



MatrixPRO™

12x Series MatrixPRO – Wideband A/V Switcher

Manual #26-0301000-00 / Revision C

RECORD OF CHANGES

REV #	DATE	ECO #	DESCRIPTION	Approved By
A	10/03	1132	Released	L. Gilstrom
B	03/04	1245	Update GUI picture & operation	L. Gilstrom
C	06/04	1277	Update GUI picture & operation	L. Gilstrom

Manual # 26-0301000-00

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



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 équilatéral signale à alerter l'utilisateur qu'il y a des instructions d'opération et d'entretien très importantes dans la littérature 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.



The rear panel ON/OFF switch does not disconnect the unit from input AC power. To facilitate disconnection of AC power, the power cord must be connected to an accessible outlet near the unit. Building Branch Circuit Protection: For 115 V use 20 A, for 230 V use 8 A.

Terms As Marked on Equipment



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

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 équilatéral signale à alerter l'utilisateur qu'il y a des instructions d'opération et d'entretien très importantes dans la littérature 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.

NOTE *This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at the users own expense.*

Table of Contents

Chapter 1 – Introduction	1
About the MatrixPRO	2
Features	2
Technical Description	3
Chapter 2 – Installation	5
Rear Panel Connectors	6
Rack-Mount Installation	7
Power Cord/Line Voltage Selection	7
Video Input Connections	8
Video Output Connections	8
Chapter 3 – Operation	9
Power-Up Initialization for MatrixPRO	10
MatrixPRO 12 x 4 and 12 x 8 Front Operation	10
A/V Key	10
Control of Audio and Video Switching	10
Output Groups	10
Grouping and Ungrouping Input/Output Groups	10
Muting	11
Status	11
Saving and Recalling Presets	11
Adjusting Input Audio Levels	11
Lockout	11
RS-232/485 Mode Select	11
GUI Operation	12
GUI Installation	12
Equipment Setup	14
Remote Ethernet Setup	14
GUI Operation	15
Chapter 4 – Connecting MatrixPRO for Specific Applications	21
Connectivity Diagram	22
Chapter 5 – Software Upgrade Instructions	23
Downloading Necessary Files	24
Preparing to Upgrade MatrixPRO 12 x	24
Verifying Communications	24
Uploading Files	24
Chapter 6 – External Remote Control Protocol	27
Serial Parameters	28
Console Port (DB-25) Pin-out	28
RS-232 and RS-485 Syntax Format	29
Serial and Ethernet Commands	31
Chapter 7 – Folsom Research Information	37
Warranty	38
RMA Information	38
Technical Support/General Contact Information	38
Appendix	39

CHAPTER ONE

Introduction

What you will find in this chapter...

- *About the MatrixPRO*
- *Features*
- *Technical Description*

The logo for MatrixPRO, featuring the word "MatrixPRO" in a bold, sans-serif font. The "TM" trademark symbol is positioned to the upper right of the "O". A solid blue horizontal line is located directly beneath the text.

MatrixPROTM

Introduction

About the MatrixPRO 12x Series

The MatrixPRO High-Resolution Matrix Switcher is designed to route universal inputs such as composite video, s-video, component, and computer video sources (640x480 to 2048x1536). Audio routing is an option.

MatrixPRO is an ideal switcher to provide professional-quality video signal routing. The operator can save up to 12 "looks" from the front panel and 16 from the MP Control GUI. Typical applications include live staging events, corporate boardroom presentations, and educational and training events.

Attention to the Installation and Operation Sections of this manual is important to ensure trouble-free operation. Should you have any questions regarding the operation of this unit, please consult the factory.

Features

- 375MHz (-3dB) @ 0dBm, minimum bandwidth, full loaded (One input driving all outputs)
- Mute on a per output basis
- Two Switching Modes:
 - Direct Front Panel Mode for One-Touch Operation
 - MP Control Software Mode for Remote Applications
- Universal Inputs accept Composite, S-Video, Component Video, HDTV, RGBHV and stereo audio
- Stereo Audio Input and Output Signals Balanced or Unbalanced (optional)
- Volume Control on a per input basis
- Audio follow or breakaway
- Output audio gain and attenuation (-75dB to +20dB)
- IP (Ethernet) Control standard using static IP address
- Front Panel Lockout Mode
- Memory Presets save individual I/O configurations for recall via the front panel or RS-232/485
- I/O Grouping allows specific outputs to be grouped together making installation and control easier.
- VREF (for Vertical Interval Switching) In with Loop Through or Channel 1 VSync or Extracted Composite VSync Input from Channel 1 Green
- Vertical Interval Switching capability provides glitch-free switches when used with synchronous video source. RGB delay used when video not synchronously locked
- MP Control Software GUI for setup and control
- Aux RS-485 connector for RS-485 pass through for daisy chaining multiple matrix switchers or other FRI devices.
- DC-Coupled Video Routing

Technical Description

MatrixPRO 12x is an RGBHV matrix switcher with 375MHz video bandwidth. It's available with 12 inputs and either 4 or 8 outputs. Output gain is unity into 75 ohm loads. All video signals are carried on BNC's for the highest signal quality. Audio routing card is available as an option.

The matrix switcher can route any input to any output or outputs, and it has built in capabilities to group outputs and/or inputs with specific outputs.

The analog video section maintains flat response in the critical 0-10MHz band to prevent video smearing. The analog video section has excellent crosstalk immunity, offset pass through, and output drive capabilities. The system can pass 2048x1536 signals with minimal degradation. The analog video section can pass RGB, RsGsBs, RGSB, component, composite, and S-video with significant input offset.

The horizontal and vertical sync sections reconstructs the sync signal to provide the most accurate output sync signals.

The audio section accepts and outputs both balanced and unbalanced audio signal on five position Phoenix quick disconnect screw terminals. A 600 ohm resistor must be placed across the inputs if a 600 ohm characteristic impedance is required.

The MatrixPRO 12x series can be controlled by the front panel, RS-232, RS-485, or Ethernet. The MP Control GUI allows the matrix switcher via RS-232 and Ethernet interfaces.

For remote push button operation, Folsom Research offers the MP Remote Control Panel. Please inquire the factory for more information.

CHAPTER TWO

INSTALLATION

What you will find in this chapter...

- *Rear Panel Connectors*
- *Rack-Mount Installation*
- *Power Cord/Line Voltage Selection*
- *Video Input & Output Connections*

The logo for MatrixPRO features the brand name in a bold, italicized, sans-serif font. The text is white and set against a dark grey rectangular background. A thin blue horizontal line is positioned directly below the text.

MatrixPRO™

Installation

Rear Panel Connectors

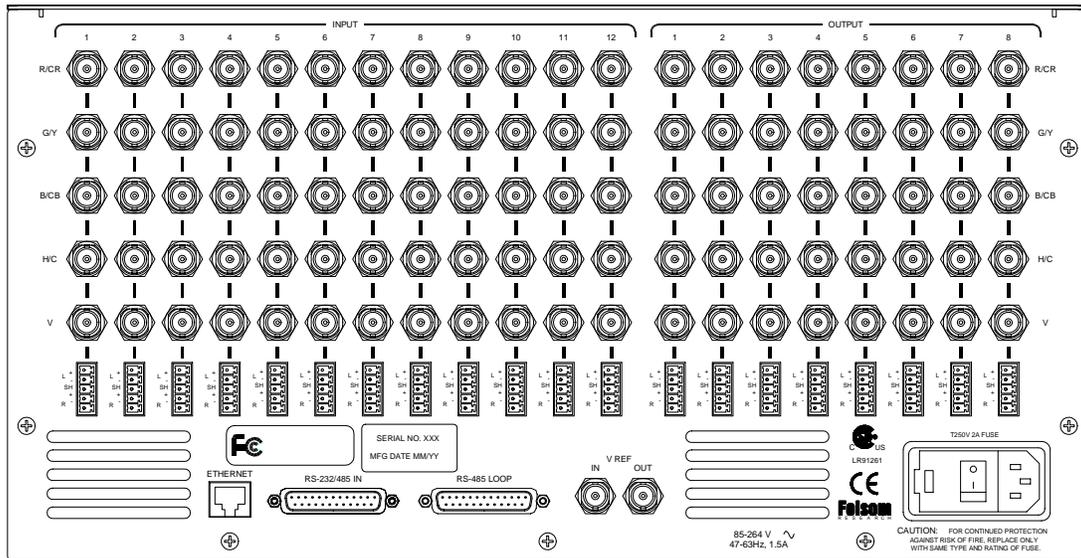


Figure 2-1: MatrixPRO 12 x 8 Rear Panel

- AC Power connector
- BNC Video Input and Output connectors
- ScreenPRO Compatible RS-232/RS-485 DB-25 connector
- Loop through RS-232/RS-485 DB-25 connector
- RJ-45 Ethernet Connector
- Vertical Sync Reference input and output BNC connectors

Rack-Mount Installation

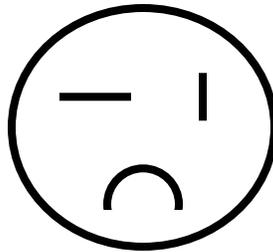
MatrixPRO 12x units are designed to be rack mounted and the necessary hardware is supplied. When rack mounting the unit, remember that maximum ambient operating temperature for the unit is 40 degrees C. Leave at least one inch of space front and rear to make sure that the airflow through the fan and vent holes is not restricted. When installing equipment into a rack, distribute the units evenly to prevent hazardous conditions that may be created by uneven weight distribution. Connect the unit only to a properly rated supply circuit. Reliable Grounding (Earthing) of Rack-Mounted Equipment should be maintained.

Power Cord/Line Voltage Selection

The MatrixPRO 12x Matrix Switcher performs line Voltage Selection automatically. No user controls are required for line voltage selection.

WARNING

When the MatrixPRO 12x is used in the 230-volt mode, a UL listed line cord rated for 250 volts at 15 amps must be used. This cord will be fitted with a tandem prong-type plug.



Tandem Plug

AVERTISSEMENT

La choix de la ligne de voltage se réalise automatiquement par le MatrixPRO 12x Transformateur Graphique. On n'a pas besoin du controller usager pour la choix de la ligne de voltage.

WARNUNG

Das MatrixPRO 12x-Gerät mu beim Anschlu an 240V ~ mit einer vom VDE auf 250V/10A geprüften Netzleitung mit einem Schukostecker ausgestattet sein.



Video Input Connections

The video input section on the MatrixPRO rear panel provides 12 universal inputs. Each input can accept RGB, YUV, S-Video (Y/C), or composite (NTSC or PAL) video signals. The connections for each input channel are made via five BNC connectors. Connection points for each type of video signal are specified below.

Input Connections

Format – RGB (Typical Devices: Computers)		Format – YUV or Y Pr Pb (Betacam) (Typical Devices: DVD Player or Betacam Deck)	
Source to MatrixPRO		Source to MatrixPRO	
R	R/CR	Y	G/Y
G	G/Y	Pr	R/CR
B	B/CB	Pb	B/CB
H	H/C	or	
V	V	Y	G/Y
Format – S-Video (Y/C) (Typical Devices: S-Video VCR)		U	R/CR
Source to MatrixPRO		V	B/CB
Y		Format – NTSC/PAL (Typical Devices: Composite/PAL VCR)	
C		Source to MatrixPRO	
		Composite/PAL	G/Y

Video Output Connections

Four or eight independently buffered outputs are provided. Outputs provide RGBHV video signals. Connect the outputs labeled R, G, B, H, and V on the rear panel of the MatrixPRO unit to the correspondingly labeled connectors on the output device.

Model	# of Inputs	# of Outputs	Audio
MP-1204	12	4	No
MP-1208	12	8	No
MP-1204A	12	4	Yes
MP-1208A	12	8	Yes

CHAPTER THREE

Operation

What you will find in this chapter...

- *Power-up Initialization*
- *Console Installation*
- *Front Panel Operation*
- *GUI Configuration*
- *Remote Ethernet Operation*

MatrixPRO™

Operation

This portion of the manual provides instructions that indicate how to control all MatrixPRO functions. Keys on the MatrixPRO front panel are used to select input sources and output destinations, save and recall looks, and mute audio sources.

Power-Up Initialization for MatrixPRO

First, locate the Power Switch on the back of the MatrixPRO frame and turn the power ON. The LED will light and the last saved setup will be recalled.

MatrixPro12x4 and 12x8 Front Operation

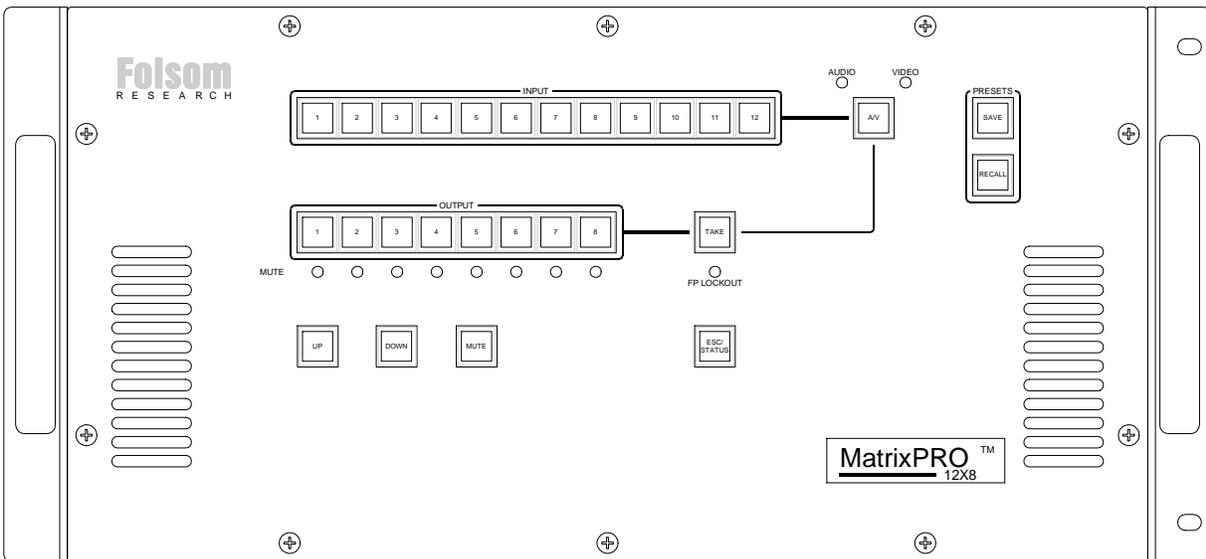


Figure 3-1: Front Panel 12x8

A/V Key

A/V Key allows the user to select three operating modes; Audio only (Audio LED on), Video only (Video LED on) or A/V Follow (both Audio and Video LEDs are on). Successive activations of the A/V key are used to sequentially cycle through the three modes. In Audio only mode, the front panel shows the status of the audio switching matrix and only the audio matrix can be switched. In Video only mode, the front panel shows the status of the video switching matrix and only the video matrix can be switched. In A/V Follow mode the same audio is switched to same output as the video channel. When a new source is selected both the audio and video are switched at the same time.

Control of Audio and Video Switching

- 1) Select the desired operating mode with the A/V Mode Key as indicated above.
- 2) Select an Output.
- 3) The selected Output as well as any other Outputs grouped with the selected Output (see Grouping Outputs) will light up.
- 4) The Input corresponding to the selected Output will be illuminated.
- 5) Select a new Input source. The newly selected Input will start blinking and the current Input will stay lit until Take or new Output is selected. This indicates that a new source has been selected to be switched to the Output once the Take key is activated.
- 6) To set up additional pending switching operations or to edit the previously entered selections repeat steps 2-5.
- 7) Press Take to route the pre-selected Inputs to the Outputs.
- 8) To erase all pending switching selections, press the ESC/STATUS button.

Output Groups

When two or more Outputs will always have the same Input source, grouping the Outputs simplifies switching control. An Output Group is defined as two or more Outputs that are configured to receive a common Input source. Before grouping any Outputs, it is important to select the desired A/V Mode. Groups for Audio, Video and A/V Follow modes can be separately defined.

- 1) To group Outputs, press and hold one of the desired Outputs to be grouped.
- 2) While holding the Output button, press and release an additional Output to be grouped, the corresponding key will light up. Continue selecting Outputs in this fashion until all of the desired outputs have been added to the group. To de-select an Output, simply press the key of the Output a second time, the key lamp will then go out.
- 3) Once all of the desired Outputs are grouped release the Output button you have been holding down.

Grouping and Ungrouping Input/Output Groups

An Input/Output group (I/O Group) defines the Inputs that can be switched to a specific Output or Output group. This prevents incompatible Input sources from being routed to an Output. For example if the Output device is a computer monitor, you may wish to enter an I/O grouping to ensure only computer video is routed to the output device. Before grouping any Outputs, it is important to select the desired A/V Mode. Groups for Audio, Video and A/V Follow modes can be separately defined.

- 1) To form an I/O Group, first select the desired Output or Output Group. If the Output is part of an Output group the other Outputs of that group will light.
- 2)) While holding the Output button, press and release an additional Inputs to be grouped, the corresponding keys will light up. Continue selecting Inputs in this fashion until all of the desired inputs have been added to the I/O Group. To de-select an Input simply press the key of the Input a second time, the key lamp will then go out.
- 3) Release the Output button, the I/O group is now configured.
- 4) Additional I/O groups can be edited in a similar manner.

Muting

Individual Muting control is provided for all outputs. Mute status is indicated by LED indicators (Muted =LED on. Active = LED off).

- 1) To Mute or de-Mute audio for an output channel, press and hold Mute, then press the desired Output to be Muted or de-Muted. The LED under the selected Output will change toggle.
- 2) Select any additional channels to be muted or activated in the same manner.
- 3) Muting takes place in real time as the Mute buttons are pressed.

Status

There are two ways to view the status of the MatrixPRO. For both operations, ensure the MatrixPRO is in the desired A/V mode.

To manually see which Input is associated with an Output, press and release the Output key. The current Input assigned to the Output will be illuminated. If a source change is pending (the Take button has not been pressed), the selected source will be indicated by a blinking key indicator.

To automatically see the inputs associated with each output, press the Esc/Status Button. The MatrixPRO will automatically cycle through the outputs to provide the operator with status information. Note that Outputs that are grouped will light at the same time. The MatrixPRO will cycle through the Outputs will continue to cycle through until the Status button is pressed again.

Saving and Recalling Presets

Save and Recall in combination with the Input buttons Store and Recall the entire configuration of the Matrix switcher including all Inputs linked to Outputs, Audio Trim Levels, Mute, and port status.

- 1) To Save a setting, configure the MatrixPRO to the desired settings, press the Save button.
- 2) Press any of the Input buttons to store the configuration in that memory space.
- 1) To Recall a configuration, press the Recall button.
- 2) Select desired Input button.
- 3) Press Take to Recall.
- 4) During Recall, to preview memory configuration and before pressing Take, press the Output buttons to view routing.

When a Save or Recall function is executed this memory location will be saved as the power up configuration. The Saved configuration contains 1) Routes, 2) Input Audio and Audio Mutes, 3) Grouping information. The power up configuration contains 1) Front Panel Lockout status, 2) Serial Mode, 3) A/V Mode, 4) RS-485 Node, 5) Switching Mode, 7) RGB Delay Time, and 8) IP Address. In other words if a Save or Recall is executed all the above information is save to flash memory and used the next time the MatrixPRO is powered up.

Adjusting Input Audio Levels

The Audio level is controlled by the Up and Down buttons. To change the volume level, select an Output that is routed to the desired Input to be changed. Press the Up or Down button to change the level. If the MatrixPro is in Video only mode, Audio volume levels cannot be adjusted.

Lockout

Lockout prevents the use of the front panel. Front panel lockout will be indicated by the Lockout LED being illuminated under the Take button. Lockout is set in GUI via serial communication or Ethernet. It can also be defeated by pressing A/V, Save, and Recall at the same time.

RS-232/485 Mode Switching

Switching between RS-232 and RS-485 is accessed by pressing and holding the ESC/STATUS and pressing 4-8-5 input buttons in that order. Release the ESC/STATUS button and the MatrixPRO will switch to that mode. To enter the RS-485 node, press and hold the ESC/STATUS key then press input buttons for that node. Nodes range from 1 to 32. Pressing and holding the ESC/STATUS key again allows switching back to RS-232 by pressing 2-3-2 input buttons.

MP Control GUI

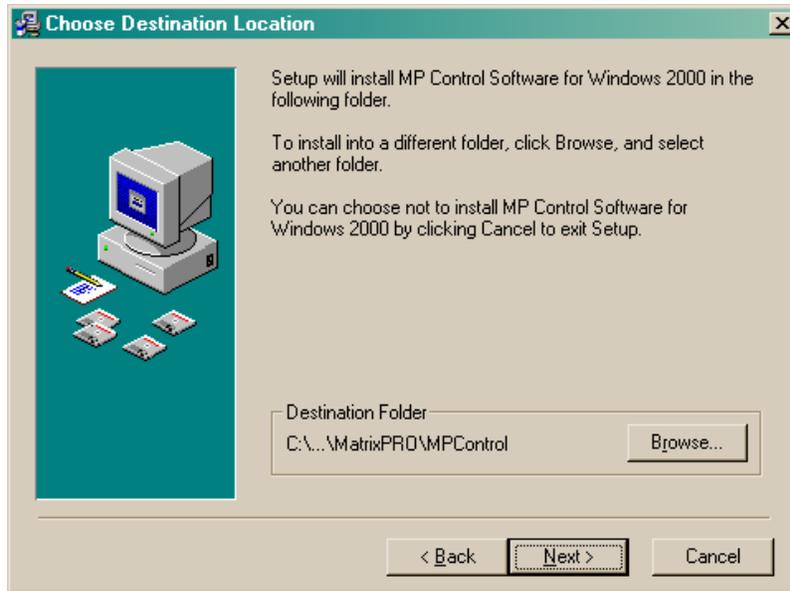
MP Control GUI is an interactive Graphical User Interface application designed to assist users with the operation of the MatrixPRO.

MP Control Install Instructions

The MP Control software is available on the enclosed CD or may be downloaded from the Folsom Research web-site or FTP server for the most updated version. The following step-by-step instructions will allow you to install Folsom Research Inc's MP Control GUI to a Windows NT/2000/XP PC.

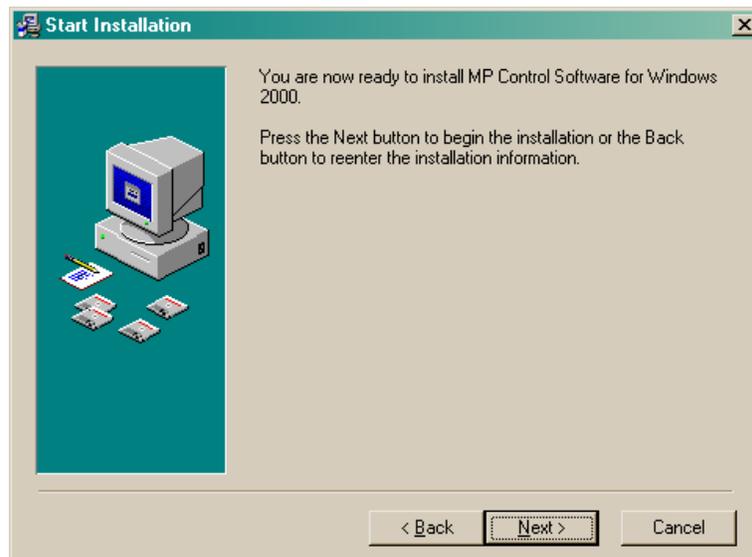
Follow the steps below and use the figures provided as a visual reference to the images being displayed during the installation process.

1. Double-click on the MPControlSetup.exe to begin the installation process. Click on the 'Next' button to continue the installation process.
2. The following dialog box will appear:



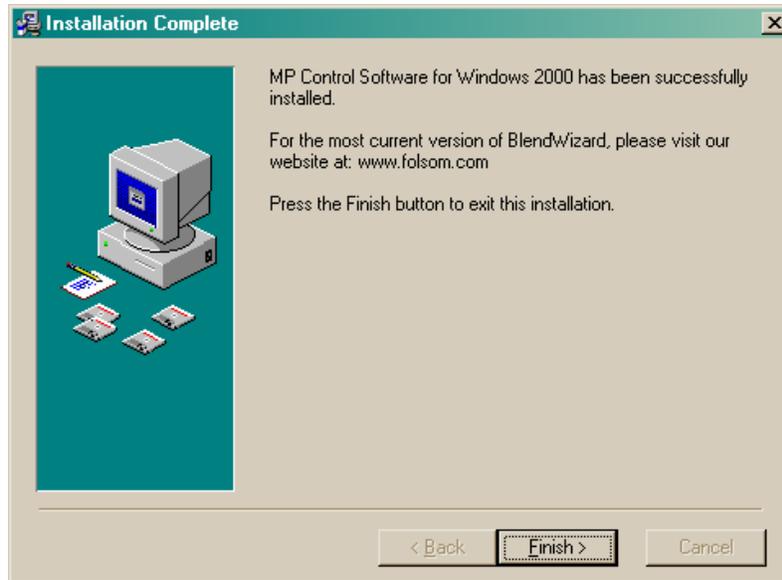
The default install directory is C:\Folsom Research\MatrixPRO\MPCControl. Click the 'Browse' button to select a different directory, if desired. Click the 'Next' button to continue.

3. The following dialog box will appear



The setup application is now ready to install the MP Control application. Click the 'Next' button to begin file transfer.

4. After successfully transferring the file to the directory specified, the following dialog box will appear:



Click the 'Finish' to exit the installation setup.

5. A shortcut to the MP Control application has been placed in the Windows desktop. The MP Control application can also be reached from the Start Menu (Start -> Programs-> Folsom Research -> MPCControl.)

Equipment Setup

Connect the input and output sources on the MatrixPRO. Connect the MatrixPRO remote port to an available serial (RS-232) port on the laptop/PC with the MP Control application installed. Turn on the MatrixPRO and wait for a complete system boot up. After the MatrixPRO has successfully booted up, run the MP Control application.

Remote Ethernet Setup

To control the MatrixPRO using a computer on the same LAN, pre-configure the MatrixPRO with a static IP address using RS-232 ipconfig command or program the MatrixPRO using the GUI over RS-232. On the remote computer, launch the GUI. Press 'NO' when it asks if you would like to connect serially. Press the Setup tab. Enter the IP address of the MatrixPRO in the IP address box. Click the 'Ethernet' radio button under the 'RS-232'. The MatrixPRO now will be under the control of the GUI.

Note: Only one Ethernet socket is available so only one remote GUI can be accommodated at one time. However the MatrixPRO can still be controlled via RS-232, RS-485 or the Front Panel while being controlled over Ethernet. Press 'Update Status' as necessary to find the current status of the MatrixPRO if the unit is control by other sources. Also note, if an operation such as a routing is not completed by using a Take command via the Front Panel or by serial command, the GUI can fall into an unknown state and operation may become unreliable. To prevent any mis-operation, it is recommended that the Front Panel Lockout be activated on the GUI.

GUI Operation

The following section describes the operation of the GUI.

A/V Routing Tab

This page is used for routing of the Video and Audio (if applicable).

Select the A/V mode first. Either select Video only, Audio only or Audio follow Video. Press the Input button of the desired input to be routed to the Output or Outputs. Select all Outputs to receive the selected Input. Pending routes are shown in red. Select a new Input and click on Outputs to receive the selected Input. Continue selecting Input and Output routings until the Look is setup then press Take to initiate routing. Press Cancel to clear all pending routes.

To save a Preset, press Save then select one of the 16 memory buttons. To Recall a Preset, press recall then one of the 16 memory buttons.

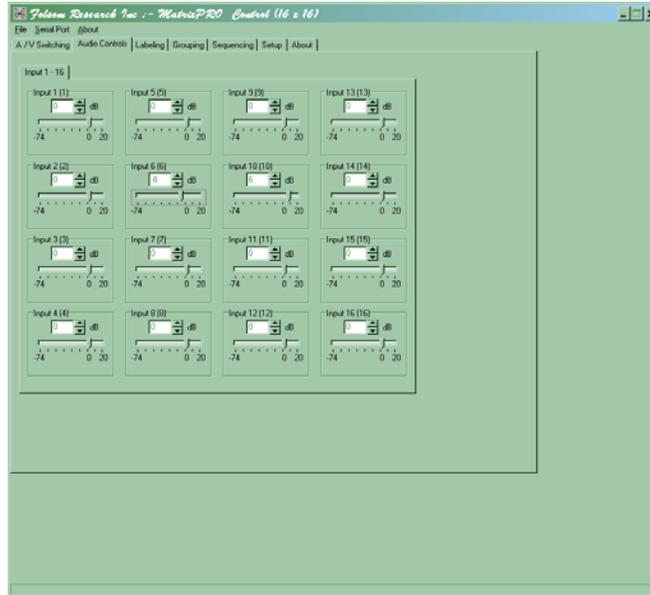
If the MatrixPRO is operated for the front panel or serially, the configuration of the MatrixPRO can be checked by pressing the Read from MatrixPRO button. To unroute all, press the Clear All Routing button.



Audio Control Tab

The audio control tab is used for setting the volume of all audio outputs.

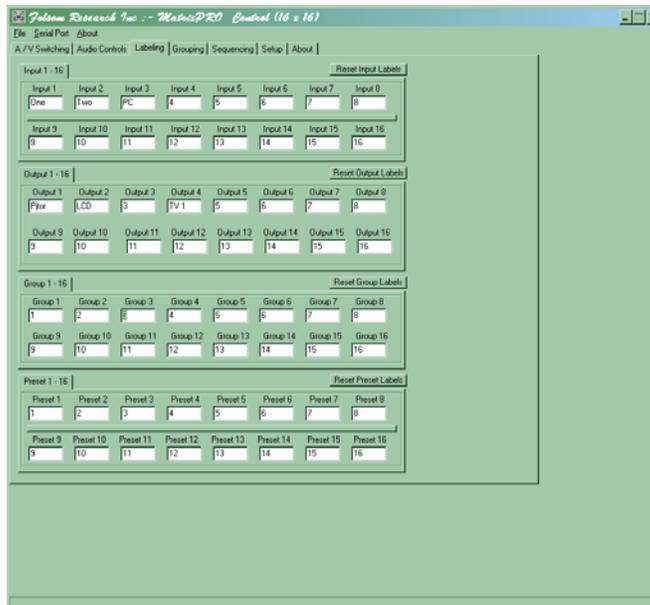
Volume is controlled real time. The volume setting can be controlled by moving the slider for quick changes or by pressing the up and down buttons to set the audio level 1dB at a time. If audio is not install in the MatrixPRO this page is inoperable.



Labeling Tab

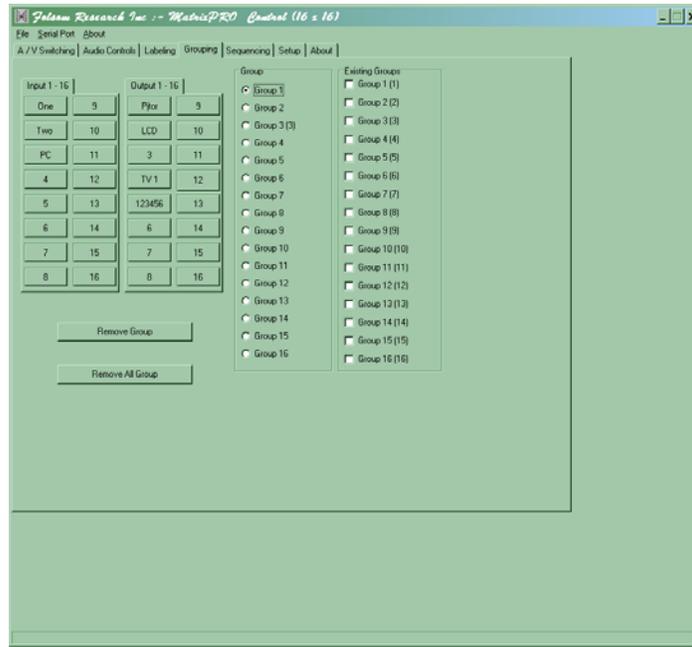
This page allows customization of labels used on the A/V Routing, Audio Control, and Grouping page.

Enter the new label of the buttons with strings up to 6 characters in length.



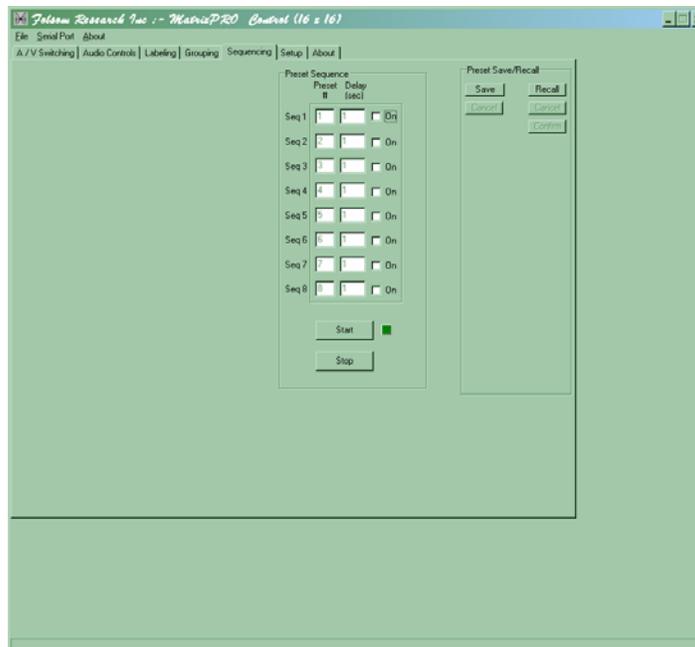
Grouping Tab

Grouping allows multiple inputs and outputs to be segregated together. This allows dividing of the MatrixPRO so that different source types can be linked only to compatible destinations. Output groups can also be formed. Output groups allow multiple Outputs to be controlled together so routing one forces the other in the group to be routed to the same input.



Sequencing Tab

The Sequencing function allows automatic recall of Presets so that a show or presentation can operate only with GUI control. Enter time, the Preset number, and check the On button in the columns and press Start. The cycle will run indefinitely until Stop is pressed.



Setup Tab

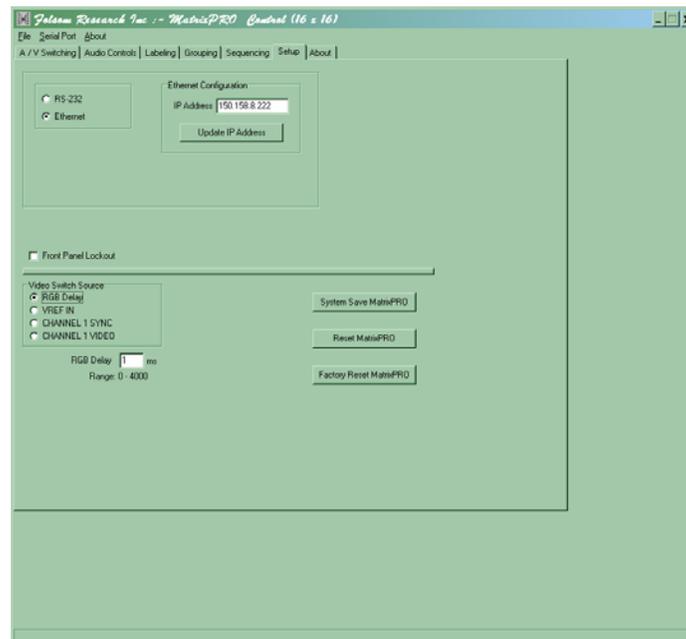
The Setup tab allows setting of the IP address, choosing means of communication (RS-232 or Ethernet), Vertical Interval Switching mode, and Resetting the MatrixPRO.

To set the IP address, the MP Control GUI needs to be communicating with the MatrixPRO via RS-232. Once the IP address is set then the GUI can be switched to Ethernet mode and communications conducted via Ethernet LAN communication. Note that computer and the MatrixPRO need to have the 3 first numbers be the same.

There are 4 means of switching the video with the Video Switching Source menu. RGB Delay blanks the video, then switches the syncs, then waits the amount of time indicated in the RGB Delay box in milliseconds then un-mutes the video. Selecting VREF In switches the video during the blanking period based on the Vsync feed into the VREF input BNC. Channel 1 Sync switches the video during the blanking period based on Vsync input from channel 1. Channel 1 Video switches the video based on the composite input video from Channel 1. If video into Channel 1 is not composite and Channel 1 video is selected, unreliable results will occur.

Also the selection of VI source also determines the VREF output except if RGB Delay is selected.

The Reset MatrixPRO button clears all routing. Factory Reset MatrixPRO button erases all memory Presets, serial settings, IP address, and routing.



About Tab

This tab tells the Version of the GUI and Main code of the MatrixPRO. It also gives the user a means of communication with the MatrixPRO via command line via RS-232. The page gives information as to which comm port that the GUI is communicating via RS-232.



CHAPTER FOUR

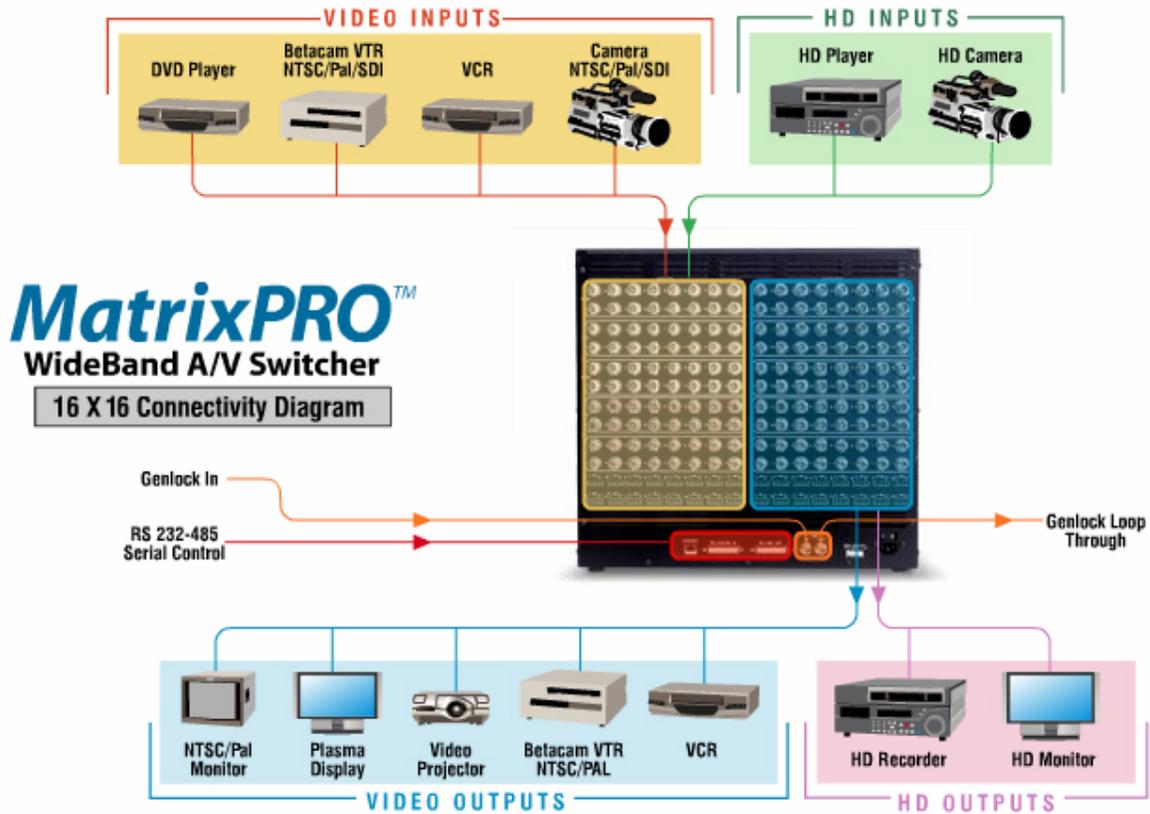
Connecting MatrixPRO

What you will find in this chapter...

- *Connectivity Diagrams*

MatrixPRO™

Connectivity Diagram – 16 x 16 MatrixPRO Model



Further Questions?

At Folsom Research, we take pride in offering unique solutions to demanding technical problems. If you have questions, require further information or would like to discuss your application requirements in more detail, please call (916) 859-2500. Our Customer Support Engineers will be happy to supply you with the support you need.

CHAPTER FIVE

Software Upgrade Instructions

What you will find in this chapter...

- *Downloading Necessary Files*
- *Preparing to Upgrade MatrixPRO 12x*

MatrixPRO™

Software Upgrade Instructions

Overview

The MatrixPRO units built by Folsom Research, Inc. incorporate the system software in a Flash memory component. Flash memory allows easy upgrades without the need to send the unit back to the factory due to software changes.

The loader utility provides the capability to update the system Flash module with the latest revision of software. The upgrade utility can be run from a hard drive (recommended) or a floppy drive. Running the loader from a floppy drive is discouraged though due to the slow speeds associated with disk access.

Hardware Requirements

* IBM compatible computer with an available COM port

* Serial cable conforming to EIA RS-232 specifications (i.e. Standard Modem cable)
(The cable should have a DB-9 male connector on one end)

Software Requirements

* Window 95/98/NT/2000/XP

* Flash File Loader

* MatrixPRO Software files

The Flash File Loader with the Software files can be downloaded from our FTP site as described below.

Connecting to Folsom Research

Folsom Research's FTP site address is: [ftp.folsom.com](ftp:folsom.com)

If you are using an FTP client, logon to our site using "anonymous" for the user name and your email address as the password (ex. johndoe@somecompany.com).

If you are using a web browser to access our FTP site, point the browser to: <ftp://ftp.folsom.com>

Downloading Necessary Files

MatrixPRO Software Files and Flash File Loader

Directory Location: [ftp.folsom.com](ftp:folsom.com)\Products\Video\MatrixPRO\MP12x

File to download: "MatrixPRO12x_Rev#####_###.exe"

Installing the MatrixPRO Software Files and Flash File Loader

Before installing the files, it is recommended that all running programs be properly shut down.

- 1) Click on the Start button and select Run.
- 2) Click on the Browse button and locate the "MatrixPRO12x_Rev#####_###.exe" file on your hard drive.
- 3) Double click on this file and then click OK to start the installation process.
- 4) Follow the on screen instructions to complete the install.

Preparing to Upgrade the MatrixPRO 12x

1. Plug the DB-25 male connector into the port labeled "RS-232/485 IN" on the back of the MatrixPRO unit.
2. Make sure the other end of the cable is attached to the available COM port on the back of the computer performing the upgrade.
3. Turn the MatrixPRO ON or do a power cycle if it was previously powered on and wait for it to boot.

Starting the MatrixPRO Flash File Loader Utility

After the files have been installed the MatrixPRO Flash File Loader can be selected to run.

1. Click on the Start button and select Programs.
2. Find the Folsom Research folder and select MatrixPRO Flash File Loader.

Verifying Communications between the Computer and MatrixPRO Unit

1. In the loader program, click in the Black Terminal Window area.
2. If communications is established, pressing the ENTER key on the keyboard will result in the terminal window displaying various messages and finally with the system prompt “#” displayed. If nothing occurs when ENTER key is pressed, it is possible that serial port communication was not established. If this is true, click on the RS232 Config Menu and select the COM Port the unit is connected to. In the CONFIG SERIAL submenu and verify the following:

```
ECHO      = ON
BAUD RATE = 57.6K
DATA BIT  = 8
STOP BIT  = 1
PARITY    = NONE
HANDSHAKING = ON
```

If any of the communication parameters are changed within the loader, it is recommended that the MatrixPRO unit be powered cycled and the verification process started over.

Uploading Files to the MatrixPRO Unit

1. Once communications have been established and verified, click on the "Open script file to read and upload" button.
2. Select "Complete Load.sld" and click OPEN.
3. After several minutes, the loader utility will display several messages. Press OK for each message that appears. After several minutes, the loader utility will inform the user that the process is complete.
4. Once this is done, you must power down the MatrixPRO unit and turn it back on for the software to take effect. You can also close the loader utility at this time.
5. Verify the new software is in the system by looking for the version numbers in the MP Control GUI.
6. Once you have verified the version number, it is recommended that a factory reset be performed. This is done by going MP Control GUI and clicking on the Factory Reset button.

Chapter SIX

External Remote Control Protocol

What you will find in this chapter...

- ❑ *Serial Parameters*
- ❑ *Console Port (DB-25) Pin-out*
- ❑ *Protocol Specification*
- ❑ *Serial Remote Commands*



Serial Command Syntax Specification

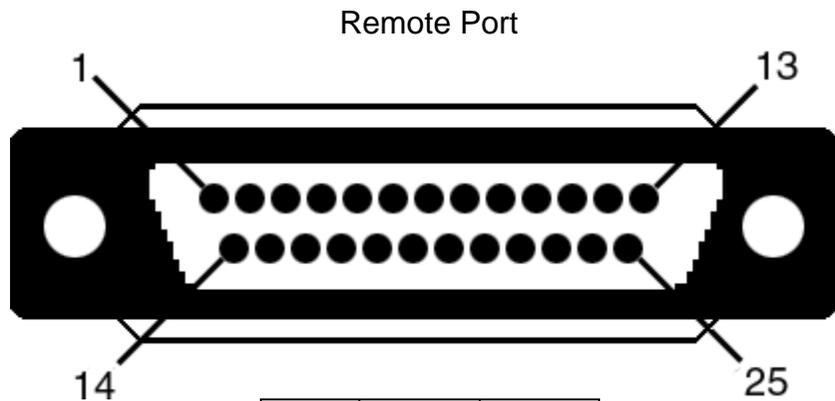
Serial Parameters

The following are the parameter settings for serial communication.

- Baud Rate is 57600 baud.
- Parity is NONE.
- Stop Bit is 1.
- Data Bit is 8.
- Echo is ON
- Flow Control is NONE

RS-232/485 Remote Control Connections

The RS-232 or RS-485 serial port can be connected to a computer to support remote control of the MatrixPRO unit. The Electronics Industry Association (EIA) has produced standards for RS232 and RS485 that deal with data communications. Below is the pinout for both RS232 & RS485 with DB25 connector.



DB25	RS232	RS485
1	Shield	Shield
2	TxD	T(-)
3	RxD	R(-)
4	RTS	N/A
5	CTS	N/A
6	DSR	N/A
7	Sig Gnd	Sig Gnd
8	DCD	N/A
10	N/A	N/A
12	N/A	N/A
14	N/A	T(+)
15	N/A	N/A
16	N/A	R(+)
19	N/A	N/A
20	DTR	N/A
21-25	N/A	N/A

RS232 Mode

The Graphics Board will respond with a '#' prompt when the command processor is ready for a command.

The command syntax is shown below
cmd arg1 arg2 ... argn<CR>

cmd	cmd is any valid Graphics Board command, typically 2 to 6 alphabetic (non numeric) characters.
arg	arg1, arg2, ... argn are required or optional parameters depending on the command used.
<CR>	carriage return (ASCII 13) terminates the command

A space (ASCII 32) must be inserted between the command and any arguments that follow. A space must also be inserted between all argument parameters except for the last argument in the chain.

All commands in RS232 mode **must** be terminated with a carriage return (ASCII 13). The carriage return will tell the command processor to begin execution of the command.

Query commands will return the following:

```
=result  
#
```

The '=' indicates a result from a command is following. The 'result' will follow directly after the '='. The value of the result will vary depending on the query command used. A new line will be generated and the prompt will indicate the system is ready for a new command.

RS485 Mode

To switch to RS-485 see page 11 in the front panel operation section. Single commands will be combined with a command delimiter start, device number, command separator and command delimiter end to form a command string as shown below:

Single Command Format:

cdsidcmd arg1 arg2 ..argncde

Multiple Command Format:

cdsidcmd arg1 arg2 ..argn,idcmd arg1 arg2 ..argn,...,idcmd arg1 arg2 ..argncde

cds	cds is the command delimiter start character '*' (ASCII 42).
id	id is the device number in the range of 1 to 32. This can be a single character for values less than 10, no preceding zero is required.
cmd	cmd is any valid Graphics Board command, typically 2 to 6 characters in length
arg	arg1,2,n is any required or optional parameters need for the command
,	separates multiple commands
cde	cde is the command delimiter end character '!' (ASCII 33).

Example:

**12XYZ A 9,9PDQY 1234,31WX 200 98!*

The command string is started by the command delimiter start character '*'. The first command follows directly after the cds. The example shows that device 12 should process the XYZ command with A and 9 as parameters. A coma (ASCII 44) separates the commands. Device 9 will process the PDQY command with a parameter of 1234 and device 31 will process the WX command with parameters of 200 and 98. The cde '!' follows directly after the last command to end the command string.

Commands received in the command string will not be processed until the cde character '!' is received. This format allows commands to be stack to the same or multiple devices and executed when the cde '!' character is received by all units. Any incomplete or unknown commands will be ignored. The maximum number of commands that can be stacked per unit is 16. Each unit will only stack those commands assigned to it, even though all units receive the same command string.

During queue processing, no input buffer processing is performed. Characters sent through the serial port during queue processing are still stored in the input buffer. If hardware flow control is not observed, it is important to guarantee that the input buffer limit is not exceeded before completion of the last command string. Note: The command queue does not support backspace characters.

To minimize bus traffic the command words will be kept as short as possible. The units will not respond with prompts or any command error conditions. Echo will be disabled when RS-485 mode is selected.

MatrixPRO™ Remote Commands

HELP	Capabilities. Send list of commands available back in ASCII format
ALVL num lvl	Input Audio Level.
AVTYPE mode	AV Type. 0=A/V, 1=Audio, 2=Video
CLEAR	Clear all matrix video and audio routings.
CSUMSTAT	Display Main Code/RBF Checksum info
FDLY dly	Field delay for RGB sync. Delay (dly) in milliseconds
FPLOCK en	Locks/unlocks Front Panel control
GCLEAR grp	Clears grouping information
GADD grp out in	Add output, input to group
GDEL grp out in	Remove output, input from group
IPCONFIG I3 I2 I1 I0	IP address configuration I3.I2.I1.I0
LOADRMP	Places unit into loader mode for firmware upgrade
OMUTE out en	Enable/disable audio mute on output.
OSTAT [out]	Displays output status in ASCII.
PSTAT [num]	Displays preset status in ASCII.
PRST num	Saves current front panel configuration to a Preset location.
RPRST num wr_flash	Recall preset from a Preset location.
RNOV	Recall Flash settings
RESETMP op	Reset the MatrixPRO and recall saved Flash values op [R F] Reset Factory Reset
RTEMP out in audio	Route inputs to outputs. If output is in group, group is routed too.
SBAUD	Sets Baud Rate. 0=19200, 1=28800, 2=38400, 3=57600.
SMODE mode [485id]	Serial Mode. 0=RS232, 1=RS485. [485id] opt if RS232
SWITCH mode	Switching Mode. mode = 0(RGB) 1(VSync) 2(Comp) 3(VREF In)
TAKE en	en = 1 simulates a TAKE button pushed on the front panel (i.e takes all prelim routes and makes it permanent). en = 0 simulates a CANCEL button pushed
UNOV	Save current settings to FLASH
VDLY dly	Vertical Interval delay. Delay for # of VSYNCS seen before raising /CE. Minimum is 1, max is 255

MatrixPRO Serial Command List/Description

Command: HELP

Description: Displays the list of available command on a terminal emulator
Parameters: None
Example: HELP (Returns the command list.)

Command: ALVL num lvl

Description: Updates input audio level
Parameters: **num** - Input number; [1 - 12]
lvl - Audio level; [0 - 252] 0 = -74dB, 200 = 0dB, 252 = +20dB

Query:
ALVL? num
Returns the selected input audio level in the format:
=lvl

Example: ALVL 1 252 (Set input 1 audio level to 252. All outputs connected to input 1 will have audio level of 252.)

Command: AVTYPE mode

Description: Updates A/V mode for routing command.
Parameters: **mode** - A/V mode; 0=A/V, 1=Audio, 2=Video
Query:

AVTYPE?
Returns the current A/V mode in the format:
=mode

Example: AVTYPE 0 (Set A/V type to route both Audio and Video for the next route command sent)

Command: CLEAR

Description: Clears all existing and pending video and audio routes.
Parameters: None
Example: CLEAR (Clears all existing and pending video and audio routes.)

Command: CSUMSTAT

Description: Displays firmware checksums and other information.
Parameters: None
Example: CSUMSTAT (Displays firmware checksums and other information.)

Command: FDLY dly

Description: Updates the field delay parameter for RGB Sync.
Parameters: **dly** - RGB delay (in milliseconds); [0-3000]

Query:
FDLY?
Returns the current field delay setting in the format:
=dly

Example: FDLY 100 (Set RGB sync field delay to be 100ms.)

Command: FPLOCK en

Description: Lock / unlock the front panel from user input. Locking the front panel will result in the front panel not responding to user button presses.

Parameters: **en** - [0|1], Disable|Enable

Query:

FPLOCK?

Returns the current front panel lock status in the format:

=en

Example: FPLOCK 1 (Locks the front panel from the user.)

Command:

GCLEAR grp

Description: Clears the selected grouping information.

Parameters: **grp** - Group number to clear; [1-8]

Example: GCLEAR 1 (Clears the grouping information in group number 1.)

Command:

GADD grp out in

Description: Add output and/or input to the selected group index. Note: cannot add output to more than 1 group index.

Parameters: **grp** - Group number to add output/input; [1-8]

out - Output number to add; [1-8] / 101 if no output to add

in - Input number to add; [1-12] / 101 if no input to add

Example: GADD 1 4 2 (Add output 4 and input 2 to group 1.)

GADD 1 101 5 (Add input 5 to group 1)

Command:

GDEL grp out in

Description: Remove output and/or input from the selected group index.

Parameters: **grp** - Group number to remove output/input; [1-8]

out - Output number to remove; [1-8] / 101 if no output to remove

in - Input number to remove; [1-12] / 101 if no input to remove

Example: GDEL 1 4 2 (Remove output 4 and input 2 from group 1.)

GDEL 1 101 5 (Remove input 5 from group 1)

Command:

IPCONFIG I3 I2 I1 I0

Description: Sets the MatrixPRO's IP address

Parameters: **I3** - First set of IP numbers for Ipv4 (I3.I2.I1.I0); [0-255]

I2 - Second set of IP numbers for Ipv4 (I3.I2.I1.I0); [0-255]

I1 - Third set of IP numbers for Ipv4 (I3.I2.I1.I0); [0-255]

I0 - Fourth set of IP numbers for Ipv4 (I3.I2.I1.I0); [0-255]

Query:

IPCONFIG?

Returns the current IP address the MatrixPRO is set to in the format:

=I3.I2.I1.I0

Example: IPCONFIG 192 168 0 141 (Set MatrixPRO IP address to 192.168.0.141)

Command:

LOADRMP

Description: Places unit into loader mode. This mode is used to perform field upgrades

Parameters: None.

Example: LOADRMP (Puts unit into loader mode.)

Command:

OMUTE out mte

Description: Updates output mute status

Parameters: **out** - Output number; [1 - 8]
mte - Mute status; [0|1], Disable|Enable

Query:

OMUTE? out

Returns the selected output mute status in the format:

=mte

Example: OMUTE 2 1 (Mute output 2.)

Command:
OSTAT out

Description: Displays output information (i.e. which input video/audio # routed, audio level, etc).

Parameters: **out** - Output number; [1 – 8]
(Note: this parameter is optional, if no parameter exist, all output information (i.e. 1-8) will be displayed.)

Example: OSTAT 1 (Displays output status for output 1.)
OSTAT (Displays output status for all outputs.)

Command:
PSTAT out

Description: Displays preset information (i.e. preset valid, which input video/audio # routed, audio level, etc).

Parameters: **out** - Preset number; [1 – 16]
(Note: this parameter is optional, if no parameter exist, all preset information (i.e. 1-16) will be displayed.)

Example: PSTAT 1 (Displays preset status for preset 1.)
PSTAT (Displays preset status for all presets.)

Command:
PRST num

Description: Saves current front panel configuration/routing to a Preset location

Parameters: **num** - Preset number to save to; [1 – 16]
Example: PRST 1 (Saves configuration to preset location 1.)

Command:
RPRST num wr_flash

Description: Recall an existing preset from a preset location and update current front panel configuration/routing
If no preset information has been saved to the preset location, no changes are made. If wr_flash bit is enabled, then the recall becomes the start up configuration.

Parameters: **num** - Preset number to recall from; [1 – 16]
wr_flash – Enables recall to become start up configuration [1|0]

Example: RPRST 1 0 (Recalls configuration from preset location 1 and doesn't become start up configuration.)

Command:
RESETMP op

Description: Resets the system to factory defaults

Parameters: **op** - Reset operation; [R|F], Restart|Factory

Example: RESETMP F (Resets system to factory defaults and resets all user saved presets.)

Command:
RTEMP out in audio

Description: Routes input to output. If the output is in a group, all the outputs in the group will be routed to the input specified. If the output is in a I/O group but the input is not in the group, the command will be ignored.

Parameters: **out** - Output number; [1 - 8]
in - Video Input number to route video; [1-12] / 101 if no input to add / 0 unroutes input
audio - Audio Input number to route audio; [1-12] / 101 if no audio to add / 0 unroutes input

Query:

RTEMP? out

Returns the current video and audio inputs routed to the specified output in the format:
=in audio

Example: RTEMP 1 3 4 (Route to output 1, video input 3, audio input 4.)
RTEMP 4 101 5 (Route to output 4, audio input 5)

Command:

SBAUD mode

Description: Serial Baud Rate. Selects between 19.2, 28.8, 38.4, or 57.6K baud.

Parameters: **mode** - Mode; [0|1|2|3], 19200|28800|38400|57600

Query:

SBAUD?

Returns the current serial baud in the format.

=mode

Example: SMODE 0 (Sets Serial baud rate to 19200.)

Command:

SMODE mode [485id]

Description: Serial Mode. Selects between RS-232 or RS-485 serial modes. If select RS-485 mode, also need to specify RS-485 ID.

Parameters: **mode** - Mode; [0|1], RS-232|RS-485

485id - RS-485 ID for the MatrixPRO. This field is ignored if switching to RS-232 mode

Query:

SMODE?

Returns the current serial mode in the format.

=mode 485id

Example: SMODE 0 (Sets Serial mode for RS-232.)
SMODE 1 10 (Sets Serial mode for RS-485 with ID 10)

Command:

SWITCH mode

Description: Video switching mode. Selects either RGB delay, Vertical Sync, Composite Sync, or V Ref Sync.

Parameters: **mode** - Mode; [0|1|2|3], RGB|Vsync|Comp|VREF

Query:

SWITCH?

Returns the current video switching mode in the format.

=mode

Example: SWITCH 0 (Sets video switching mode to RGB delay.)

Command:

TAKE en

Description: Route / Cancel all pending video/audio routes.

Parameters: **en** - Mode; [0|1], Cancel all pending|Route all pending. 0 is the equivalent of pressing the ESC button on the front panel. 1 is the equivalent of pressing the TAKE button on the front panel.

Example: TAKE 1 (Routes all pending video/audio routes.)

Command:

UNOV

Description: Saves the system parameters to non-volatile RAM. The system parameters stored are the current output/input routes, grouping information, IP setting and serial port configuration parameters. Upon power up, the system parameters stored in non-volatile RAM are used for system configuration.

Parameters: None

Example: UNOV (System parameters are saved to non-volatile RAM.)

Command:
VDLY dly

Description: Updates the vertical interval delay parameter for vertical interval switching.

Parameters: **dly** - The number of V Syncs before video is switching occurs; [1-255]

Query:

VDLY?

Returns the current vertical interval delay setting in the format:

=dly

Example: VDLY 10 (Set vertical interval delay to 10.)

Chapter SEVEN

Folsom Research Information

What you will find in this chapter...

- *Warranty*
- *RMA Information*
- *Technical Support/General Contact Information*



Folsom Research Warranty

All video products are designed and tested to the highest quality standards and are backed by a full 3-year parts and labor warranty. Warranties are effective upon delivery date to customer and are non-transferable. Folsom Research, Inc. warranties are only valid to the original purchaser/owner. Warranty related repairs include parts and labor, but do not include faults resulting from user negligence, special modifications, lightning strikes, abuse (drop/crush), and/or other unusual damages.

The customer shall pay shipping charges when unit is returned for repair. Folsom Research will cover shipping charges for return shipments to customers.

Return Material Authorization (RMA)

In the unlikely event that a product is required to return for repair, please call 888-414-7226 and ask for a Sales Engineer to receive a Return Merchandise Authorization number (RMA).

RMA Conditions:

- a) Prior to returning any item, you must receive a Return Merchandise Authorization (RMA) number.
- b) All RMA numbers must appear on their return-shipping label.
- c) RMA numbers are valid for ten (10) days from issue date.
- d) All shipping and insurance charges on all RMA's must be prepaid by the customer

Folsom Research Contact Information

Sales Contact Information

Direct Sales Line: 916-859-2505

Toll Free Line: 888-414-7226

E-mail: sales@folsom.com

Technical Support Information

Tech Line: 888-414-7226 (Monday – Friday, 8 - 5 pm PST)

John Orr: 916-802-6867 (24hours/7days)

Chris Proso: 916-719-6867 (24hours/7days)

E-mail: support@folsom.com

General Company Information

Folsom Research, Inc.

11101 Trade Center Drive

Rancho Cordova, CA 95670

Toll Free: 888-414-7226

Tel: 916-859-2500

Fax: 916-859-2515

Web Address: www.folsom.com

Folsom Research Europe

Folsom Research BV

Chrimiumweg 111

3812 NM Amersfoort

The Netherlands

T: +31 521 522737

F: +31 521 522775

M: +31 6 20005591

Email: saleseurope@folsom.com

Hours of operation are Monday through Friday 0900 to 1800 (GMT +1)

APPENDIX

- *Technical Specifications*

MatrixPRO™

MatrixPRO 12x Technical Specifications

Video Routing

Gain.....Unity into 75 ohm load
Coupling.....DC
Bandwidth375 MHz (-3dB) @ 0dBm, fully loaded (One input driving all outputs)
0-25MHz +/- .1dB, 25-300MHz +1.5dB -.5dB @ 0dBm
Crosstalk.....-80dB @ 1 MHz, -60dB @ 10 MHz, -50dB @ 30 MHz, -30dB @ 100 MHz
Switching speed.....100 us to 4 seconds (Programmable)

Video Input

Number/signal type12 RGBHV, RGBS, RGsB, RsGsBs, analog HDTV, component, composite,
S-video
Connectors12 x 5 are female
Minimum/maximum levels.....Analog-0.5V to 1.85V p-p with no offset
Impedance.....75 ohms
Return loss-30dB @ 5 MHz
Maximum DC offset (Vin=1Vpp)..... +1.8V, -.6V

Video Output

Number/signal type 4 or 8 RGBHV, RGBS, RGsB, RsGsBs, analog HDTV, component, composite,
S-video
Connectors..... 4 or 8 x 5 BNC female
Maximum level..... 2.85V p-p with limited BW, 0dBm for 375MHz BW
Impedance..... 75 ohms
Return loss..... -30dB @ 5 MHz
DC offset..... ±125mV maximum with input at 0V offset
Switching type..... RGB Delay up to 4 seconds

Sync

Input type..... RGBHV, RGBS, RGsB
Output type..... RGBHV, RGBS, RGsB
Input level0.5V to 5.0V p-p, 2.5V p-p normal
Output level (min).....2.0-V p-p into 75 ohm load, 4V p-p no load
Input impedance.....75 ohms
Output impedance.....75 ohms
Polarity..... Positive or negative (follows input)

VREF Sync

Input type..... VSync
Output type..... VSync, Channel 1 VSync, Channel 1 Green VSync (Extracted)
Input level0.5V to 5.0V p-p, 2.5V p-p normal
Output level (min).....2.0-V p-p into 75 ohm load, 4V p-p no load
Input impedance.....75 ohms
Output impedance.....75 ohms
Polarity..... Positive or negative (follows input)

Audio Routing

Gain.....-76dB to +20dB
Frequency response 20 Hz to 20 kHz, @2V_{p-p} with 0.03% THD+N
Noise 0.03% @ 1 kHz at rated maximum output drive
S/N >75dB, balanced, at 2V_{rms}
Crosstalk / Stereo Separation..... <-88dB @ 1 kHz, fully loaded

Audio Input

Number/signal type12 stereo, balanced/unbalanced
Connectors12 3.5 mm captive screw connectors, 5 pole
Impedance.....10 kohm balanced or unbalanced, DC coupled
Maximum level.....6V_{rms} at 0.3% THD+N

