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MVP-24

Frame Rate Converter

Operations Manual

For proper operation and user safety, please read through this manual before powering the MVP-24.

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QUICK REFERENCE CHART

FUNCTION	MENU	DESCRIPTION	MENU ACCESS	LOCATION
AGC: AUTOMATIC GAIN CONTROL	VID1 AGC: VID2 AGC: SVHS AGC:	Use to enable or disable Automatic Gain Control for selected input.	MENU ENABLE  + INPUTS  , NEXT OR PREV	See section 2.3.3b See section 2.3.3c See section 2.3.3d
BETACAM INPUT FORMAT	YRB FORMAT:	Use to select between Betacam and SMPTE/EBU input levels.	MENU ENABLE  + INPUTS  , NEXT OR PREV	See section 2.3.3f
BLACK		Enable or disable Black mode (go to black level).	BLACK 	See section 2.4.7
BRIGHTNESS	SETUP (BRIGHTNESS):	Use to adjust setup level.	MENU ENABLE  + LEVELS  , NEXT OR PREV	See section 2.3.4b
CENTER	VERT CENTER: HORZ CENTER:	Use to adjust position of picture.	MENU ENABLE  + SIZE / POSITION  , NEXT OR PREV	See section 2.3.5b See section 2.3.5e
CHANNEL SELECT	RF MODULATOR:	Use to select channel for RF Modulator.	MENU ENABLE  + OUTPUTS / FRM RATE  , NEXT OR PREV	See section 2.3.7f
CHASSIS TEMPERATURE	CHASSIS TEMPERATURE:	Status of internal temperature in deg. C.	MENU ENABLE  + FAN  , NEXT OR PREV	See section 2.4.9b
COLOR BALANCE	COLOR BALANCE-X COLOR BALANCE-Y	Use to adjust color balance.	MENU ENABLE  + COLOR CORRECT  , NEXT OR PREV	See section 2.4.5c See section 2.4.5d
COLOR CORRECTION	COLOR CORRECTION-X COLOR CORRECTION-Y	Use to adjust color correction.	MENU ENABLE  + COLOR CORRECT  , NEXT OR PREV	See section 2.4.5a See section 2.4.5b
COLOR CORRECT (COLOR TEMP)		Enable or disable Color Correction (Temp).	COLOR CORRECT 	See section 2.4.5
COLOR LEVEL	SATURATION (COLOR):	Use to adjust color level.	MENU ENABLE  + LEVELS  , NEXT OR PREV	See section 2.3.4c
COLOR STANDARD	OUT STANDARD:	Use to select output color standard.	MENU ENABLE  + OUTPUTS / FRM RATE  , NEXT OR PREV	See section 2.3.7b
COLOR TEMPERATURE	COLOR CORRECTION COLOR BALANCE	Use to adjust color correction/ balance.	MENU ENABLE  + COLOR CORRECT  , NEXT OR PREV	See section 2.4.5a,b See section 2.4.5c,d
COLOR TEMP PRESETS	COLOR TEMP PRESET:	Use to recall/ load stored color correction settings.	MENU ENABLE  + COLOR CORRECT  , NEXT OR PREV	See section 2.4.5e
CONTRAST	LEVEL(CONTRAST):	Use to adjust video level.	MENU ENABLE  + LEVELS  , NEXT OR PREV	See section 2.3.4a
CROP HORIZONTAL	HORZ CROP:	Use to crop left and right 2.5% of picture.	MENU ENABLE  + SIZE / POSITION  , NEXT OR PREV	See section 2.3.5f
CROP VERTICAL	VERT CROP:	Use to crop top and bottom 2.5% of picture.	MENU ENABLE  + SIZE / POSITION  , NEXT OR PREV	See section 2.3.5c
CROSS COLOR FILTER	CROSS COLOR FILTER:	Use to enable or disable cross color filter.	MENU ENABLE  + FILTERS / SHARPNESS  , NEXT OR PREV	See section 2.3.6c
DEFAULT SETTINGS	RECALL SETTINGS:	Use to recall stored or default settings.	MENU ENABLE  + PRESETS  , NEXT OR PREV	See section 2.3.2a
DETAIL ENHANCEMENT	HORZ SHARPNESS: VERT SHARPNESS:	Use to adjust sharpness of picture.	MENU ENABLE  + FILTERS / SHARPNESS  , NEXT OR PREV	See section 2.3.6a See section 2.3.6b

DRIVE REFERENCE OUT	DRIVE REF OUTPUT:	Use to select signal at <i>Drive Ref Output</i> .	MENU ENABLE  +  , NEXT OR PREV	See section 2.3.7e
DUB MODE	Y/C DUB MODE:	Use to enable or disable Dub mode for Y/C input.	MENU ENABLE  +  , NEXT OR PREV	See section 2.3.3e
EBU INPUT FORMAT	YRB FORMAT:	Use to select between Betacam and SMPTE/EBU input levels.	MENU ENABLE  +  , NEXT OR PREV	See section 2.3.3f
FAN		Enable or disable FAN.	FAN 	See section 2.4.9
FAN SPEED	FAN SPEED:	Use to adjust speed of fan when enabled.	MENU ENABLE  +  , NEXT OR PREV	See section 2.4.9a
FIELD DISPLAY MODE	FIELD DISPLAY MODE:	Use to control how field mode is displayed.	MENU ENABLE  +  , NEXT OR PREV	See section 2.4.8a
FIELD FREEZE	FREEZE DISPLAY MODE:	Use to control how a freeze is displayed.	MENU ENABLE  +  , NEXT OR PREV	See section 2.4.1a
FIELD MODE		Enable or disable Field mode.	FIELD MODE 	See section 2.4.8
FILM MODE	MOTION FILTER:	Select between normal and film mode.	MENU ENABLE  +  , NEXT OR PREV	See section 2.3.6d
FRAME FREEZE	FREEZE DISPLAY MODE:	Use to control how a freeze is displayed.	MENU ENABLE  +  , NEXT OR PREV	See section 2.4.1a
FRAME RATE	OUTPUT RATE:	Use to select output frame rate.	MENU ENABLE  +  , NEXT OR PREV	See section 2.3.7a
FREEZE		Enable or disable freeze.	FREEZE 	See section 2.4.1
GENLOCK SOURCE	GENLOCK SOURCE:	Use to select type of genlock input.	MENU ENABLE  +  , NEXT OR PREV	See section 2.3.8a
GOTO BLACK		Enable or disable Black mode (go to black level).	BLACK 	See section 2.4.7
HORIZONTAL CENTER	HORZ CENTER:	Use to adjust position of picture in horz direction.	MENU ENABLE  +  , NEXT OR PREV	See section 2.3.5e
HORIZONTAL CROP	HORZ CROP:	Use to crop left and right 2.5% of picture.	MENU ENABLE  +  , NEXT OR PREV	See section 2.3.5f
HORIZONTAL SHARPNESS	HORZ SHARPNESS:	Use to adjust horizontal sharpness of picture.	MENU ENABLE  +  , NEXT OR PREV	See section 2.3.6a
HORIZONTAL SIZE	HORZ SIZE:	Use to adjust size of picture in horz direction.	MENU ENABLE  +  , NEXT OR PREV	See section 2.3.5d
HOURS OF OPERATION	HOURS OF OPERATION	Menu display of total hours of operation.	MENU ENABLE  , 	See section 2.5.2
HUE	HUE (TINT):	Use to adjust color phase.	MENU ENABLE  +  , NEXT OR PREV	See section 2.3.4d
INPUT SELECT	INPUT SELECT:	Use to select desired input.	MENU ENABLE  +  , NEXT OR PREV	See section 2.3.3a See section 1.8
INPUT STANDARD	INPUT STANDARD:	Use to select desired input standard.	MENU ENABLE  +  , NEXT OR PREV	See section 2.3.3h
LEVEL, VIDEO	LEVEL (CONTRAST):	Use to adjust video level.	MENU ENABLE  +  , NEXT OR PREV	See section 2.3.4a

MONOCHROME		Enable or disable Monochrome (B&W).		See section 2.4.6
MOTION FILTER	MOTION FILTER:	Select between normal and film mode.	 +  , 	See section 2.3.6d
OUTPUT FORMAT	VIDEO OUT FORMAT:	Use to select video output format. (vidYC,YRB,RGB)	 +  , 	See section 2.3.7c See section 1.6.2
OUTPUT STANDARD	OUT STANDARD:	Use to select output color standard.	 +  , 	See section 2.3.7b
OUTPUT RATE	OUTPUT RATE:	Use to select output frame rate.	 +  , 	See section 2.3.7a
PHASE ADJUST	VERTICAL PHASE:	Use to adjust vertical phase of ALL outputs.	 +  , 	See section 2.3.8b
RECALL SETTINGS (PRESETS)	RECALL SETTINGS:	Use to recall stored or default settings.	 +  , 	See section 2.3.2a
REFERENCE OUTPUTS	SYNC REF OUTPUT: DRIVE REF OUTPUT:	Use to select signal at <i>Ref Outputs</i> .	 +  , 	See section 2.3.7d See section 2.3.7e
RF MODULATOR CHANNEL OUT	RF MODULATOR:	Use to select channel for RF Modulator.	 +  , 	See section 2.3.7f
RGB SYNC INPUT FORMAT	RGB SYNC FORMAT:	Use to select between 3 or 4 wire input.	 +  , 	See section 2.3.3g
SAVE SETTINGS (PRESETS)	STORE SETTINGS:	Use to store settings to presets.	 +  , 	See section 2.3.2b
SATURATION	SATURATION(COLOR):	Use to adjust color level.	 +  , 	See section 2.3.4c
SERIAL NUMBER DISPLAY	SERIAL NUMBER	Menu display of chassis serial number.	 , 	See section 2.5.1
SETUP	SETUP (BRIGHTNESS):	Use to adjust setup level.	 +  , 	See section 2.3.4b
SHARPNESS	HORZ SHARPNESS: VERT SHARPNESS:	Use to adjust sharpness of picture.	 +  , 	See section 2.3.6a See section 2.3.6b
SIZE	VERT SIZE: HORZ SIZE:	Use to adjust size of picture.	 +  , 	See section 2.3.5a See section 2.3.5d
SMPTE/EBU INPUT FORMAT	YRB FORMAT:	Use to select between Betacam and SMPTE /EBU input levels.	 +  , 	See section 2.3.3f
STORE COLOR TEMP SETTINGS	STORE TEMP SETTINGS:	Use to store color temp (correction/bal) settings.	 +  , 	See section 2.4.5f
STORE SETTINGS (PRESETS)	STORE SETTINGS:	Use to store settings to presets.	 +  , 	See section 2.3.2b
SYNC REFERENCE OUTPUT	SYNC REF OUTPUT:	Use to select signal at <i>Sync Ref Output</i> .	 +  , 	See section 2.3.7d
TEST SIGNAL GENERATOR		Enable or disable TSG.		See section 2.4.2
TEST SIGNAL LEVELS	TEST SIGNAL LEVELS:	Selects if TSG is modified by level controls.	 +  , 	See section 2.4.2b
TEST SIGNAL SELECT	TEST SIGNAL:	Use to select which test signal is displayed.	 +  , 	See section 2.4.2a

TINT	HUE(TINT):	Use to adjust color phase.	MENU ENABLE  + LEVELS  , NEXT OR PREV	See section 2.3.4d
VERTICAL CENTER	VERT CENTER:	Use to adjust position of picture in vert direction.	MENU ENABLE  + SIZE / POSITION  , NEXT OR PREV	See section 2.3.5b
VERTICAL CROP	VERT CROP:	Use to crop top and bottom 2.5% of picture.	MENU ENABLE  + SIZE / POSITION  , NEXT OR PREV	See section 2.3.5c
VERTICAL PHASE	VERTICAL PHASE:	Use to adjust vertical phase of ALL outputs.	MENU ENABLE  + GENLOCK / PHASE  , NEXT OR PREV	See section 2.3.8b
VERTICAL SIZE	VERT SIZE:	Use to adjust size of picture in vert direction.	MENU ENABLE  + SIZE / POSITION  , NEXT OR PREV	See section 2.3.5a
VERTICAL SHARPNESS	VERT SHARPNESS:	Use to adjust vertical sharpness of picture.	MENU ENABLE  + FILTERS / SHARPNESS  , NEXT OR PREV	See section 2.3.6b
VIDEO LEVEL	LEVEL (CONTRAST):	Use to adjust video level.	MENU ENABLE  + LEVELS  , NEXT OR PREV	See section 2.3.4a
VIDEO OUTPUT FORMAT	VIDEO OUT FORMAT:	Use to select video output format (vidYC,YRB,RGB)	MENU ENABLE  + OUTPUTS / FRM RATE  , NEXT OR PREV	See section 2.3.7c See section 1.6.2
Y/C DELAY	Y/C DELAY:	Use to adjust horizontal position of color.	MENU ENABLE  + LEVELS  , NEXT OR PREV	See section 2.3.4e
Y/C DUB MODE	Y/C DUB MODE:	Use to enable or disable Dub mode for Y/C input.	MENU ENABLE  + INPUTS  , NEXT OR PREV	See section 2.3.3e
YRB INPUT FORMAT	YRB FORMAT:	Use to select between Betacam and SMPTE/EBU input levels.	MENU ENABLE  + INPUTS  , NEXT OR PREV	See section 2.3.3f
YRB OUTPUT FORMAT	VIDEO OUT FORMAT:	Use to select video output format (vidYC,YRB,RGB)	MENU ENABLE  + OUTPUTS / FRM RATE  , NEXT OR PREV	See section 2.3.7c See section 1.6.2

3 YEAR LIMITED WARRANTY MVP-24

Schindler Imaging, Inc. warrants that this product is free from defects in material or workmanship for a period of three (3) years from the date of original purchase. In case of manufacturer defects in material or workmanship incurred through normal usage, Schindler Imaging, Inc. agrees to repair (remedy) the defective product without charge.

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state. Any implied warranty is limited in duration to three years provided in this, the only, expressed warranty.

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Warranty is void if the unit's air flow is obstructed in any way.

Warranty is void if service is performed by any non-authorized individual or agency.

Warranty is void if unauthorized modifications are made to the unit.

This warranty is limited to the original purchaser of the unit. Warranty is non-transferable.

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SAFETY INFORMATION

- ✓ **Power source** This product is intended to operate from a power source of 110 VAC, +/- 20 %, at 60 Hz, or 220 VAC, +/- 20 %, at 50 Hz. A protective ground connection, by way of the grounding conductor in the power cord, is essential for safe operation.

- ✓ **Grounding** The chassis of this product is grounded through the grounding conductor of the power cord. To avoid electric shock, plug the power cord into a properly wired receptacle before making any connections to the product. A protective ground connection, by way of the grounding conductor in the power cord, is essential for safe operation.

- ✓ **Danger from loss of ground** If the protective ground connection is lost, all accessible conductive parts, including ones that appear to be insulated, can render an electric shock.

- ✓ **Proper power cord** Use only the power cord and connector specified for the product. Use only a cord that is in good condition.

- ✓ **Proper fuse** The power fuse is located in a serviceable fuse holder on the back panel of the unit. The fuse holder accepts 5mm diameter fuses. Replace only with **1.5A, 250VAC**, fast acting fuse.

- ✓ **Operating location** Do not operate this equipment under any of the following conditions: explosive atmospheres, in wet locations, in inclement weather, improper or unknown AC mains voltage, or if improperly fused.

To avoid personal injury or injury to others, do not remove the product covers or panels. Do not operate the product without the covers and panels properly installed and secured.

INTRODUCTION

Congratulations on your decision to use Schindler Imaging's MVP-24 Frame Rate Converter. The MVP-24 is a broadcast quality frame rate converter designed specifically for the film industry and widely used by studios and playback specialists. Conventional standards converters are not designed for the varied playback situations encountered in the industry, and often require the use of additional equipment. Schindler Imaging has incorporated the functionality of other equipment with our high quality processing, producing a single unit solution to simplify the task of 24 frame playback.

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| ☐ Inputs | The MVP-24 accepts standard NTSC video signals (videotape machines, video cameras, tuners, video disks, video games, etc.) with composite, Y/C, SVHS, YRB (Betacam or SMPTE-EBU levels), RGB (3/4 wire sync), and optionally Serial D1 (digital) formats. |
| ☐ Outputs | The MVP-24 produces 23.976 FPS, 24.000 FPS, 24.022 FPS, 25.000 FPS and 30 (29.97) FPS video, with composite, SVHS, and either Y/C, Y/R/B (Betacam or SMPTE-EBU levels) or RGB formats. For composite and SVHS outputs, the MVP-24 can generate all standard sub carrier formats (NTSC, NTSC-4.43, PAL, SECAM, PAL-N and PAL-M) for maximum compatibility of existing monitors. |
| ☐ Genlock | The MVP-24 will lock to Vertical Drive, Frame square wave, Composite video sync, or HD 1080sF tri-level composite sync. The MVP-24 may be vertically phased to this reference with a range of >360 degrees. This allows the MVP-24 to be phased to the camera* eliminating the need for a shutter synchronizer for single camera shots. |
| ☐ Progressive Processing | The MVP-24 utilizes full progressive video in it's processing to guarantee maximum sharpness and clarity. A motion adaptive vertical temporal filter is used to de-interlace the in-coming video to produce full progressive video, maintaining full vertical resolution of the original interlaced frame. |
| ☐ Locked Color at 24.000 FPS | A unique feature of the MVP-24 is the "locked color" produced in 24.000 FPS mode. With proprietary digital techniques, true color locked 24.000 FPS composite video is produced without annoying video artifacts such as "roaming" dot patterns and detail "breathing" which are typical of traditional methods used in frame rate conversion, usually involving unlocked or non-coherent color. |
| ☐ Color Temperature Adjustments | Color correction and balance controls are provided for adjusting the color temperature of the picture to match the ambient lighting in the scene being filmed. The MVP-24 has menu controls for easy adjustment, as well as factory presets for 3200, 4800, and 5500 degrees. |

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| ☐ Size & Centering Controls

- larger shutter angles | <p>The MVP-24 allows the vertical and horizontal size of the picture as well as it's position to be adjusted. This provides easy calibration of monitors which were not setup for 24 frame playback. These controls can also be used for effects by shrinking or stretching the picture, or making non standard aspect ratios. Internal test signals are provided for precise resizing and positioning.</p> <p>These controls can also be used to achieve increased vertical blanking time. This would allow for shutter angles greater than 180 degrees*.</p> |
| ☐ Field Mode
- viewing

- phasing

- larger shutter angles | <p>The MVP-24 can be configured to display field 1's only, while blanking out field 2's (<i>see section 2.4.8</i>). This allows the operator to see exactly what the camera's shutter will see.</p> <p>It can also be used to help "phase" the camera's shutter, since a complete picture will only be seen through the camera when the two are in phase.</p> <p>This mode also allows larger shutter angles* ($>>180^{\circ}$) to be used, since there are no field 2's present to interfere.</p> |
| ☐ H/V Sharpness Controls | <p>The MVP-24 provides separate Horizontal and Vertical Sharpness Controls. Each control has 3 levels of sharpening, and 4 levels of softening.</p> |
| ☐ Proc. Amp Controls | <p>The MVP-24 provides standard Proc. Amp controls for adjusting Video Level (affecting the Contrast of the image), Setup Level (affecting brightness), Chroma (affecting saturation of color level) and Hue (affecting the tint).</p> |
| ☐ Freeze Frame | <p>The MVP-24 can freeze an image and display it as either field 1,2 or full frame.</p> |
| ☐ Go to Black | <p>A "go to black" button will switch the output of the unit to black to simulate the monitor being turned off.</p> |
| ☐ Test Signal/
Alignment
Pattern Generator | <p>Test signals may be generated to assist the operator with level adjustments, color correction, sizing the image, and adjusting the camera's shutter phase. These patterns include: Color bars, SMPTE bars, mono and color 5 and 10 step, mono and color ramp, grayscale, sizing chart, Blue screen, Green screen, RED screen, and many more.</p> |

* Limitations may apply. See manual for further details.

SECTION 1

REAR PANEL CONNECTIONS

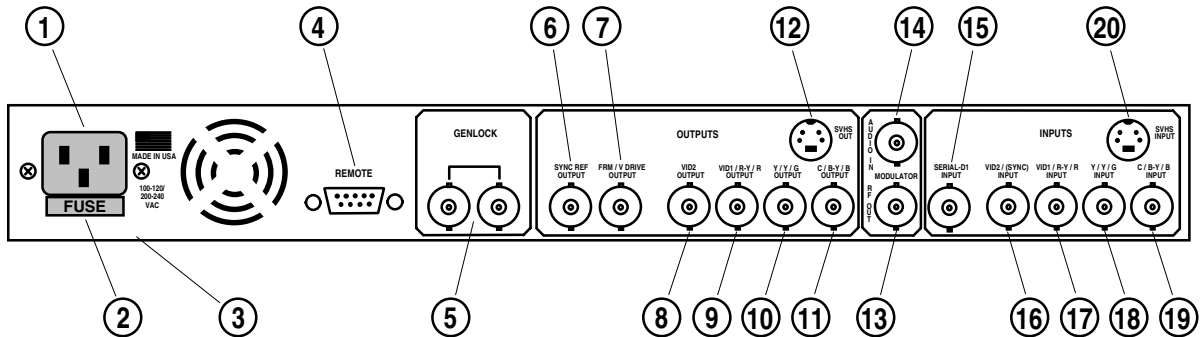


Figure 1. MVP-24 Rear Panel

1.1 ENTRY MODULE

1.1.1 AC POWER

- ① This product is intended to operate from a power source of 110 VAC, +/- 20 %, at 60 Hz, or 220 VAC, +/- 20 %, at 50 Hz. A protective ground connection, by way of the grounding conductor in the power cord, is essential for safe operation.

1.1.2 FUSE HOLDER

- ② This fuse holder accepts 5mm diameter fuses.
Replace only with 1.5A, 250VAC, fast acting fuse.

1.2 SERIAL NUMBER

- ③ The serial number for the MVP-24 is found on the lower left edge of the back panel.

1.3 REMOTE CONNECTOR

- ④ This 9 pin D connector is used to externally control the MVP-24.

1.4 GENLOCK INPUTS

- ⑤ These BNC connectors provide a “loop through” connection for an external sync reference. The reference may be composite sync, tri-level sync, vertical drive, or a frame square wave. The reference signal may be daisy chained through the unit to other equipment requiring external sync. If the unit is the last piece of equipment in the chain, then the second connection will require termination. If no signal is applied to either connector then an internal sync generator is used for the reference.

1.5 REFERENCE OUTPUTS

1.5.1 SYNC REFERENCE OUTPUT

- ⑥ This BNC connector provides a reference output signal for synchronizing other film equipment or cameras. The output signal is selected at the front panel by using the menu “*Sync Ref Output*” under *OUTPUTS*. Possible output signal are: Video composite sync, 1Vpp composite sync, +5V composite sync, -5V composite sync, HDSF tri-level sync, +5V vert drive, -5V vert drive, +5V Frame drive, and -5V Frame drive.

1.5.2 FRM/V-DRIVE OUTPUT

- ⑦ This BNC connector provides a reference output signal for synchronizing other film equipment or cameras. The output signal is selected at the front panel by using the menu “*Drive Ref Output*” under *OUTPUTS*. Possible output signal are: +5V vert drive, -5V vert drive, +5V Frame drive, and -5V Frame drive.

1.6 VIDEO OUTPUTS

1.6.1 VID2 OUTPUT

- ⑧ This BNC connector provides composite video output.

1.6.2 VID1-YC / YRB / RGB OUTPUTS

- ⑨ ⑩ ⑪ These three BNC connectors are the main video outputs. They are multi-format outputs and are configured at the front panel by using the menu “*VIDEO OUT FORMAT*” under *OUTPUTS*. The three connectors can be configured as either: [Composite, Y, C] ; [R-Y, Y, B-Y] ; or [Red, Green, Blue].

1.6.3 SVHS OUT

- ⑫ This 4 pin mini-DIN connector provides SVHS video output.
(Note: This output is not valid when main outputs are configured as RGB.)

1.7 RF MODULATOR

1.7.1 RF OUTPUT

- ⑬ This BNC connector provides a RF output for connection to a television or monitor with a tuner. The output frequency is selected as either channel 3 or 4 at the front panel by using the menu “*RF Modulator*” under *OUTPUTS*.
(Note: For best picture quality, composite, Y/C, or component video should be used if possible). An audio input is also provided for the RF output.

1.7.2 AUDIO IN

- ⑭ This BNC connector takes audio in and combines it with the output video to produce the RF output signal.

1.8 VIDEO INPUTS

1.8.1 SERIAL-D1 INPUT (OPTIONAL)

- ⑮ This BNC connector is the serial digital video input.

1.8.2 VID2 (SYNC) INPUT

- ⑯ This BNC connector is the Composite video input VID2, or SYNC input for 4 wire RGB inputs.

1.8.3 VID1-YC / YRB / RGB INPUTS

- ⑰ ⑱ ⑲ These three BNC connectors are the main video inputs. They are multi-format inputs and are used for Composite, Y/C, YRB, or RGB inputs. The desired input format is selected at the front panel by using the menu “*INPUT SELECT*” under *INPUTS*.

1.8.4 SVHS INPUT

- ⑳ This 4 pin mini-DIN connector is the SVHS input.

SECTION 2

FRONT PANEL OPERATION

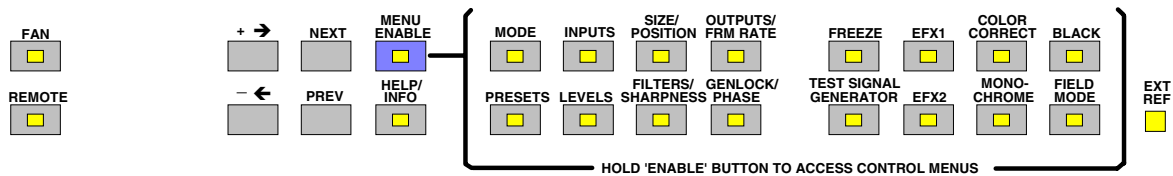
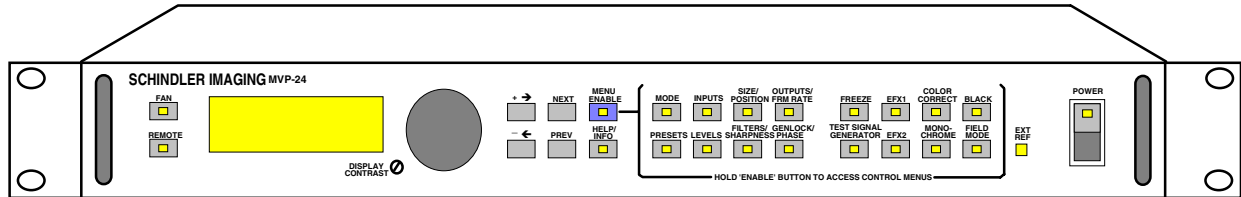


Figure 2. MVP-24 Front Panel

2.1 DISPLAY

The MVP-24 utilizes a graphic LCD display to report status information, and to assist the operator when making adjustments.

The top line of the display always indicates important status about the operation of the MVP-24. This allows the operator to see at a glance, how the MVP-24 is configured.

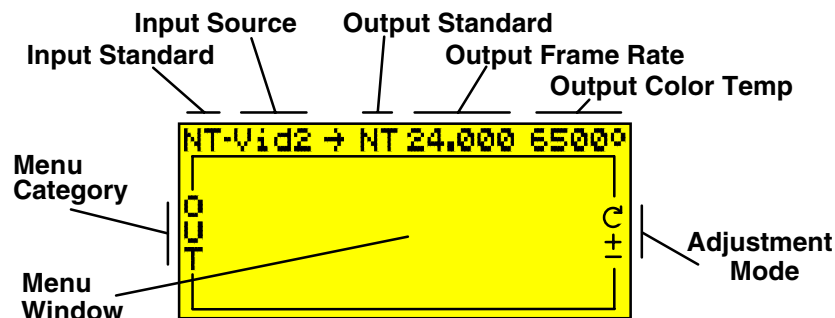
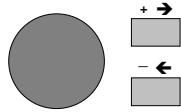


Figure 3. MVP-24 Status Display

The remainder of the display is used for various adjustment and status menus.

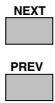
2.2 CONTROLS



2.2.1

The rotary knob, + and - buttons are used to make changes and adjustments to the displayed menus.

Icons will appear on the display to indicate when these controls are active.
 indicates the rotary knob is active. $\pm$ Indicates the + and - buttons are active.



2.2.2

NEXT and PREV (previous) buttons are used to access additional menus for a selected category.



2.2.3

HELP/INFO button is used to get information about a selected menu or to diagnose a problem. When pressed, an information window appears along the bottom line of the display. Text information is displayed within the window. Use the knob or +/- buttons to scroll through any additional information. To close the information window, press **HELP/INFO** again, or change to another menu.

If the **HELP/INFO** button indicator is flashing, then a problem has been detected. Pressing the button in this mode will display the help window with a description of the detected problem. Pressing the button a second time will display either another detected problem, or the standard information window.



2.2.4

MENU ENABLE button is used to access adjustment menus for all category buttons. To access menus for a desired category (such as "Inputs"), push the MENU ENABLE button down and continue holding it down while also pushing the category button (such as "Inputs"). The display will now show the first menu in that category.

To exit any menu, press MENU ENABLE (alone) and release.

2.3 CATEGORY BUTTONS AND MENUS

The following buttons are used to access menus for each category. These buttons are only active when MENU ENABLE is also pressed. When a category is active, the category and MENU ENABLE buttons will illuminate yellow.

2.3.1 **MODE**

This button currently has no function. It is reserved for future options and enhancements.

2.3.2 **PRESETS**

Presets are stored settings for all functions within the MVP-24.

This button (with MENU ENABLE) is used to access menus for recalling and storing presets.

2.3.2a Menu: **Recall Settings**

Recalling a preset will overwrite all current settings within the MVP-24 with settings stored in the preset.

⇒ Use the Knob to select a preset (0,1,2 or 3).

Note: Preset 0 is a factory default and will change all settings to nominal values.

⇒ Once the desired preset is selected, press + and – buttons simultaneously to recall settings from the preset.

2.3.2b Menu: **Store Settings ***

Storing a preset will save all settings within the MVP-24 to a selected preset.

Each preset may be assigned a unique eight character name.

⇒ Use the Knob to select a preset number (1,2 or 3).

Note: Preset 0 is a factory default and cannot be written to.

⇒ To load default name, push knob while cursor is positioned under selected preset number.

⇒ To edit the name, press + or – button to move the cursor into the eight character name. Use the Knob to change the character where the cursor is positioned.

Note: Pushing knob will advance the selected character to “A”.

⇒ Once desired preset and name are selected, press + and – buttons simultaneously to store settings to the preset.

* Note: Write Enable switch must be ON (enabled) to access the *Store* menu (see Appendix-C).

2.3.3 **INPUTS**

This button (with MENU ENABLE) is used to access menus for selecting and configuring inputs.

2.3.3a Menu: **Input Select**

This menu is used to select the input source for the MVP-24.*

The current selected source is indicated in BOLD print on the first line.

⇒ Use the Knob or +/- buttons to move desired source within the brackets on the second line.

⇒ Once desired source is selected, push on the knob to enter selection.

The new selection will now appear in BOLD on first line.

* See Section 1.8.2 for proper connections of the multi-format video inputs.

2.3.3b Menu: **Vid1 AGC**

Automatic Gain Control for Vid1 Input. This menu will be present if the Vid1 source is currently selected. It is used to control AGC for Vid1 input.

⇒ Use the Knob or +/- buttons to turn AGC ON or OFF.

2.3.3 INPUTS (continued)

2.3.3c Menu: **Vid2 AGC**

Automatic Gain Control for Vid2 Input. This menu will be present if the Vid2 source is currently selected. It is used to control AGC for Vid2 input.

⇒ Use the Knob or +/- buttons to turn AGC ON or OFF.

2.3.3d Menu: **SVHS AGC**

Automatic Gain Control for SVHS Input. This menu will be present if the SVHS source is currently selected. It is used to control AGC for SVHS input.

⇒ Use the Knob or +/- buttons to turn AGC ON or OFF.

2.3.3e Menu: **Y/C Dub Mode**

Dub Mode may be used with a VTR with Y-688 outputs. Dub Mode may provide for improved picture quality by taking advantage of the Y-688 output's increased bandwidth (resolution). In this mode the Y input is connected to the Y-688's Y output, and the C input is connected to the VTR's composite output. Dub Mode enables a COMB filter on the C input to remove any luminance (Y) components from the composite source. This menu will be present if the Y/C source is currently selected.

⇒ Use the Knob or +/- buttons to turn Dub Mode ON or OFF.

2.3.3f Menu: **YRB Format**

The Format for YRB inputs may be either **Beta** (Betacam) levels (700mV), or **EBU** (SMPTE-EBU) levels (525mV). This menu will be present if the YRB source is currently selected.

⇒ Use the Knob or +/- buttons to select between Beta or EBU.

2.3.3g Menu: **RGB sync Format**

The RGB input may be configured for 3 wire (sync on green), or 4wire (sync on Vid2/sync input). This menu will be present if the RGB source is currently selected.

⇒ Use the Knob or +/- buttons to select between 3wire or 4wire.

2.3.3h Menu: **Input Standard**

This menu is used to select the input standard for the MVP-24.

The MVP-24 supports NTSC, PAL-M, and NTSC 4.43 as input standards.

The current selected standard is indicated in BOLD print on the first line.

⇒ Use the Knob or +/- buttons to move desired standard within the brackets on the second line.

⇒ Once desired standard is selected, push on the knob to enter selection. The new selection will now appear in BOLD on first line.

2.3.4 LEVELS

This button (with MENU ENABLE) is used to access menus for adjusting picture levels.

2.3.4a Menu: **Level (Contrast)**

This menu is used to adjust the level (or contrast) of the picture.

⇒ Use the Knob or +/- buttons to adjust.

2.3.4b Menu: **Setup (Brightness)**

This menu is used to adjust the black level (or brightness) of the picture.

⇒ Use the Knob or +/- buttons to adjust.

2.3.4 **LEVELS** (continued)

2.3.4c Menu: **Saturation (Color)**

This menu is used to adjust the color level of the picture.
⇒ Use the Knob or +/- buttons to adjust.

2.3.4d Menu: **Hue (Tint)**

This menu is used to adjust the color hue (or tint) of the picture.
⇒ Use the Knob or +/- buttons to adjust.

2.3.4e Menu: **Y/C Delay**

This menu is used to adjust the horizontal (side to side) position of the color portion of the picture with respect to the luminance (black and white) portion. Can be used to correct color smear artifacts produced by VTR's.
⇒ Use the Knob or +/- buttons to adjust.

2.3.5 **SIZE / POSITION**

This button (with MENU ENABLE) is used to access menus for adjusting the size and position of the picture.

2.3.5a Menu: **Vert Size**

This menu is used to adjust the size of the active picture in the vertical (up-down) direction. This menu displays the size in both percent and number of active lines.
⇒ Use the +/- buttons to adjust in 5 line increments.
⇒ Use the Knob to adjust in 1 line increment.

2.3.5b Menu: **Vert Center**

This menu is used to position the center of the active picture in the vertical (up-down) direction.
⇒ Use the +/- buttons to adjust in 5 line increments.
⇒ Use the Knob to adjust in 1 line increment.

2.3.5c Menu: **Crop Vertical**

Vertical cropping blanks the top and bottom 2.5% of the active picture. Cropping can be used to remove unwanted edge signals (such as closed captioning or teletext) when picture edge is visible.
⇒ Use the Knob or +/- buttons to turn cropping ON or OFF.

2.3.5d Menu: **Horz Size**

This menu is used to adjust the size of the active picture in the horizontal (side to side) direction. This menu displays the size in both percent and number of pixels.
⇒ Use the +/- buttons to adjust in 10 pixel increments.
⇒ Use the Knob to adjust in 2 pixel increments.

2.3.5e Menu: **Horz Center**

This menu is used to position the center of the active picture in the horizontal (side to side) direction.
⇒ Use the +/- buttons to adjust in 5 pixel increments.
⇒ Use the Knob to adjust in 1 pixel increment.

2.3.5 **SIZE / POSITION** (continued)

- 2.3.5f Menu: **Crop Horz**
- Horizontal cropping blanks the left and right 2.5% of the active picture. Cropping can be used to remove unwanted edge signals when picture edge is visible.
- ⇒ Use the Knob or +/- buttons to turn cropping ON or OFF.

2.3.6 **FILTERS / SHARPNESS**

This button (with MENU ENABLE) is used to access menus for adjusting various filters.

- 2.3.6a Menu: **Horz Sharpness**
- This menu is used to adjust the horizontal (side to side) sharpness of the picture.
- ⇒ Use the Knob or +/- buttons to adjust.

- 2.3.6b Menu: **Vert Sharpness**
- This menu is used to adjust the vertical (top to bottom) sharpness of the picture.
- ⇒ Use the Knob or +/- buttons to adjust.

- 2.3.6c Menu: **Cross Color Filter**
- This filter may help reduce cross-color (improperly separated chroma sub carrier) artifacts by removing high frequency information from the luminance (black and white) portion of the picture. THIS FILTER WILL REDUCE THE HORIZONTAL SHARPNESS OF THE PICTURE.
- ⇒ Use the Knob or +/- buttons to turn filter ON or OFF.

- 2.3.6d Menu: **Motion Filter**
- This menu selects between Normal and Film Mode. Film Mode detects the presence of a film 3:2 field sequence and alters the algorithm for improved motion and vertical detail with film sources.
- WARNING, FILM MODE SHOULD ONLY BE USED WITH ORIGINAL FILM SOURCES. DO NOT USED WITH TIME-COMPRESSED OR EDITED FILM SOURCES OR VIDEO.
- ⇒ Use the Knob or +/- buttons to turn filter ON or OFF.

2.3.7 **OUTPUTS / FRM RATE**

This button (with MENU ENABLE) is used to access menus for selecting and configuring outputs.

- 2.3.7a Menu: **Output Rate**
- This menu is used to select the output frame rate for the MVP-24. The MVP-24 supports 23.976, 24.000, 24.022, 25.000, and 29.970 frame rates. This selection has no effect on the color standard of the output (see 2.3.7b *Out Standard* to select color standard). Any color standard can be produced at any frame rate; i.e. NTSC is not limited to 29.970 but can also be 25.000, 24.000 etc.; PAL is not limited to 25.000 but can also be 29.970, 24.000 etc. The current selected frame rate is indicated in BOLD print on the first line.
- ⇒ Use the Knob or +/- buttons to move desired rate within the brackets on the second line.
- ⇒ Once desired rate is selected, push on the knob to enter selection. The new selection will now appear in BOLD on first line.

2.3.7b Menu: **Out Standard**

This menu is used to select the output color standard for the MVP-24. The MVP-24 supports NTSC, PAL-M, NTSC 4.43, PAL, SECAM, and PAL-N. This selection has no effect on the frame rate of the output (see 2.3.7a *Output Rate* to select frame rate). Any color standard can be produced at any frame rate; i.e. NTSC is not limited to 29.970 but can also be 25.000, 24.000 etc.; PAL is not limited to 25.000 but can also be 29.970, 24.000 etc.).

The current selected standard is indicated in BOLD print on the first line.

- ⇒ Use the Knob or +/- buttons to move desired standard within the brackets on the second line.
- ⇒ Once desired standard is selected, push on the knob to enter selection. The new selection will now appear in BOLD on first line.

2.3.7c Menu: **Video Out Format**

This menu selects the output format for the MVP-24's multi-format outputs.* The Output Format may be either Vid1/Y/C, RGB, YRB **Beta** (Betacam) levels (700mV), or YRB **EBU** (SMPTE-EBU) levels (525mV).

- ⇒ Use the Knob or +/- buttons to select format.

*See Section 1.6.2 for proper connections of the multi-format video outputs.

2.3.7d Menu: **Sync Ref Output**

This menu is used to configure the SYNC REF OUTPUT. Choose between video composites sync, 1 Vpp composite sync, +5V (TTL-CMOS) composite sync, -5V composite sync, HDSF Hi-definition 1080sF tri-level sync, +5V vertical drive, -5V vertical drive, +5V frame drive (square wave), or -5V frame drive (square wave).

- ⇒ Use the Knob or +/- buttons to select reference signal for output.

2.3.7e Menu: **Drive Ref Output**

This menu is used to configure the FRM/ V-DRIVE OUTPUT. Choose between +5V vertical drive, -5V vertical drive, +5V frame drive (square wave), or -5V frame drive (square wave).

- ⇒ Use the Knob or +/- buttons to select reference signal for output.

2.3.7f Menu: **RF Modulator**

This menu is used to select the output channel for the RF Modulator. The Output channel may be either US channel 3, or US channel 4.

- ⇒ Use the Knob or +/- buttons to select channel.

2.3.8 **GENLOCK / PHASE**

This button (with MENU ENABLE) is used to access menus for genlocking and phasing.

2.3.8a Menu: **Genlock Source**

This menu is used to select the source type to be used for genlocking the MVP-24. Select "Composite Sync" for composite video, black-burst, TTL level composite sync or tri-level High definition sync. Select "Frm/Vrt Drive" for a vertical drive pulse, or a frame square wave.

- ⇒ Use the Knob or +/- buttons to select genlock type.

2.3.8b Menu: **Vertical Phase**

This menu is used to vary the vertical phase of all the output signals from the MVP-24. When genlocked, this phase adjustment is with respect to the genlock source. See section 5.5 for tips on using this feature.

- ⇒ Use the Knob or +/- buttons to select genlock type.

2.4 ACTIVE BUTTONS AND MENUS

The following buttons provide two functions. When pressed alone, they activate or de-activate the named function. Upon activation, the button will illuminate red. When pressed along with MENU ENABLE, they are used to access adjustment menus for the named function. While the menu mode is active, the button will illuminate yellow, or flash between red and yellow if that function is also active.

2.4.1



FREEZE

This button (alone) will freeze or un-freeze the displayed picture.

2.4.1a

Menu: **Freeze Display Mode** (MENU ENABLE + FREEZE)

This menu is used to control how a freeze is displayed.

Select between field 1, field 2 or full frame.

Note; the MVP-24's processing produces very stable full frame freezes even with significant motion. Full frame mode is usually the preferred mode.

⇒ Use the +/- buttons to select how a freeze is displayed.

2.4.2



TEST SIGNAL GENERATOR

This button (alone) will enable or disable the test signal generator.

2.4.2a

Menu: **Test Signal** (MENU ENABLE + TEST SIGNAL GENERATOR)

This menu is used to select which test signal is displayed.

⇒ Use the Knob or +/- buttons to select test signal.

The following signals are available:

Sizing Chart (circle, square grid and over scan markings)

Color Bars

SMPTE Bars

Monochrome 5 step

Modulated 5 step

Monochrome 10 step

Modulated 10 step

Monochrome Ramp

Modulated Ramp

NTC-7 (Pulse and Bar)

Multipulse

Multiburst

6 MHz Frequency Sweep

Vertical Frequency Sweep

50 IRE Flat Field

75% Window (75 IRE, 75% square)

12 Field pulse (Window signal once every 12 fields)

RED screen

GREEN screen

BLUE screen

F1-BLU/F2-YEL (Alternating field signal, F1=Blue, F2=Yellow)

2.4.2b

Menu: **Test Signal Levels** (MENU ENABLE + TEST SIGNAL GENERATOR)

This menu selects whether test signals can be modified by level controls (level, setup, saturation, hue), or fixed at unity levels.

⇒ Use the Knob or +/- buttons to select.

2.4.3  **EFX1**
This button currently has no function, but is reserved for future enhancements

2.4.3a Menu: (MENU ENABLE + EFX1)
There are no menus available for this function.

2.4.4  **EFX2**
This button currently has no function, but is reserved for future enhancements

2.4.4a Menu: (MENU ENABLE + EFX2)
There are no menus available for this function.

2.4.5  **COLOR CORRECT***
This button (alone) will enable or disable color correction (color temperature) settings. When enabled, the status line of the display will indicate the color temp (if preset used) or USER. When disabled, the status line of the display will indicate 6500°, which is the default color temperature for a video monitor. *See section 5.3 for more information.

2.4.5a Menu: **Color Correction-X:*** (MENU ENABLE + COLOR CORRECT)
This menu is used to adjust color correction (white balance) along the X axis of the color circle. COLOR CORRECT must be enabled for these settings to take effect. *See section 5.3 for more information.
⇒ Use the Knob or +/- to adjust.

2.4.5b Menu: **Color Correction-Y:*** (MENU ENABLE + COLOR CORRECT)
This menu is used to adjust color correction (white balance) along the Y axis of the color circle. COLOR CORRECT must be enabled for these settings to take effect. *See section 5.3 for more information.
⇒ Use the Knob or +/- to adjust.

2.4.5c Menu: **Color Balance-X:*** (MENU ENABLE + COLOR CORRECT)
This menu is used to adjust color balance (black balance) along the X axis of the color circle. COLOR CORRECT must be enabled for these settings to take effect. *See section 5.3 for more information.
⇒ Use the Knob or +/- to adjust.

2.4.5d Menu: **Color Balance-Y:*** (MENU ENABLE + COLOR CORRECT)
This menu is used to adjust color balance (black balance) along the Y axis of the color circle. COLOR CORRECT must be enabled for these settings to take effect. *See section 5.3 for more information.
⇒ Use the Knob or +/- to adjust.

2.4.5e Menu: **Color Temp Preset:*** (MENU ENABLE + COLOR CORRECT)
This menu is used to load presets (stored correction and balance settings) for color temperatures. Loading a preset will overwrite any color correction and color balance settings. COLOR CORRECT must be enabled for these settings to take effect. *See section 5.3 for more information.
⇒ Use the Knob or +/- to select a preset.
⇒ Once the desired preset is selected, push the knob to load settings from the preset.

2.4.5f

Menu: **Store Temp Settings:*** (MENU ENABLE + COLOR CORRECT)

This menu is used to store correction and balance settings to a color temperature preset. Each preset may be assigned a unique four character name.

- ⇒ Use the Knob to select a preset number (1,2,3 or 4).
Note: Presets 6500,5500,4800, and 3200 are factory default settings and cannot be written to.
- ⇒ To load default name, push knob while cursor is positioned under selected preset number.
- ⇒ To edit the name, press + or – button to move the cursor into the four character name. Use the Knob to change the character where the cursor is positioned.
Note: Pushing knob will advance the selected character to “0”.
- ⇒ Once desired preset and name are selected, press + and – buttons simultaneously to store settings to the preset.

* Note: Write Enable switch must be ON (enabled) to access the *Store* menu (see *Appendix-C*).

2.4.6



MONOCHROME

This button (alone) will enable or disable monochrome mode. When enabled, all color information is removed leaving a black and white picture.

2.4.6a

Menu: (MENU ENABLE + MONOCHROME)

There are no menus available for this function.

2.4.7



BLACK

This button (alone) will enable or disable Black mode. When enabled, the video outputs go to black level (0 IRE).

2.4.7a

Menu: (MENU ENABLE + BLACK)

There are no menus available for this function.

2.4.8



FIELD MODE

This button (alone) will enable or disable field mode.

2.4.8a

Menu: **Field Display Mode** (MENU ENABLE + FIELD MODE)

This menu is used to control how the picture is displayed in field mode.

“field1/field1” displays field 1 for both output fields.

“field2/field2” displays field 2 for both output fields.

“field1/black” displays field1 and blanks the output for field2.

“field2/black” displays field2 and blanks the output for field1.

FIELD MODE must be enabled for these settings to take effect.

* See sections 5.5 and 5.6 for tips and additional usage of this feature.

- ⇒ Use the +/- buttons to select field mode.

Field1/black

*Field1/black is a mode which displays only field 1, and blanks out field 2. This mode can be used to see exactly what the film camera's shutter will see. Many principles of interlaced video depend on the ability of the human eye to average artifacts between odd and even fields. Unfortunately the shutter of a film camera only ever sees one of the two fields, and therefore no averaging occurs. This could produce many artifacts on film that might not have been seen during the filming. The **Field1/black** setting eliminates all even fields. The picture will appear to flash rapidly, but any interlace artifacts should be more apparent to the operator. See sections 5.5 and 5.6 for tips and additional usage of this feature.*

2.4.9 FAN

This button (alone) will enable or disable the fan.

2.4.9a Menu: **FAN Speed** (MENU ENABLE + FAN)

This menu is used to adjust the speed of the fan when enabled.

⇒ Use the Knob or +/- to adjust.

2.4.9b Menu: **Chassis Temperature** (MENU ENABLE + FAN)

This menu shows the internal temperature of the chassis in degrees Celsius.

2.4.10 REMOTE

This button currently has no function, but is reserved for future enhancements

2.4.10a Menu: (MENU ENABLE + REMOTE)

There are no menus available for this function.

2.5 SPECIALTY MENUS

The following menus can be accessed when the MVP-24 is in standby mode (no menus selected). Pressing MENU ENABLE (alone) will exit any currently accessed menus.

2.5.1 Menu: **Serial Number:** (press NEXT without MENU ENABLE)

This menu displays the chassis serial number.

2.5.2 Menu: **Hours of Operation:** (press PREV without MENU ENABLE)

This menu displays the total number of hours that the chassis has been powered.

2.6 EXT REF INDICATOR



This yellow LED lights solid when the unit is locked to an external sync reference. A flashing LED indicates a problem with the reference signal; the frame rate of the reference does not match the selected rate, or the wrong reference type is selected (*see section 2.3.8a*), or the external sync is unstable. When the LED is off, then the unit is locked to the internally generated sync.

SECTION 3

APPLICATIONS

Below, are a few typical examples of how the MVP-24 can be used.

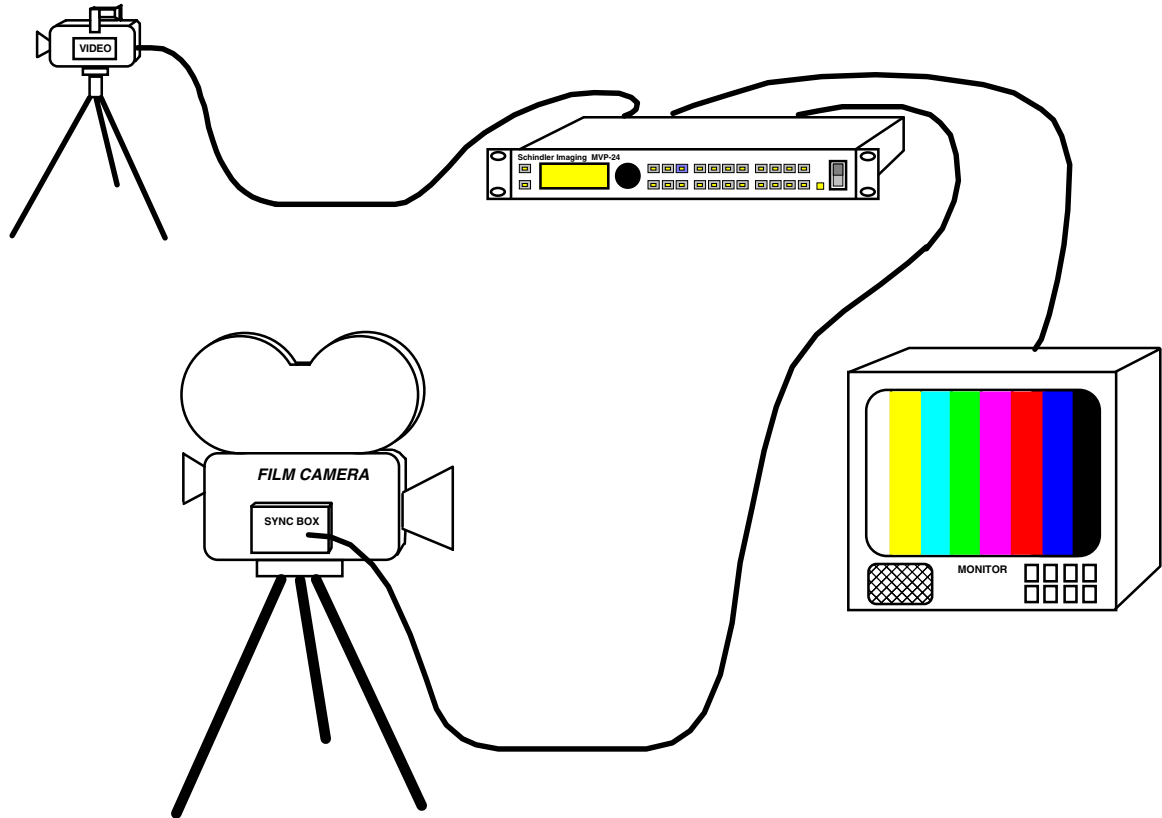


Figure 4. Real-time frame rate conversion and synchronization.

A live video camera is used as the source. The film camera is locked to the reference output of the MVP-24 with the use of a camera synchronizer box.

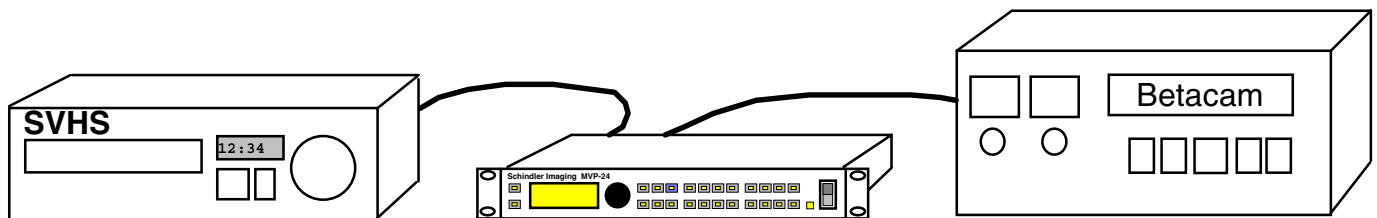


Figure 5. 30 FPS to 24 FPS videotape conversion.

The MVP-24 is being used for transferring a tape source at 30 FPS to 24 FPS for recording on a modified 24 FPS VCR. Note, in this application, the MVP-24 is also converting the SVHS input format to Component output format for the Betacam VCR.

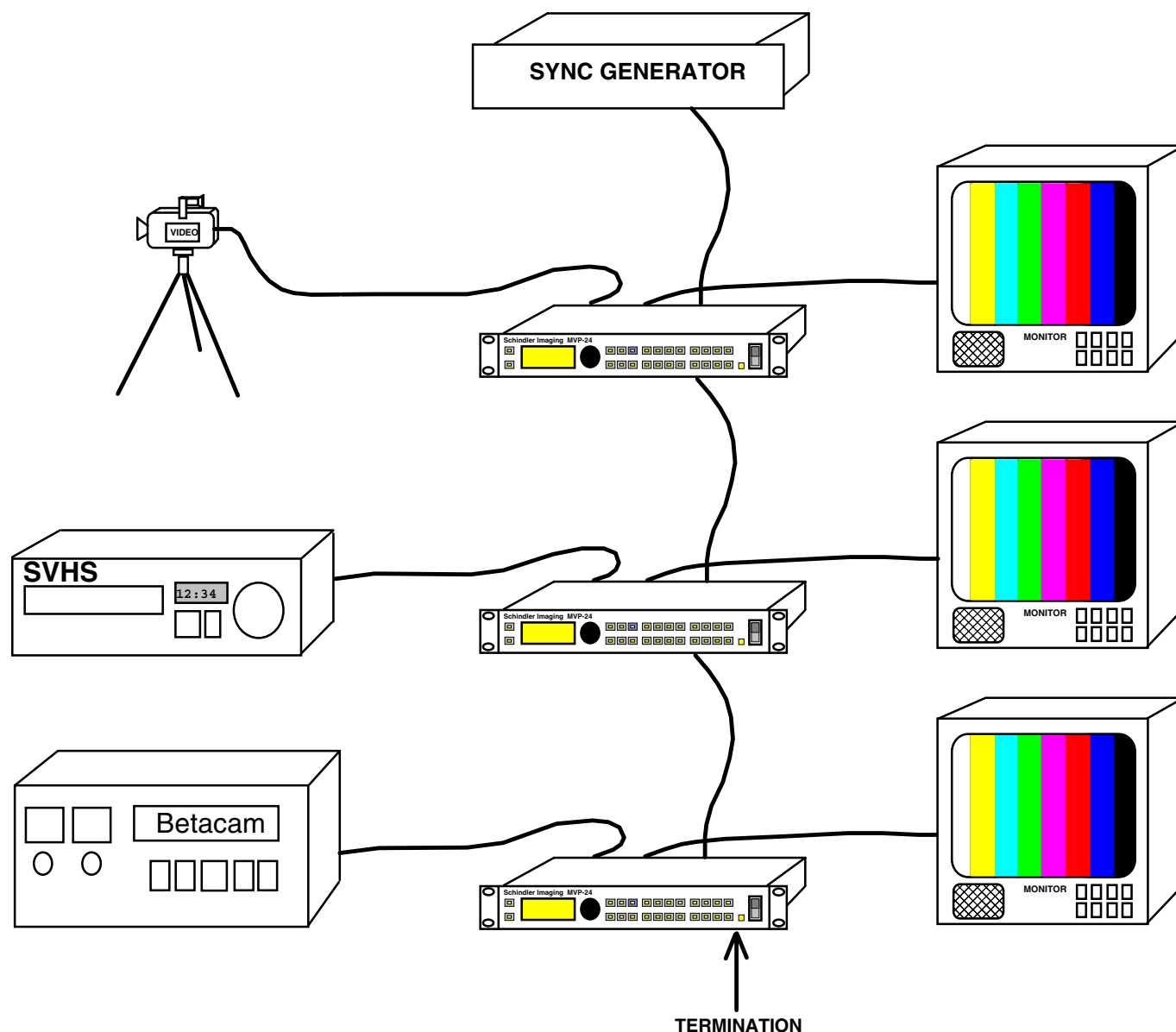


Figure 6. Multiple Displays or Video Walls.

Multiple MVP-24 units are being used for converting to 24 FPS as well as synchronizing all the monitors to the same reference. Either an external sync generator is used, or the first MVP-24 can be used as the reference.

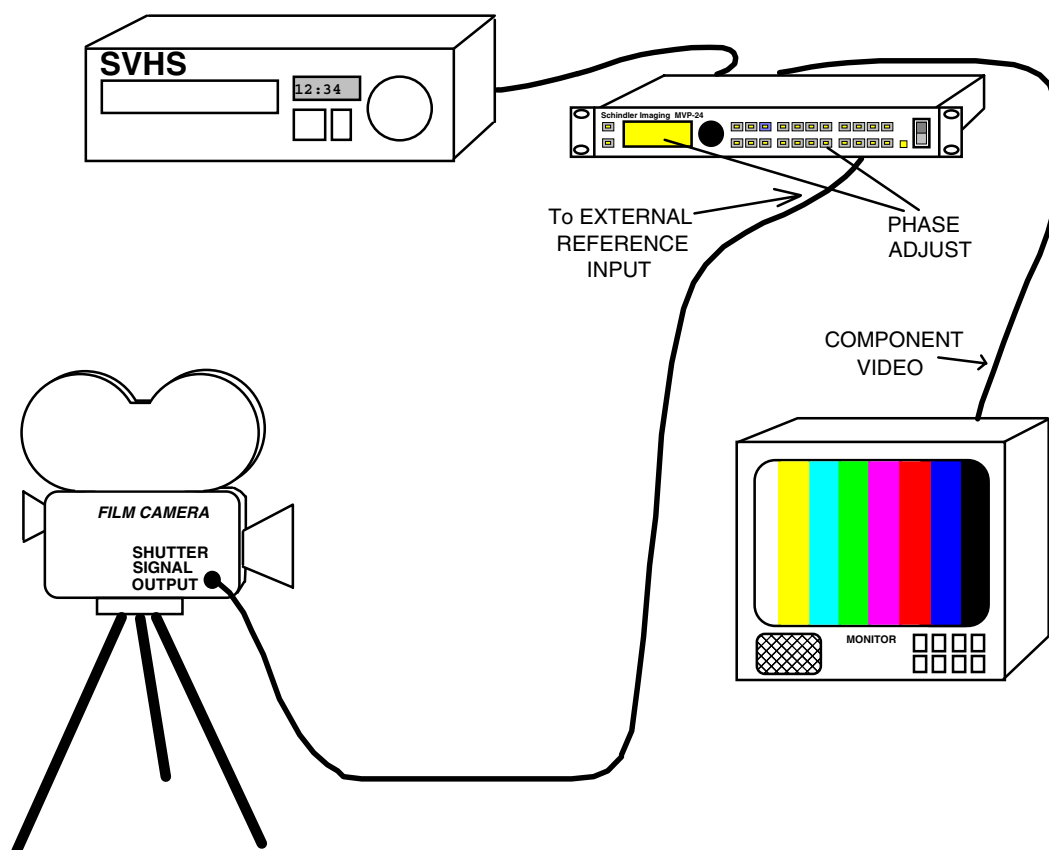


Figure 7. Single Camera without Sync Box.

The MVP-24 is being sync locked to the shutter signal produced by the film camera. Adjustment is made on the MVP-24 to phase the vertical blanking bar out of the picture while looking through the camera's view finder.

Note: If the shutter signal is created mechanically, color phase (tint) errors may occur in composite and Y/C outputs. For mechanical shutter signals, it is recommended to use component video as the output format.

SECTION 4

OVERVIEW OF 24 FPS VIDEO PLAYBACK

4.1 INTRODUCTION

There are three factors that affect the camera's ability to film a television monitor; the frame rates of the camera and monitor, the phase of the camera's shutter and the monitor, and the shutter angle of the camera. What follows is a simplified description of these factors.

4.2 FRAME RATES

The frame rate of a film camera is typically 24 Frames Per Second (FPS), while a television's frame rate is 30 FPS (for NTSC). When a 30 FPS television is filmed with a 24 FPS camera the result is a picture with light and dark horizontal bands that roll through the picture. This is caused by the shutter's exposure time not equaling the video's scanning time. Figure 8 below, demonstrates this phenomenon.

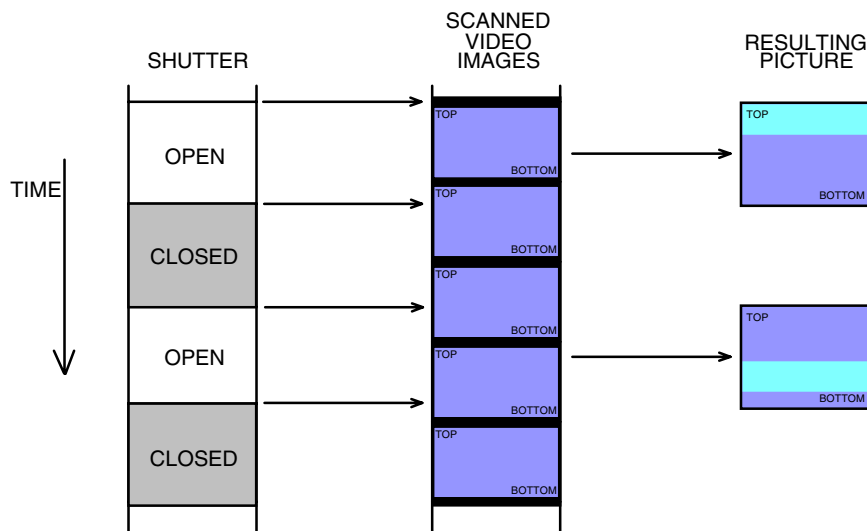


Figure 8. 24 FPS Camera filming a 30 FPS video.

As can be seen from figure 8, when the camera's shutter opens, one and a fraction video images are exposed to the film. The overlapping portion of the video image becomes double exposed, thus producing a light band in the image. Since each succeeding shutter opening occurs at different places in the video, the band appears in different locations in the picture. The final result is a light band that appears to move or roll through the picture.

If the video's frame rate is made equal to the film camera's 24 FPS rate, then exactly one whole image can be exposed on the film, thus eliminating the problem.

4.3 SHUTTER PHASE

Once the video's frame rate is made equal to the camera's frame rate, then the phases of the camera's shutter and the monitor become important. It will be assumed that the camera's shutter is open 50% of the time and closed the other 50%. Because the time period of one shutter opening equals one video image, one complete picture will always be exposed onto the film with no light or dark bands. However, depending on the phase of the shutter with respect to the video, the exposed picture may actually be made of portions of different video images. This becomes a problem when there is motion in the video image. Figure 9 demonstrates the effects of shutter phase and motion.

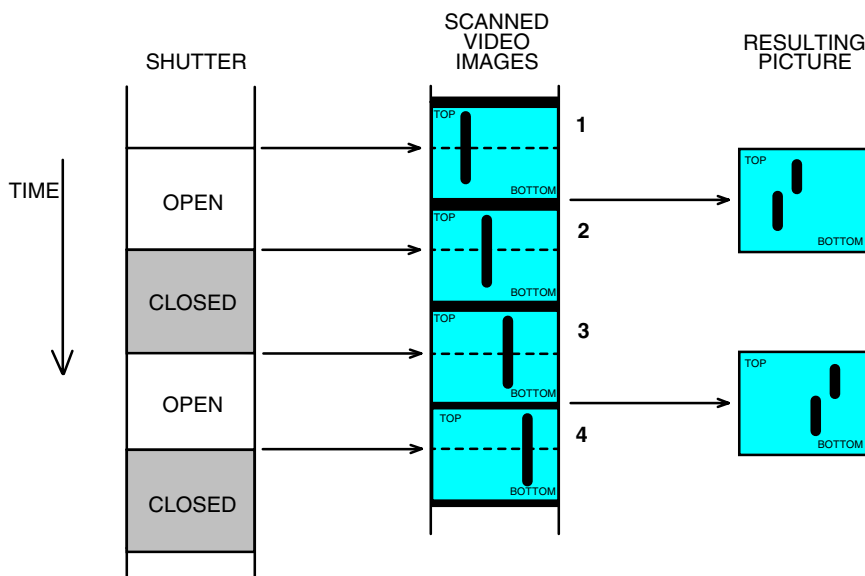


Figure 9. Effect of phase difference on motion.

In figure 9, the sequence of video images shows an object moving left to right. The time that the shutter opens is occurring in the middle of a video image. The film will become exposed with the bottom portion of image 1 and the top portion of image 2. This results in a picture where any objects in motion may be split in half.

The preceding example demonstrated a 90 degree phase difference between the shutter and the video image. If the phase of the camera's shutter or the phase of the video image can be adjusted to bring these two into alignment (or 0 degrees), then a whole picture without motion splitting will be produced.

4.4 SHUTTER ANGLES

The preceding discussion assumed that the camera's shutter was open 50% of the time and closed the other 50%. This 50/50 condition is referred to as a 180 degree shutter angle.

Referring back to figure 9, it was seen that with a 180 degree shutter angle, one whole picture was produced from two halves (even though there were motion artifacts). This worked because the time of the shutter opening was exactly the time of one video image. If the shutter angle is now changed to 51% open and 49% closed (~184 degrees), then the open time is now greater than one video image. This will result in one and a fraction video images being exposed onto the film. If the shutter and the video image are not in alignment (as in figure 9), then a light horizontal band will be produced in the middle of the picture. Figure 10a demonstrates this effect.

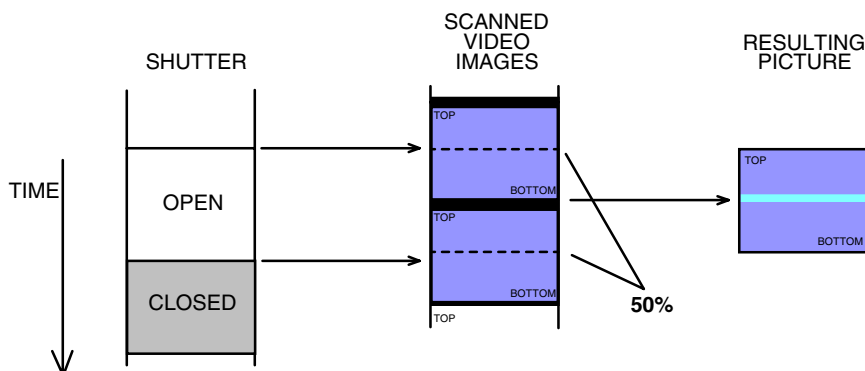


Figure 10a. Example of shutter angle > 180 degrees.

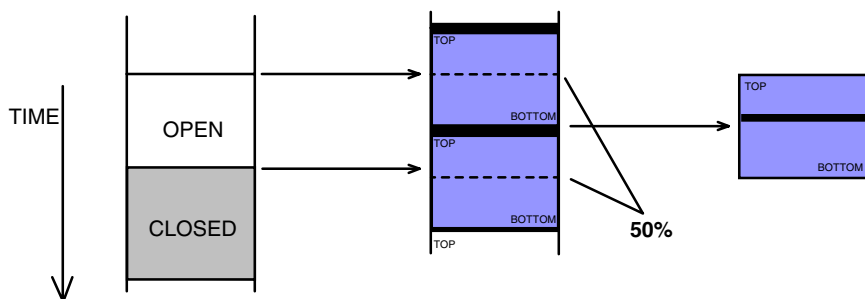


Figure 10b. Example of shutter angle < 180 degrees.

In Figure 10a, the shutter angle is greater than 180 degrees. As can be seen from this example, a small portion of the image is seen by the film twice, double exposing it and creating a light horizontal band in the picture. Conversely, figure 10b demonstrates the condition when the shutter angle is less than 180 degrees. In this case a small portion of the image is never seen by the film, thus leaving a black horizontal band in the picture. It should be apparent that the larger the shutter angle differs from 180 degrees, the larger this banding artifact is.

If the examples in figures 10a and 10b were aligned so that the shutter opening occurred at the top of the video image (shutter phase equals 0 degrees), then this banding artifact goes away. This is due to the video image's blanking interval.

In a television system, the image is scanned from the top left corner down to the bottom right corner. The television then requires time to move back to the top so it can begin another scan. During this time, the video signal is blanked, so that no light appears at the output of the television's picture tube. This time is referred to as the blanking interval.

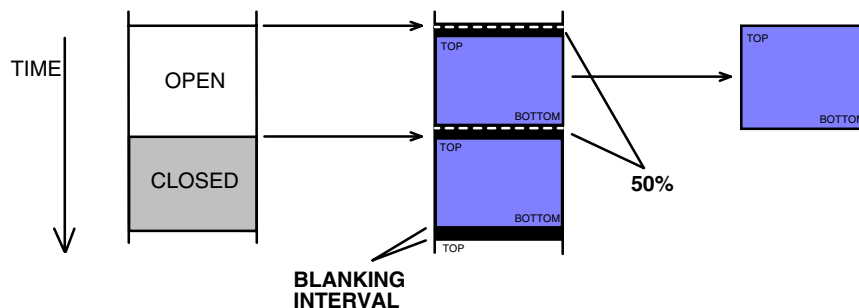


Figure 11. Example of shutter angle > 180 degree, with 0 degrees of shutter phase.

Figure 11 demonstrates the condition when the shutter and the image are in alignment. Even though the shutter angle is greater than 180 degrees, the area of the image that would be double exposed is now blanked. The results is a perfect picture.

It should be noted that the blanking interval of a standard video image is approximately eight percent. This means that the shutter angle must not differ from 180 degrees by more than the 8 percent (14 degrees) or else a visible artifact will occur. The phase stability and frequency tolerance of the system also become more critical as the phase difference approaches the 8 percent.

SECTION 5

HELPFUL TIPS AND SUGGESTIONS

5.1 INTRODUCTION

The MVP-24 comes equipped with many features to help with the varying demands of video playback. This section offers suggestions on various configurations and the use of the MVP-24's special features to simplify the task of video playback.

5.2 MONITORS

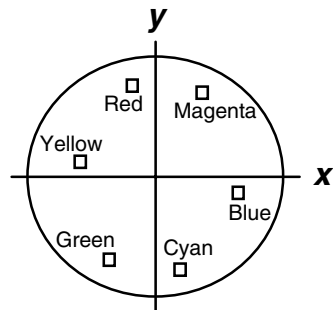
The selection of the video monitor is very important, and unfortunately this choice is often made by set designers or directors with little thought to the logistics involved in making it work. The MVP-24 has several features that were designed for this situation.

- | | | | | | | | | | | |
|------------------------|--|---|------------------------|--------------------------------------|-------------|------------------------------------|-----------|-------------------------------------|--------------|--|
| 5.2.1 | VERTICAL LOCK REQUIREMENT | There is one important requirement of the monitors used, they must be able to vertically lock to a 24 FPS video signal . Most older monitors which have a vertical hold control will most likely have a range large enough to lock up. However, newer televisions and monitors having a digital locking circuit with no controls might not be able to lock at 24 FPS. These monitors must be modified in order to be used. | | | | | | | | |
| 5.2.2 | VIDEO FORMAT | <p>The MVP-24 produces various output formats to feed to the monitor depending on what the monitor is capable of receiving.</p> <table border="0"><tr><td>Component (YRB or RGB)</td><td>- produces the best quality picture.</td></tr><tr><td>Y/C or SVHS</td><td>- produces a high quality picture.</td></tr><tr><td>Composite</td><td>- the standard format for monitors.</td></tr><tr><td>RF Channel 3</td><td>- used for televisions without video inputs.</td></tr></table> | Component (YRB or RGB) | - produces the best quality picture. | Y/C or SVHS | - produces a high quality picture. | Composite | - the standard format for monitors. | RF Channel 3 | - used for televisions without video inputs. |
| Component (YRB or RGB) | - produces the best quality picture. | | | | | | | | | |
| Y/C or SVHS | - produces a high quality picture. | | | | | | | | | |
| Composite | - the standard format for monitors. | | | | | | | | | |
| RF Channel 3 | - used for televisions without video inputs. | | | | | | | | | |
| 5.2.3 | SIZE & CENTERING CONTROLS | <p>The MVP-24 has controls which allow the video image to be resized to match the monitor being used. This could save time when presented with a monitor which is still calibrated for standard NTSC. A "Sizing Chart" test signal is provided for making these adjustments to ensure the correct aspect ratio of the image.</p> <p><i>See section 2.3.5 for more information.</i></p> | | | | | | | | |
| 5.2.4 | LEVEL (PROC AMP) CONTROLS | <p>Level controls allow the brightness, contrast, color saturation, and tint to be adjusted to compensate for the monitor.</p> <p><i>See section 2.3.4 for more information.</i></p> | | | | | | | | |
| 5.2.5 | SHARPNESS | <p>The Horz and Vert Sharpness feature can be used to improve the sharpness on low resolution monitors.</p> <p><i>See section 2.3.6 for more information.</i></p> | | | | | | | | |
| 5.2.6 | COLOR TEMPERATURE | (See following section). | | | | | | | | |

5.3 COLOR TEMPERATURE

The color temperature of television monitors must be adjusted to match the ambient lighting in the scene being filmed. It is possible to individually adjust each monitor's screen controls to set them to the proper temperature, however this would be difficult to do on the set and it could not be performed quickly. The solution has been to use color correction devices to alter the colorimetry of the video signal instead of the monitors. The MVP-24 has built in color correction controls as well as 3200, 4800, and 5500 degree presets* which can be used for this purpose.

- | | | |
|-------|-----------------------|---|
| 5.3.1 | COLOR
CORRECTION | Pressing the COLOR CORRECT button (alone) will enable or disable the color correction and balance settings. |
| 5.3.2 | COLOR TEMP
PRESET* | Using the "Color Temp Preset" menu (see section 2.4.5) load pre-defined settings for a user defined or 3200, 4800, or 5500 degree temperature picture. |
| 5.3.3 | ADJUSTMENTS | Menu controls are used to adjust "Color Correction" and "Color Balance". The adjustments work on the x and y axis of the color circle as viewed with a NTSC vector scope. |



CW (+)  = x axis moves right (more blue)
y axis moves up (more red)

CENTER (0) = no color added

CCW (-)  = x axis moves left (more yellow)
y axis moves down (more cyan)

COLOR CORRECTION controls only add color to the white or lighter areas of the picture.

COLOR BALANCE controls add color to all intensities equally, including black or darker areas of the image.

- | | | |
|-------|--------------|--|
| 5.3.4 | TEST SIGNALS | The built in test signal generator contains various grayscale patterns to assist with color temperature adjustments. |
| 5.3.5 | PROCEDURE | Using a color temperature meter along with the "grayscale steps" test signal, first adjust the COLOR BALANCE controls for the proper temperature in the black or dark steps looking at the monitor. Second, adjust the COLOR BALANCE controls for the proper temperature in the white steps. |
| 5.3.6 | EFFECTS | By using the MONOCHROME control to turn off color, a black and white security-cam look can be achieved while maintaining proper color temperature so that the filmed image turns out truly black and white.

By exaggerating the color correction controls with color turned off, a sepia or tinted monochrome effect is also possible. |

* The Color Temp presets are correct assuming the monitor has been properly calibrated for the television standard of 6500 degree color temperature.

5.4 SYNCHRONIZATION

For proper setup, the Camera(s) and the monitor(s) must be synchronized. This is typically done by supplying a master reference to all the cameras and video equipment used. (See Figures 4 - 7 in Section 3 for typical applications).

5.4.1 MVP-24 AS MASTER REFERENCE The MVP-24 has an internal sync generator which may be used for the master reference. The MVP-24 generates Vertical Drive, Frame, and composite sync signals to synchronize other equipment.

5.4.2 SINGLE CAMERA AS REFERENCE For single camera shots, it is possible to use the shutter signal from the camera as the master reference. This eliminates the need and expense for a camera sync box. The MVP-24(s) will receive the camera's frame or V-drive signal and synchronize the video monitor(s) to it (See Figure 7).

Note: If the shutter signal is created mechanically, color phase (tint) errors may occur in composite and Y/C outputs. For mechanical shutter signals, it is recommended to use component video as the output format.

5.4.3 GENLOCKING: NO NEED FOR BLACK BURST Unlike most video converters which require a black burst video signal for genlock, the MVP-24 will lock to most anything. The MVP-24 only requires a vertical signal which can be in the form of Vertical Drive, Frame square wave, Composite horizontal and vertical sync, Black burst, or even High Def 1080sF tri-level sync. The MVP-24 will also generate all of the above regardless of the form of the input (see section 2.3.7d and e). This eliminates the need and expense for miscellaneous sync converter boxes.

5.5 PHASING THE CAMERA'S SHUTTER

It is important to vertically phase the camera with the monitors to eliminate any artifacts. As described in section 4.3 (Overview of 24 FPS Playback) even if the shutter angle is 180 degrees there can still be motion splitting if the camera and monitor are not in alignment. Traditionally, the camera is phase aligned by looking through the view finder and adjusting camera phase until the artifact is out of the picture. This can be difficult if the shutter angle is exactly 180 degrees because it will be difficult to see the artifact. The MVP-24 has Test Signals to simplify this task.

5.5.1 PHASING USING A SYNC BOX For multiple camera shots, it's usually required that each camera have its own synchronizer box. This allows the shutter phase of each camera to be adjusted with respect to a reference. This reference can be a master sync generator, or the MVP-24. The camera sync box will have a phase control which will be used to vertically phase the camera.

5.5.2 SINGLE CAMERA PHASING USING THE MVP-24 For single camera shots, it is possible to lock the MVP-24(s) to the shutter signal from the camera, and eliminate the camera sync box (see Figure 7). In this configuration, the monitor will be phase adjusted instead of the camera. The procedure is similar, except the "Vertical Phase" control menu (see section 2.3.8b) on the MVP-24 is used to make the adjustment.

5.5.3 TEST SIGNAL:
F1-BLU/F2-YEL

The MVP-24 generates a special test signal for the purpose of phasing the camera with the monitor ("F1-BLU/F2-YEL"). It is a field alternating signal that appears to the eye as a gray flashing image. The signal is really blue in field one, and yellow in field two. Since the camera shutter sees only 50% of the picture (at 180 degrees), it will only see one of the two fields. When phased correctly, the shutter will either see an all blue or an all yellow picture. If shutter phase is not correct, there will be a split image that is half blue and half yellow.

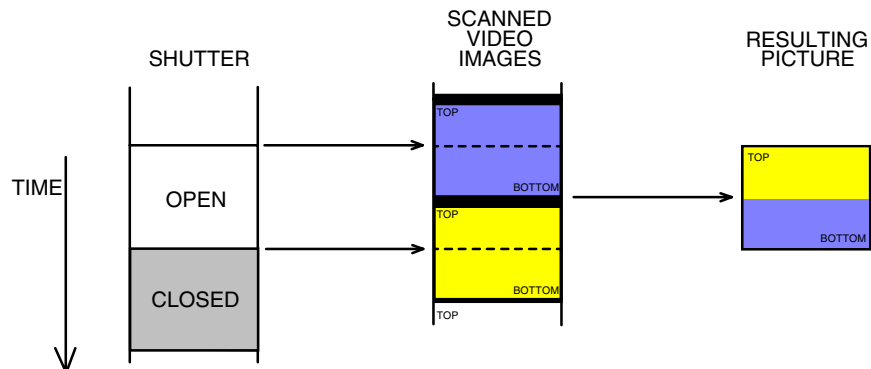


Figure 12a. Vertical Phase at 90 degrees.

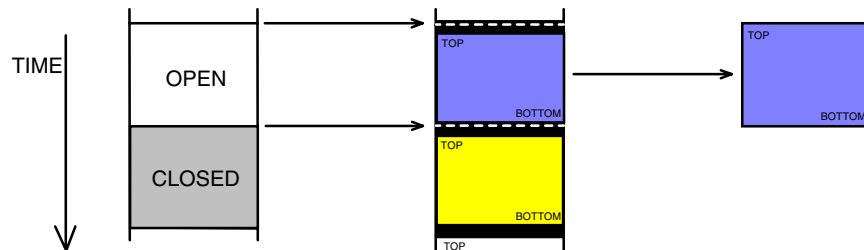


Figure 12b. Vertical Phase at 0 degrees.

5.5.4 FIELD MODE:
"field1/black"

The MVP-24 has a special field mode called "field1/black" which displays only field 1, and blanks out field 2 (see section 2.4.8). This mode can be used to help "phase" the camera's shutter. When the MVP-24's FIELD MODE is enabled and configured for "field1/black", field one is displayed, but field two is blanked. When viewing the image through the camera's view finder, a whole picture will only be seen when the phase is 0 degrees.

Note: If FIELD MODE:(field1/black) is to be used during actual filming, it is important to know how the view finder works. On some cameras, the view finder is seeing the image during the non-exposure time. A mirror either directs light to the film or to the view finder. If this is the case, then the image seen through the view finder is not the image being recorded on film. A black picture could result as the final filmed image. A test should be made to determine this, before using this FIELD MODE on a production.

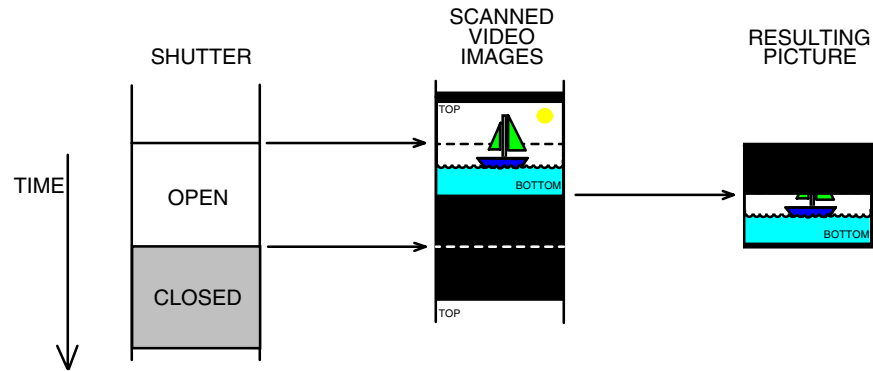


Figure 13a. Field Mode (field1/black): Vertical Phase at 90 degrees.

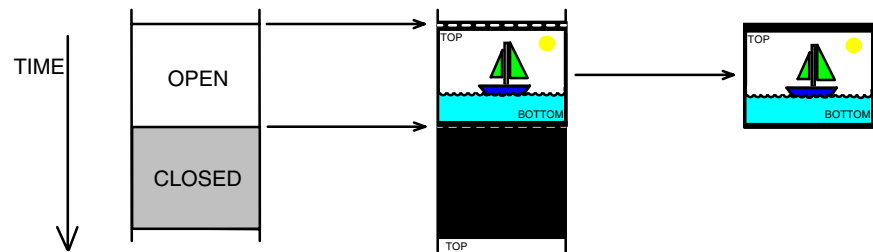


Figure 13b. Field Mode (field1/black): Vertical Phase at 0 degrees.

5.6 WIDE CAMERA SHUTTER ANGLES (>> 180 degrees)

In order to film standard 24 FPS video, the camera shutter angle needs to be approximately 180 degrees. Often times however, larger shutter angles are desired or required by the director. Using the MVP-24, it is possible to increase the shutter angle and still avoid any artifacts in the picture.

As explained earlier (section 4.3, Overview of 24 FPS playback), the blanking interval of the video signal allows some variance of the shutter angle when the phase of the shutter is at 0 degrees. By increasing the blanking interval, larger shutter angles can be achieved.

5.6.1 CALCULATING RANGE OF SHUTTER ANGLES

Standard 24 FPS video has 300 active lines of picture information per field (1/2 frame) of video, and 655 lines in the complete frame. It can be seen that $300 / 655 = 0.458$ or 45.8%. 45.8% of 360 degrees is 164.9 degrees, which is the minimum shutter angle required to capture the whole image. It can also be seen that $(655-300) / 655 = 0.542$ or 54.2%. 54.2% of 360 degrees is 195.1 degrees, which is the maximum shutter angle before the second field image begins to be exposed.

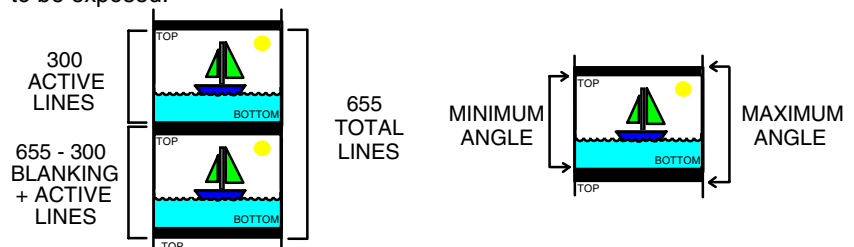


Figure 14. Calculation of shutter angles for normal blanking.

5.6.2 INCREASE SHUTTER ANGLE BY RESIZING IMAGE

One method to get larger shutter angles is to increase the blanking interval by reducing the vertical image size. The MVP-24 has VERTICAL SIZE and CENTER controls which can be used for this purpose. The minimum size the image can be reduced to is 50%, or 150 active lines per field (1/2 of 300 lines/frame). Calculating the maximum shutter angle yields: $(655 - 150) / 655 = .771$ or 77.1%. 77.1% of 360 degrees is 278 degrees.

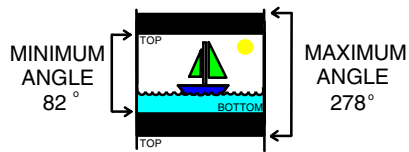


Figure 15. Maximum shutter angle by reducing vertical size.

Once the image has been sized to achieve the desired shutter angle, the picture will probably look compressed when viewed on the monitor. Using the monitor's Vertical Size and Centering controls, adjust the monitor to correct the picture's aspect ratio back to normal (use the "Sizing Chart" built-in test signal).

5.6.3 INCREASED SHUTTER ANGLE BY USING FIELD MODE: "field1/black"

Another method to increase the shutter angle, is to use FIELD MODE: "field1/black" (see section 2.4.8). In this mode all of field 2 is blanked. This has the effect of increasing the blanking interval by over 300 lines. This would theoretically allow for a 360 degree shutter angle. $(655 - 0) / 655 = 1.0$ or 100%. 100% of 360 degrees is 360 degrees.

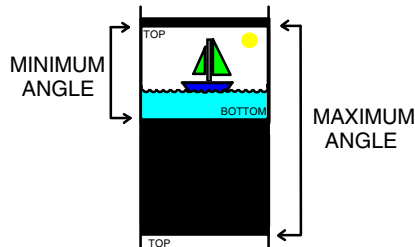


Figure 16. Maximum shutter angle by using FIELD MODE: "field1/black".

Note: If FIELD MODE:(field1/black) is to be used during actual filming, it is important to know how the view finder works. On some cameras, the view finder is seeing the image during the non-exposure time. A mirror either directs light to the film or to the view finder. If this is the case, then the image seen through the view finder is not the image being recorded on film. A black picture could result as the final filmed image. A test should be made to determine this, before using this FIELD MODE on a production.

APPENDIX A

SPECIFICATIONS

MVP-24 SPECIFICATIONS

VIDEO INPUTS:

	Composite-1	1.0 Vpp (including sync)	Vid1 / R-Y / R BNC, 75Ω
	Y/C	(Y) 1.0 Vpp (including sync)	Y / Y / G BNC, 75Ω
		(C) 700 mVpp	C / B-Y / B BNC, 75Ω
or	YRB	(R-Y) 700 mVpp	Vid1 / R-Y / R BNC, 75Ω
		(Y) 1.0 Vpp (including sync)	Y / Y / G BNC, 75Ω
		(B-Y) 700 mVpp	C / B-Y / B BNC, 75Ω
or	RGB	(Red) 700 mVpp	Vid1 / R-Y / R BNC, 75Ω
		(Green) 700 mVpp or 1.0 Vpp w/sync	Y / Y / G BNC, 75Ω
		(Blue) 700 mVpp	C / B-Y / B BNC, 75Ω
		(sync – 4 wire) 300 mVpp thru 6 Vpp MAX	Vid2 / SYNC BNC, 75Ω
	Composite-2	1.0 Vpp (including sync)	Vid2 / SYNC BNC, 75Ω
	SVHS	(Y) 1.0 Vpp (including sync)	SVHS 4 pin mini-DIN, 75Ω
		(C) 700 mVpp	
	SERIAL-D1	800 mVpp, Auto EQ to 300 meters (8281)	SERIAL-D1 BNC, 75Ω
	Audio	(for RF modulator) 316 mV (-10 dBV)	AUDIO IN BNC, 28KΩ
	GENLOCK (External Ref)	1.0 Vpp video (286 mVpp composite sync), or +/- 3 Vpp min, 12 Vpp max Frame or Vertical Drive	GENLOCK 2 BNCs ,Hi-Z loop

VIDEO OUTPUTS:

	Composite-1	1.0 Vpp (including sync)	Vid1 / R-Y / R BNC, 75Ω
	Y/C	(Y) 1.0 Vpp (including sync)	Y / Y / G BNC, 75Ω
		(C) 700 mVpp	C / B-Y / B BNC, 75Ω
or	YRB	(R-Y) 700 mVpp	Vid1 / R-Y / R BNC, 75Ω
		(Y) 1.0 Vpp (including sync)	Y / Y / G BNC, 75Ω
		(B-Y) 700 mVpp	C / B-Y / B BNC, 75Ω
or	RGB	(Red) 700 mVpp	Vid1 / R-Y / R BNC, 75Ω
		(Green) 1.0 Vpp w/sync	Y / Y / G BNC, 75Ω
		(Blue) 700 mVpp	C / B-Y / B BNC, 75Ω
	Composite-2	1.0 Vpp (including sync)	Vid2 BNC, 75Ω
	SVHS	(Y) 1.0 Vpp (including sync)	SVHS 4 pin mini-DIN, 75Ω
		(C) 700 mVpp	
	Sync Ref	(selectable) 150 mVpp, 500 mVpp, +2.5Vp, -2.5Vp (selectable) 300mVpp, 1.0Vpp, +5V TTL, -5Vp	BNC, 75Ω Hi-Z
	FRM / V-Drive	(selectable) +2.5Vp, -2.5Vp (selectable) +5V TTL, -5Vp	BNC, 75Ω Hi-Z

All specifications are subject to change without notice.

PERFORMANCE

Composite, Y/C, SVHS Inputs:

Bandwidth	5.0 MHz
Signal Filter	Digital Adaptive COMB filter
Signal to Noise Ratio	>58 dB (weighted, 10KHz to 5 MHz)
Differential Phase	<2 deg
Differential Gain	<2%
K-Factor (2T Pulse)	<2%
Sampling	9 bit ADC 4:2:2, 13.5 MHz

Component YRB/RGB Inputs:

Bandwidth	5.5 MHz
Signal to Noise Ratio	>61 dB
Differential Phase	<1 deg
Differential Gain	<1%
K-Factor (2T Pulse)	<1%
Sampling	10 bit ADC 4:2:2, 13.5 MHz

Luma of composite, Y and YRB/RGB Outputs:

Sampling	10 bit DAC 27MHz
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Chroma of composite, Y/C and SVHS Outputs:

Sampling	8 bit DAC 27MHz
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Processing:

CCIR 601 digital (internal 16 bit 4:2:2 limit)
Full Frame TBC. – Accepts non-interlace video
games, and Macrovision encoded sources.
Adaptive Progressive processing with 2 frame
motion filtering.

Residual time base error

+/- 15 nsec

Delay through unit

@ 24.000 FPS

approx. 1 frame +/- 1 field
(measured) 46ms or 2.75 fields on average

OUTPUT FORMATS: (interlaced 2:1 with user controlled active lines of video)

NTSC / NT443 / PAL-M

23.976 FPS	15.752KHz @ 657 lines
24.000 FPS	15.720KHz @ 655 lines
24.022 FPS	15.734KHz @ 655 lines
25.000 FPS	15.625KHz @ 625 lines
29.970 FPS	15.734KHz @ 525 lines

PAL / SECAM / PAL-N

23.976 FPS	15.608KHz @ 651 lines
24.000 FPS	15.624KHz @ 651 lines
24.022 FPS	15.638KHz @ 651 lines
25.000 FPS	15.625KHz @ 625 lines
29.970 FPS	15.734KHz @ 525 lines

ENVIRONMENTAL

Power Supply

47 - 63 Hz, 85 -264 VAC auto ranging

Fuse

5x20mm **1.5 AMP** 250-Volt Fast Acting Fuse

Power Dissipation

60 Watts MAX

Operating Temperature

+32° F (0° C) to +113° F (45° C)

Operating Humidity

10% to 85% RH

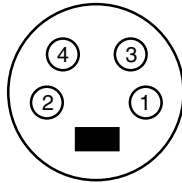
Dimensions

2.25 inches (with feet) x 14 inches x 19 inches

All specifications are subject to change without notice.

APPENDIX B

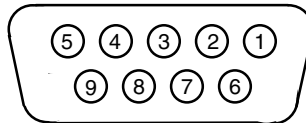
CONNECTOR PINOUTS



Rear Panel SVHS Pin out

SVHS INPUT AND OUTPUT

1	GND (Y)	3	Y
2	GND (C)	4	C



Rear Panel Remote Pin out

REMOTE – RS232 Configuration*

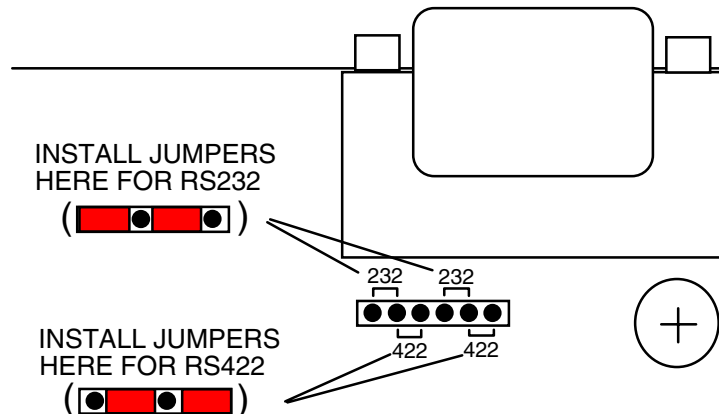
1	CD	4	DTR	7	RTS
2	RXD	5	GND	8	CTS
3	TXD	6	DSR	9	AUX

REMOTE – RS422 Configuration*

1	GND	4	GND	7	RXB
2	RXA	5	AUX	8	TXA
3	TXB	6	GND	9	GND

*REMOTE CONFIGURATION

The Remote PORT is configurable by a pair of jumpers located at the rear right corner of the main board.



APPENDIX C

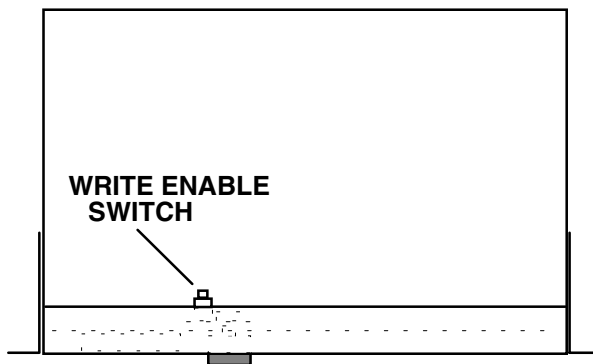
WRITE ENABLE SWITCH

WRITE ENABLE SWITCH

The MVP-24 has a write enable switch inside the chassis. This switch enables or disables any menus which store information, such as presets.

The switch is located inside the chassis, behind the front panel knob.

To access the switch, remove the top cover of the chassis.
Locate the switch by referring to the figure below.



When the switch is in the up position, it is configured for Write Protect.



When the switch is in the down position, it is configured for Write Enable.

