LEGAL NOTICES:

Unless you are experienced in the installation and set-up of high-performance video electronics, we suggest you hire a professional home -theater specialist to do installation and configuration of this product. We recommend that you choose a professional who has been certified by the Imaging Science Foundation™ (ISF).

WARNINGS:

- **Do not defeat the safety features of the power supply or power cord, such as, but not limited to, removing the ground pin connection.**

- **Do not open, insert objects into, or spill liquid into, this equipment.**

- **Do not block the cooling vents.**

- **Do not program an output resolution that exceeds the maximum specified refresh rate of the attached television, or projector.**

- **Improperly set gray-bar intensity may accelerate screen burn-in. Consult a home -theater specialist for help setting gray-bar intensity.**

VisionHDQ™ User Manual and Installer Guide

Table of Contents

VisionHDQ*TM* User Manual and Installer Guide

Introduction

Thank you for purchasing the Lumagen® VisionHDQ*TM* Video Processor. It has been designed to offer great video processing quality, while providing the best available value.

The two main sections of this manual are the *User Guide* and the *Installer Guide*. As their names imply, the *User Guide* provides instructions on day-to-day usage, and the *Installer Guide* provides initial setup information. It is important to read and understand this manual, and the display's specifications, before setting up the video processor. Also, check the www.lumagen.com website for possible updates to the manual or software.

To simplify references to video projectors, direct-view televisions and rear-projection televisions, they are all referred to as a "display" in this manual.

Features

The Lumagen VisionHDQ™ Video Processor provides a cornerstone for the ultimate home theater experience. It is designed to adapt to your home theater needs, rather than having the designed-in limitations commonly found in today's video processors. Some notable features are listed below.

- Ten inputs (1 Composite, 2 SVideo, 2 SD/HD analog, 4 DVI-I, and 1 SD-SDI)
- All video processing features are supported for HDCP encrypted DVI-D inputs.
- All video processing features are supported for HD analog YP_BP_R and RGB inputs.
- Component/RGB analog and DVI-D input accept 720p and 1080i sources
- Transcoding is supported for both digital and analog SD and HD inputs.
- Per-pixel motion-adaptive video deinterlacing for SD and HD source sources
- 3:2, 3:3 and 2:2 film pull-down frame-reconstruction for SD sources
- 3:2, 3:3 and 2:2 film pull-down frame-reconstruction for HD sources
- Four independent configuration memories for each input
- Black-level, contrast, calibration per memory
- Color, red-color-offset, green-color-offset calibration per memory
- Hue, red-Hue-offset, green-Hue-offset calibration per memory
- Y/C delay calibration with independent C_B and C_R delay
- Detail enhancing scaler
- Output resolution from 480p to 1080p, plus 1080i
- Output width programmable in pixel increments
- Programmable output color format (SD and HD component, plus RGB)
- Programmable vertical refresh rate
- Programmable screen aspect ratio
- DVI-D output with HDCP encryption support
- BNC connectors for the analog output
- Backlit infrared remote control with on-screen menu system
- RS232 serial interface for control and software-updates
- Silent operation (no fan)

VisionHDQ™ Video Processor

The function of the VisionHDQ is to act as a video switch, then process the selected video source and finally output it in the appropriate format and resolution. Standard definition (SD), enhanced-definition (ED), or high-definition (HD) video inputs are all supported in addition to a number of PC formats. Video inputs are converted to progressive video (if needed) and are then scaled to the video output resolution.

Interlaced video has been in use for more than 50 years and is still the most common video format. It displays half of the lines of picture information each sixtieth (or fiftieth) of a second. Each half of the image is called a field and displays either all the even lines, or all the odd lines. So, an entire image, called a frame, takes a thirtieth (or twenty-fifth) of a second to display on the screen. An "i" suffix on the resolution specification is used to indicate interlaced formats.

In contrast, progressive video presents each frame as a whole. A "p" suffix on the resolution specification is used to indicate progressive formats. Converting interlaced video to progressive video is referred to as "deinterlacing."

The VisionHDQ is comprised of four major functional sections:
- Input selection with conversion to digital (if needed) and video decoding
- Deinterlacing
- Filtering and scaling
- Output with conversion to analog video or output as digital DVI-D video.

These functional blocks are shown below.
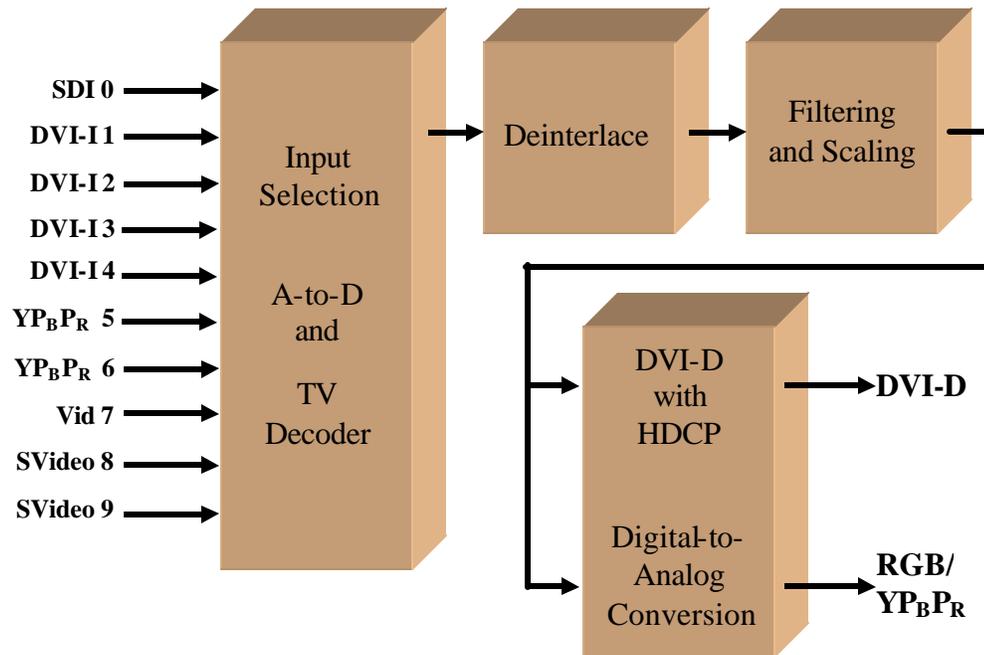
VisionHDQ Functional Block Diagram

Composite and SVideo inputs automatically select between NTSC, PAL and SECAM formats. The component, RGB and DVI-D inputs accept SD, ED and HD video at either 50 or 59.94 Hertz. HDCP encryption is supported for the DVI-D inputs. If the signal is encrypted, the DVI-D inputs are decrypted, processed, scaled and then re-encrypted for output as DVI-D. This is not just a "pass-through" function.

NOTE:
HDCP encrypted DVI-D sources must be re-encrypted for output.
The analog output is disabled in this case. The display
must be HDCP capable to show these encrypted sources.

If the video input is interlaced, it is first deinterlaced into a progressive format. Proprietary scaling algorithms are used to scale the resulting progressive video to the optimal size for the display. The Lumagen video processor scaling is programmable in scanline increments. For analog outputs, the video is over-sampled to provide the best possible image quality. For DVI-D outputs the resolution is programmable in both scanline increments vertically, and pixel increments horizontally.

As part of the scaling process, digital filtering is used to enhance the image detail. This enhancement allows standard definition inputs, such as DVDs, to appear to be much higher resolution. This is especially good for DVDs when they are viewed on the large screen sizes common in home theaters.

When the digital processing is completed; the video is converted to analog using digital-to-analog converters (DACs), or is output as DVI-D (digital) video.

To accommodate the various video displays, the output type is programmable. It can be set to analog YP_RP_B, RGBHV, RGBS or RGsB; with programmable sync type and polarities. YP_RP_B can be selected with either the SD or HD color formats. DVI-D video can use either the "PC" range (full range black to white), or "video range" (reduced range black to white to allow for blacker-than-black and whiter-than-white levels).

An infrared remote control is provided. Alternately, the serial RS232 port can be used for control, or for software updates. Critical display setup parameters have direct commands. Other functions use an on-screen menu.

Every input has four independent configuration memories, to allow options such as day and night specific modes for both NTSC and PAL sources. In addition, the HD capable inputs have four input resolution based sub-memories. These allow independent calibration and setup for 480i/p or 576i/p sources, 720p sources, 1080i sources, plus an additional sub-memory for another resolution. This feature is very useful for satellite receivers and other source devices, such as D-VHS HD video recorders, that can output the native resolution of the source material. In this "hybrid mode," SD sources are output as either 480i/576i or 480p/576p, 720p source material is output as 720p, and 1080i material is output as 1080i. Each of these source formats can be independently calibrated for each of the four input memories.

User Guide

This section describes the user interface for everyday functions. For initial setup information see the *Installer Guide* section (page 6).

User commands can be entered with the supplied infrared remote control, or using the RS232 serial control port. Contact the installer for information on user commands if the RS232 serial port is used.

Remote Control

The infrared remote control is shown below.

Input Aspect Ratio Selection

Power and Standby

Input Aspect Ratio Selection Step

Input Aspect Ratio Selection Step

Image Zoom

Command completion and OSD

Exit/Cancel

Activate Menu

Numeric Entry and Input Selection

Configuration Input Selection

User Commands

Power

Turn power on by pressing **ON**. Place the VisionHDQ in standby-mode by pressing **STBY**.

Input Selection

The ten inputs are numbered 0 to 9. To select an input, press the button (**0** to **9**).

NOTE:

To select an input, the menu must not be active.

Configuration Memory Selection

Each input has four configuration memories. These are referred to as memory "A," "B," "C," and "D." To select memory "A", press **MEMA**. To select memory "B", press **MEMB**. To select memory "C", press **MENU** then **MEMA**. To select memory D, press **MENU** then **MEMB**. Note, RS232 codes are provided to directly access **MEMA**, **MEMB**, **MEMC** and **MEMD**.

When NTSC/PAL auto-selection is enabled (i.e. output mode set to **AUTOIND**), **MEMA** and **MEMC** are linked and used for NTSC and PAL, respectively. In this mode, if **MEMA** or **MEMC** is active, an NTSC source automatically selects **MEMA** and a PAL source automatically selects **MEMC**. **MEMB** and **MEMD** are also linked, with **MEMB** used for NTSC and **MEMD** for PAL.

Each configuration memory is independent of all others. To allow these memories to be used for mode selection (e.g. day/night), the type remains unchanged when a new input is selected. (e.g. if input 2 memory B is active pressing 3 selects input 3 memory B).

Input Aspect Ratio Selection

The four source aspect ratios are: 4:3, letterbox, 16:9, and 1.85. They can be selected by pressing the **4:3**, **LBOX**, **16:9**, or **1.85** buttons, respectively. Use **4:3** for standard full-screen material. Use **LBOX** for "letterbox" material, such as analog-television movies shown with black bars above and below the image. For material labeled as "Enhanced for 16:9 televisions" selecting **16:9** is generally best. However, **1.85** can be used for sources "Enhanced for 16:9 televisions" that have a 1.85 aspect ratio stretched vertically to 16:9.

The **4:3** input aspect ratio mode can also be programmed as a "non-linear stretch" mode so 4:3 sources fill a 16:9 screen. See the *Nonlinear Stretch* section (page 20) for details.

NOTE:

Make sure the "television aspect ratio" setting is 16:9 in the setup menu of all source devices that support this feature (e.g. DVD players), even if your display is not 16:9.

Image Zoom

After the input aspect ratio has been selected, the image can be zoomed in to better fit the screen. The zoom function uses the ⋀ and ⋁ arrow buttons. When the menu is off, the ⋀ arrow button zooms in and the ⋁ arrow button zooms out.

On Screen Display

Pressing **OK** successively, when the menu is off, displays input and output status.

Installer Guide

Installation

Unpack the shipping container. Save the container and packing materials incase they are needed later. Place the VisionHDQ Video Processor on a component shelf and connect as described in the *Rear Panel* section. The cooling vents must be clear of obstructions to provide for convection cooling.

Install two AAA batteries in the remote control.

The following items should be included:

> VisionHDQ Video Processor
> Infrared remote control
> External power supply
> User manual
> License agreement
> Warranty card
> RS232 null-modem cable for updating the VisionHDQ

Front Panel

NOTE:

The front panel LED does NOT stay on by default. To change the LED function to stay illuminated to indicate "power-on," see the "Front Panel LED Function" section (page 26).

The front panel has an light-emitting-diode (LED) indicator, which will flash on to show command activity (default). Alternately, the LED can be programmed by the user to remain illuminated while power is on to serve as a "power-on" indicator. When the LED is set to "activity" it illuminates for a short time after commands are received and then turns off to prevent it from being an unwanted light source in the darkened theater. When the LCD light is set to "power" it stays illuminated as long as the VisionHDQ is on, flashing off briefly when a command is received.

The front panel is shown below.

IR sensor   LED command indicator

Rear Panel

All connections are made on the rear panel, which is shown below.

Connections from left to right

- **POWER**: Connect to the supplied external 5 Volt DC power supply.
- **RS-232**: Connect the supplied external 5 Volt DC at 5 Amp power supply.
- **Analog Video output**: Provides analog RGB or component video output.
- **DVI-I Video output**: Provides digital (DVI-D) video output.
- **INPUT 0** to **INPUT 9**: Standard input connections.
    - Input 0: SDI (Serial-Digital-Interface)
    - Input 1 to 4: DVI-I with HDCP support. Can be DVI-D or DVI-A (VGA)
    - Input 5 and 6: SD/HD Component, RGsB, RGBS, or SCART
    - Input 7: Composite
    - Input 8 and 9: SVideo (SVID) or composite (VID on the Y channel)

RS-232

The RS232 serial port allows the use of an external home theater RS232 controller. This is the same as a PC DB9 serial port, except no "flow-control" is used. For updates, connect to a PC using the supplied DB9-F to DB9-F null-modem cable.

Analog Video Output

The analog output supports RGBHV (default, MENU **012 OK**), RGBS (TTL composite sync, MENU **013 OK**), RGsB (sync-on-green, MENU **014 OK**), or component (MENU **011 OK**), using BNC connectors. For component output the Y channel is connected to green, the P_R channel to red and the P_B channel to blue. Digital output uses a DVI-D connection, which can also drive a HDMI display using a "DVI-D to HDMI" adaptor cable.

Video Inputs

- **Input 0** is a standard-definition Serial-Digital-Interface (SDI) input. If desired this input can be reprogrammed to use the cvS6 input connection as a separate composite video input (MENU $\rightarrow$ **IN** $\rightarrow$ **TYPE** $\rightarrow$ **VID**), replacing the SDI input.

- **Inputs 1 to 4** are DVI-I. These inputs can be independently selected as either DVI-D (MENU $\rightarrow$ **IN** $\rightarrow$ **TYPE** $\rightarrow$ **DVI-D**), or as RGBHV video (MENU $\rightarrow$ **IN** $\rightarrow$ **TYPE** $\rightarrow$ **DVI-A**) on the DVI-A pins of the connector.

- **Inputs 5 and 6** can be component (also called YP_BP_R, MENU $\rightarrow$ **IN** $\rightarrow$ **TYPE** $\rightarrow$ (**HDYPBPR, SDYPBPR**)), RGsB (sync-on-green, MENU $\rightarrow$ **IN** $\rightarrow$ **TYPE** $\rightarrow$ **RGsB),** RGBS **(**TTL composite sync, MENU $\rightarrow$ **IN** $\rightarrow$ **TYPE** $\rightarrow$ **RGBS**), or SCART (MENU $\rightarrow$ **IN** $\rightarrow$ **TYPE** $\rightarrow$ **SCART**). For input 5 in SCART mode, VID7 is used as the cvS input. For RGB formats, the Y channel is used for green, the P_B for blue and P_R for red. cvS6 is composite if Input0 type is set to "VID".

- **Input 7** is composite (or it can be used as composite-sync for SCART mode for input 5).

- **Inputs 8 and** 9 are SVideo, but can be selected as composite (MENU $\rightarrow$ **IN** $\rightarrow$ **TYPE** $\rightarrow$ **VID**).

Command Format

Commands are selected with the supplied infrared remote or the RS232 serial port. To prevent possible command conflict, only one of these methods of command should be used at a time.

The infrared remote control command notation is described below:

- Remote buttons are named as shown on the remote in a bold font.
  Example: **MENU**.
- For comma separated lists, press the buttons in the sequence shown.
- For parenthesized lists, select one button from the list.
- For square-bracketed lists, press the buttons as needed.
  Example: For the list [◄, ►, ▲, ▼], press the arrow keys as needed.
- For menu commands press the **MENU** button. The ▲ and ▼ arrow keys are used to select the function. The ► arrow key (or OK) is used to enter sub-menus. This is shown as: **MENU → MenuItem → MenuItem.** The ◄ arrow key (or **EXIT**) steps up one menu level.
- Numerical entries are listed as *value*. While entering the value, the ◄ arrow key acts as a backspace key.
- Some commands are activated immediately. Other commands must be explicitly accepted by pressing **OK**. If needed, **OK** is listed as part of the command.
- Pressing **EXIT** cancels a partially completed command. If the menu system is active, **EXIT** returns to one level higher in the menu system.
- There are four independent configuration memory types for each input (**MEMA**, **MEMB**, **MEMC** and **MEMD**). The input setup and output resolution/timing can be set independently for each memory. Note that, initially, there is a single output mode for all configuration memories. To program an input memory, first select the input, then select the desired configuration memory and use the menu system to configure.
- Some menu commands are only available when their respective input is selected.
- Before changes are saved, they can be discarded by entering standby mode.
- To prevent unintended configuration changes, before saving, use the lock command.
- Save the configuration after making changes, otherwise the changes will be lost when entering **STBY** mode.

If the serial port is used, the ASCII character associated with the respective remote control button must be sent. See the *Serial RS2323 Command Interface* section (page 28) for information on serial commands.

Initial Setup - Step By Step

The setup sequence for typical configurations is shown below. See the *Command Format* section (page 8) for information on entering commands. Typically, not all commands shown here are needed. Only the most common setup commands and options are shown in this section. See the *Installation Commands* section (page 14) for additional commands and options.

Initial Output/Input Setup:

- Connect video cables as described in the *Rear Panel* section. Then connect power and turn all required components on.

- Select the output type: Skip this step if a DVI-D/HDMI display is connected. If a DVI-D display is connected, DVI-D will be selected by default, otherwise analog RGBHV output is the default. For analog output, the mode can be changed as shown below. For more info see the *Output Configuration* Section (page 14).

    HD YP$_R$P$_B$ tri-level: **MENU 0 1 1 OK**   HD component with embedded tri-level sync
    SD YP$_R$P$_B$ bi-level: **MENU 0 1 5 OK**   SD component with embedded bi-level sync

- Set vertical refresh rate: Skip this step if the output rate is to be 59.94 (U.S.A and some other countries). The default vertical refresh rate is 59.94, but it can be changed to be from 23.98 up to 120 Hertz. The maximum rate varies depending on the resolution.

    MENU 0 4 *value* OK   Value is in hundredths (e.g. 59.94 is **5 9 9 4**)

- Set output resolution: The output resolution defaults to 480p, with 480 active scanlines in progressive format. A different output resolution can be selected using the menu or by direct command. The menu command is:

    MENU ® OUT ® RES ® VRES ® *value* OK

    The direct commands to select output resolution are:
    480p: **MENU 0 2 1**   540p: **MENU 0 2 2**   600p: **MENU 0 2 3**
    720p: **MENU 0 2 4**   768p: **MENU 0 2 5**   840p: **MENU 0 2 6**
    1080p: **MENU 0 2 7**   1080i: **MENU 0 2 8**
    Other: **MENU 0 3 *value* [∨,∧] OK**, where ∨ is interlaced and ∧ is progressive (default).

- For digital displays using the DVI-D input (skip this step for displays using an analog input), it is important to operate the display at their native resolution to achieve a "pixel-perfect" image. This maximizes the Lumagen's video processing advantages by disabling the display's internal processing. Some displays do not support their native resolution as an input, or do not operate in "pixel-perfect" mode even when they are driven at their native resolution. Consult with the display's manufacturer for more information on if the display can achieve a pixel-perfect image.

- Set the horizontal resolution. Skip this step for analog output, or if the default HRES selected by the Lumagen for user selected VRES is correct. The command is:
    MENU ® OUT ® RES ® HRES ® *value* OK

- Some DVI-D/HDMI displays can achieve a "pixel-perfect" image, but require specific pixel timings for all parameters, not just active pixel counts (skip this step for displays using an analog input). Lumagen video processors can accommodate these displays using the TIMING command.

For more information on using this command see the *Exact Output Timing* section (page 16). The command is:

> **MENU ® OUT ® RES ® TIMIING**

• If pixel perfect mode cannot be achieved, adjust overscan. Skip this for analog outputs.

NOTE:

If pixel-perfect mode has been achieved, skip this step,
since these operations may disable pixel-perfect mode.

Adjust size and position to have approximately 0% to 1% overscan, as shown using the Lumagen overscan test pattern. Note that overscan will be adjusted to approximately 2% while adjusting the input configuration.

Select the overscan test pattern with **MENU ® MISC ® TPAT ® OK**. Then use the right arrow to step to the overscan pattern. If the display has output size and position, use them. Otherwise use the Lumagen commands. Lumagen's commands cannot be entered while the Lumagen overscan pattern is displayed, so this method may require some iteration. The commands are:

> Output size: **MENU ® OUT ® RES ® SIZE ®** [◄,►,▼,▲] **OK**
> Output position: **MENU ® OUT ® RES ® POS ®** [◄,►,▼,▲] **OK**

• Set the output aspect ratio to match the screen. Skip this step if the screen aspect ratio is 16:9 (the default). Press "**MENU 0 6 *value* OK**" where "***value***" is the screen aspect ratio in hundredths (4:3 is **MENU 0 6 1 3 3 OK**)

• Set the output level. For DVI-D/HDMI displays it is important to match the display's requirement for this parameter. If unsure, selecting DVI-D as VIDEO output level is safer. Most analog displays work well with either pedestal setting. The commands are:

> For analog: **MENU ® OUT ® LEVL ® PDSTL ®** (**0 IRE**, **7.5 IRE**) **OK**
> For DVI-D: **MENU ® OUT ® LEVL ® DVILVL ®** (**VIDEO**, **PC**) **OK**

• Select the input type for the DVI-I inputs 1 through 4. Skip this step if input is DVI-D. DVI-D inputs can also be selected to accept the 4:4:4 or 4:2:2 HDMI input format. Select desired input, then press

> M**ENU ® IN ® TYPE ®** (**DVI-D, 4:4:4, 4:2:2**, **DVI-A**), **OK**

• Select the input type for the component/RGB inputs 5 and 6. Skip this step if input 5 and 6 are component and use the correct color-space. Note SD component inputs always use the SD color space. The SD/HD selection for YPbPr only applies to HD input resolutions. Select desired input, then press

> **MENU ® IN ® TYPE ®** (**SDYPBPR**, **HDYPBPR**, **RGBS**, **RGsB, SCART**), **OK**

• Set the video input levels. If unsure, selecting 0 IRE for analog, and PC input levels for DVI-D, is safer. The commands are:

> For analog inputs: MENU → **IN** → **CONFIG** → **ADJ** → **LEVL** → (**0 IRE**, **7.5 IRE**) OK
> For DVI-D inputs: MENU → **IN** → **CONFIG** → **ADJ** → **LEVL** → (**VIDEO**, **PC**) OK

Output Calibration:

- The interface between the Lumagen and display should be calibrated first. This is best accomplished using the internal Lumagen test patterns to assure that any variance in a source (either size or levels) does not affect the calibration. Later, differences between inputs can be calibrated using the source devices. If grayscale is to be calibrated, a base line calibration should also be done after setting black and white levels.

- To calibrate the black and white levels, select the Lumagen contrast test pattern (**MENU ® MISC ® TPAT ® OK**), then use the left-arrow key to select the contrast test pattern. This pattern has two white rectangles and two black rectangles. In the dark areas, there are two vertical bars – One at 4 IRE and one at –4 IRE. The white area has two vertical bars – one at 96 IRE and one at 104 IRE. Note that 0 IRE is reference black and 100 IRE is reference white. Since –4 and 104 are outside the nominal black to white range, not all displays will show these levels.

  First adjust the display's black level using the brightness control. Adjust so that the 4 IRE bar is barely visible against the black background (0 IRE). There should be no visible difference between the black background areas and the –4 IRE bar. This is a secondary indication verses the 4 IRE bar, but can be useful in optimizing the black level in displays that support blacker-than-black.

  Next adjust the white level using the display's contrast control. Adjust so that the 96 IRE bar is barely visible against the white (100 IRE) background. If a display supports whiter-than-white, the 104 IRE bar may be visible. This is not a requirement, but does show that there is some additional headroom above white.

  If either or both the 4 IRE and/or 96 IRE bars cannot be seen after adjusting the controls, recheck that the appropriate output level has been selected.

- Grayscale and gamma should be calibrated at this point. Calibrating these parameters is an essential part of the video calibration process. However, a trained technician using the appropriate equipment must calibrate grayscale and gamma.

  Grayscale calibration adjusts the "color of gray" so that the color "gray" adheres to the industry standard D6500 point, at all levels from black to white. Most HDTVs, and projectors, are intentionally miss-calibrated to maximize their brightness for the showroom. This calibration step is necessary to correct this error, so the image appears as the producers intended.

  Gamma is the response curve between black and white and also has an industry defined standard that should be followed. Lumagen has developed a unique 11-point parametric grayscale/gamma calibration feature, which allows both grayscale and gamma to be optimized over the entire range from black to white, and not just at one or two points.

  Lumagen strongly suggests that a qualified video technician be hired to do grayscale and gamma calibration. A technician with the proper training and equipment must do the grayscale/gamma calibration. Contact Lumagen for the service codes necessary to use the grayscale and gamma calibration features.

- After completing the output calibration, copy the results to all configuration memories using the following command:

  MENU ® IN ® COPY ® ALL ® OK

- It is a good idea to save the configuration before proceeding. Use the SAVE command as shown below:

  MENU ® SAVE ® SAVE ® OK

Input Calibration:

- Each input source should be calibrated, starting with the DVD. The Lumagen provides four independent input configuration memories for each input. So, calibration for each input is independent of the other inputs and multiple independent calibrations can be done for each input. One use for the multiple calibrations for each input is to calibrate MEMA for day and MEMB for night viewing. Typically the DVD input is calibrated first, using a DVD calibration disc. Then the results of the DVD calibration are copied to all input memories as a reference starting point for the other sources.

- Play a DVD calibration disc and select it as the input source. AVIA® test patterns are referenced here, but Digital Video Essentials® is also excellent.

- Select Lumagen input aspect ratio as **16:9** for a 16:9 screen, or **4:3** for a 4:3 screen. This is necessary to properly set the overscan.

- Select *Advanced AVIA → Video Test Patterns → Special Tests → Overscan*.

- Adjust the input size and position. This selects which pixels are captured. The corner being adjusted is moved toward the center to make it easy to calibrate. If the corner being adjusted cannot be seen on-screen, go back to the *Initial Output/Input Setup* section and correct the output size, then come back to this step. Adjust the top-left corner of the image first. Then adjust the bottom-right corner.
  Input top-left: **MENU® IN® CONFIG® ADJ® SIZE® TOPL®** [◄,►,∨,▲] **OK**
  Input bottom-right**: MENU® IN® CONFIG® ADJ ® SIZE® BTMR** →[◄,►,∨,▲] **OK**

- Select *Advanced AVIA → Video Test Patterns → Gray Scale & Levels → Black and White Levels → Needle Pulses*.

- Set the black level. Follow *AVIA* instructions for setting the black level. Since the Lumagen-to-display levels were set above in the *Output Calibration* section, the Lumagen internal *Black* level control should be used. It is recommended that the black frame with two moving bars (2 and 4 IRE) be used for setting black level. The reason is that the black level varies with the average intensity on the screen for a lot of displays and the black level is most critical in dark scenes. The command is:
  MENU ® IN ® CONFIG ® COLR ® BLCK ® [▲,∨] OK

- Set the white level. Follow *AVIA* instructions for setting the white level (often called contrast). Since the Lumagen-to-display levels were set above in the *Output Calibration* section, the Lumagen internal *Contrast* control should be used. The command is:
  MENU ® IN ® CONFIG ® COLR ® CONT ® [▲,∨] OK

- Select *Advanced AVIA → Video Test Patterns → Color → Standard Colorbars*.

- Set Color and Hue and then the Color and Hue offsets for red and green. Set the display's Color and Hue to default before performing this calibration step. Follow instructions on the AVIA disc for the color bar images. First set Color and Hue using the AVIA blue colorbar pattern and the blue filter. Next set the red color (COLRED) and Hue (HUERED) offsets using the red

colorbar pattern and the red filter. Finally set the green color (COLGRN) and Hue (HUEGRN) offsets using the green colorbar pattern and the green filter.

> **MENU ® IN ® CONFIG ® COLR ® COLR ®**
> **(COLR, HUE, COLRED, HUERED, COLGRN, HUEGRN) ® [◄, ►, ▼, ▲] OK**

- Select *Advanced AVIA → Video Test Patterns → Special Tests → Y/C-Delay.*

- Set Y/C Delay. Use the Lumagen Control to minimize the error in the blue and red timing verses Luma. On the right part of the screen there are red bars on a yellow background. Adjust to balance any color transition errors on the left and right edges of the red bars. The C_B and C_R channels are calibrated independently.

> **MENU ® IN ® CONFIG ® ADJ ® YC-DLY ® (CBCR, CB, CR) → [◄, ►, ▼, ▲] OK**

- Copy the DVD configuration to all configuration memories (**MENU ® IN ® COPY ® OK**).

- If desired, change to MEMB and calibrate for a different amount of room light. Then switch back to MEMA, and again copy the DVD configuration to all configuration memories.

- Calibrate the other inputs.

- Name the inputs, if desired (**MENU ® CONFIG ® IN ® NAME ® OK** and follow directions).

- Set power-on message, if desired (**MENU ® MISC ® POWR ® MSG** → **[◄, ►, ▼, ▲] OK**)

- Lock the configuration, if desired (**MENU ® MISC ® LOCK ® LOCKED OK**)

- *SAVE THE CONFIGURATION* (**MENU ® SAVE ® SAVE OK**)

Installation Commands

See the *Command Format* section (page 8) for a description of the installation command interface.

Output Configuration

The factory-default is 480p at 59.94 Hertz, with a 1.78 (16:9) aspect ratio. For analog output, the default mode is RGBH-V-. See the *Selecting the Output Resolution* section (page 33) for more information on which output resolution to use. If more than a single output resolution is required, see the *Multiple Output Mode* section (page 34).

NOTE:
If the analog output is enabled, it is turned off for HDCP encrypted sources.

Display Type

By default (*Auto*), if a DVI-D display is detected, DVI-D output is enabled and analog output is disabled. If no DVI-D display is detected, analog RGBHV output is enabled and DVI-D is disabled. The output can also be manually selected. If both DVI-D and analog are enabled, the analog output must be one of the RGB types. The commands are:

Auto:	**MENU 0 9 3 2 1**	Output DVI-D only, if detected, else analog only
DVI-D only:	**MENU 0 9 3 2 2**	DVI-D only, even if DVI-D is not detected
Analog only:	**MENU 0 9 3 2 3**	Analog only, even if DVI-D is detected
Both:	**MENU 0 9 3 2 4**	Output DVI-D and analog RGB

The following commands select the output color-space and synchronization type for the analog output. The selection takes effect immediately. The arrow buttons are then active and have immediate effect. If no arrow buttons are pressed the default mode is used. Press the OK button when done to prevent the arrow buttons from continuing to change the sync type.

RGBHV: **MENU 0 1 2 [⌄,⌃] [◄, ►] OK**
    ⌄ sets both H and V sync as negative (default)
    ⌃ sets both H and V sync as positive.
    ◄ sets negative H sync. If needed, select after the ⌄ or ⌃ button.
    ► sets positive H sync. If needed, select after the ⌄ or ⌃ button.

RGBS: **MENU 0 1 3 [⌄,⌃] OK**
    ⌄ sets negative composite sync (default)
    ⌃ sets positive composite sync

RGsB: **MENU 0 1 4 [⌄,⌃] OK**
    ⌄ sets embedded bi-level sync
    ⌃ sets embedded tri-level sync (default)

HD color-space YP_RP_B: **MENU 0 1 1 [⌄,⌃] OK**
    ⌄ sets embedded bi-level sync
    ⌃ sets embedded tri-level sync (default)

SD color-space YP_RP_B: **MENU 0 1 5 [⌄,⌃] OK**
    ⌄ sets embedded bi-level sync (default)
    ⌃ sets embedded tri-level sync

Vertical Output Resolution - Presets

Select one of the preset output vertical resolutions. The only interlaced format supported is 1080i. The command format for each resolution is:

480p:	**MENU 0 2 1 OK**	540p:	**MENU 0 2 2 OK**	600p:	**MENU 0 2 3 OK**
720p:	**MENU 0 2 4 OK**	768p:	**MENU 0 2 5 OK**	840p:	**MENU 0 2 6 OK**
1080p:	**MENU 0 2 7 OK**	1080i:	**MENU 0 2 8 OK**		

Vertical Output Resolution - Programmable

Manually set the output vertical resolution from 480p to 1080p, in scanline increments. To select between 1080i, 1080p, 1080p24sF and 1080p24; enter a vertical resolution of 1080 lines and then use the arrow buttons to selected the correct format. 1080p output also allows the choice between two modes. MODEA follows the SMPTE standard. MODE B is required for some 1080p devices, such as the JVC® HD2K® projector. Out of range values are ignored. The command format is:

> **MENU 0 3 *value* OK**
> or **MENU ® OUT ® RES ® VRES ® *value*, [∨,∧] OK**

Vertical Output Refresh Rate

Set the vertical refresh rate. The range is 23.98 (DVI-D), to 120 Hertz in hundredths (e.g. 75.00 is entered as **7 5 0 0**). The maximum refresh rate depends on the output resolution. For DVI-D Segmented-Frame (sF) output format, select 1080 lines and then select 24sF (or 25 sF). Out-of-range values are ignored. The command format is:

> **MENU 0 4 *value* OK**
> or **MENU ® OUT ® RES ® VRATE ® value OK**

Horizontal Resolution for DVI Output

For DVI-D output, use this command to set the active horizontal resolution if the HRES selected by the Lumagen does not match the display. The command format is:

> **MENU 0 7 *value* OK**
> or **MENU ® OUT ® RES ® HRES ® *value* OK**

Horizontal Refresh Rate for Analog Output

NOTE: Generally this command should <u>not</u> be used.

Set the analog output horizontal refresh rate in Hertz. The vertical total scanline count is adjusted to achieve the specified horizontal frequency, if possible. The active vertical resolution is **not** changed. Out-of-range values are ignored. The command format is:

> **MENU 0 5 *value* OK**
> or **MENU ® OUT ® RES ® HRATE ® *value* OK**

Exact Output Timing

The *Timing* command sets output timing in pixel increments. This command can be selected using the menu or with a direct command. The menu command screen is:

MENU ® OUT ® RES ® TIMING

To directly select press: MENU 0 9 4 3. An example screen for 480p is shown below:

0	VTOT	525	4	HTOT	858
1	VRES	480	5	HRES	720
2	VSYN	5	6	HSYN	54
3	VFRN	5	7	HFRN	15
8	VRATE	59.94	9	EXECUTE	

To program the pixel timing, first enter the single-digit (0-8) for a parameter to change. This will bring up a sub-menu where the desired value can be entered. Select the value and press **OK**. Continue setting all parameters that need to be changed. The changes do not take effect until option **9** (**EXECUTE**) is selected. This updates the hardware timing, and gives the user 15 seconds to accept the changes. If the accept-screen times out, or if the user presses **EXIT** while it is active, the output timing reverts to the old timing and the *Timing* command screen is once again displayed without the changes.

The parameters entered are for vertical (V) or horizontal (H), for the total pixel count (TOT), the active pixel count (RES), the sync-pulse duration (SYN), or the front porch (FRN). Note the front-porch is the time after active video and before the sync pulse. The back-porch timing is automatically calculated. The vertical rate (VRATE) can also be set.

Output Size
Change scale of the image with respect to the active output. The command format is:

MENU ® OUT ® RES ® SIZE ® [◄, ►, ▼, ▲] OK
or **MENU 0 9 4 1 [◄, ►, ▼, ▲] OK**

Output Position
Position the image with respect to the active output. The command format is:

MENU ® OUT ® RES ® POS ® [◄, ►, ▼, ▲] OK
or **MENU 0 9 4 2 [◄, ►, ▼, ▲] OK**

Screen Aspect Ratio
Select the screen aspect ratio. The screen aspect ratio range is 1.33 (4:3) to 2.35 and is entered in units of hundredths (e.g. 16:9 is entered as 1 7 8). The command format is:

MENU 0 6 *value* OK
or **MENU ® OUT ® ASPECT ® *value* OK**

Graybar Intensity
NOTE:

Consult a home theater specialist for assistance setting the graybar intensity.

Some degree of burn-in will occur on any susceptible display, but this command can help minimize it by allowing the intensity of graybars to be adjusted. The command format is:

MENU ® OUT ® GBAR ® SIDE ® [▼, ▲] OK

Output Level

For analog output, specify black pedestal as 0 IRE (PC) or 7.5 IRE (Video). Typically this is set to 0 IRE for fixed-pixel displays, and 7.5 IRE for CRT displays. For DVI-D output, set levels as *video* (allows blacker-than-black and whiter-than-white) or *PC* (full-range black to white). If unsure, use 7.5 IRE for analog and PC levels for DVI-D. The commands are:

> For analog: **MENU ® OUT ® LEVL ® PDSTL ®** (**0 IRE**, **7.5 IRE**) **OK**
> For DVI-D: **MENU ® OUT ® LEVL ® DVILVL ®** (**VIDEO**, **PC**) **OK**

Shrink

The "shrink" command allows you to bring in any edge of the picture, thus shrinking the picture either horizontally or vertically. The "shrink" parameters are part of an output configuration. The main use of the shrink command is to shrink the picture to fit in the display and when using masking systems.

Many displays overscan their picture which results in some of the picture being cut off at the edges of the screen. For CRT type displays and some digital displays this can be corrected using the **OUT® RES® SIZE** and **POS** (position) commands. The SIZE and POS commands shrink the picture by adjusting the display timings. Unfortunately many digital displays do not allow the picture to be resized in this manner and that is where the SHRINK command comes in. The SHRINK command can achieve the same result when trying to eliminate overscan in digital displays as the SIZE and POS commands and does not alter the display timing. The command format is:

> **MENU ® OUT ® MISC ® SHRINK ® OK®** (**T, L, B , R**) **OK**

NOTE:

When calibrating overscan you should check the picture overscan with Lumagen's overscan test pattern (under MISC->TPAT->PATS).

Sync

The "sync" command allows you to set the polarity for the horizontal and vertical sync. The command format is:

> **MENU ® OUT ® MISC ® SYNC ® OK®** (**H+V+, H+V-, H-V+, H-V-**) **OK**

Output Mode

When set to factory-defaults, there is a single output configuration for all input memories. If the output mode is set to one of the two independent modes (**INDEP** or **AUTOIND**) each input memory can select the eight (0 to 7) independent output configurations. For SD inputs you can choose one output configuration. For HD inputs you can up to four output resolutions, one for each input resolution. The command to set the output mode is:

> **MENU ® OUT ® MODE ®** (**SAME**, **INDEP**, **AUTOIND**) **OK**

NOTE:

After changing to an independent output mode, all memories use output mode 0. To change an output configuration, the appropriate input and input memory must be selected, Then, the output configuration number must be selected using

the input menu's OUTSEL command. Changes to the output timing will affect the selected output configuration.

When NTSC/PAL auto-selection is enabled (**AUTOIND**), **MEMA** is linked to **MEMC** and **MEMB** is linked to **MEMD**. If **MEMA** is active, a NTSC source automatically selects **MEMA** and a PAL source automatically selects **MEMC**. If **MEMB** is active, a NTSC source automatically selects **MEMB** and a PAL source automatically selects **MEMD**.

Horizontal Sync Pulse Width

NOTE:

Generally this command should <u>not</u> be used.

Some displays require a narrower horizontal sync pulse than standard SMPTE timing. This command allows the HSync pulse width to be controlled. The command format is:

> **MENU 0 9 4 0 ® [◄, ►] OK**

Copy Output Settings

NOTE: This command is only visible if an independent output mode is selected.

For independent modes (**INDEP**, or **AUTOIND**), this command copies the current output configuration to the selected configuration or configurations. The command format is:

> **MENU ® OUT ® COPY® (ALL, 0 – 7) OK**

Input Configuration

After the output is configured and calibrated, calibrate the DVD input. Copy that configuration to all the other configuration memories (see the *Copy Input Settings* section on page 24). Then calibrate the other inputs. To program one of the independent input memories, select the input, then select the configuration memory and use the menu to configure the input. For example; if memory *A* for an input is to be the same as memory *B* for that same input, the input configuration must be copied from one to the other.

Component/RGB Input Type Selection

The source type must be programmed for the component/RGB inputs (3 and 4). Select the input then program its type. For component input mode, you can select either standard-definition (SD) or high-definition (HD) color-space. The command format is:

> **MENU ® IN ® TYPE ® (SDYPBPR, HDYPBPR, RGBHV, RGBS, RGsB) OK**

NOTE:

For SD resolutions on the component inputs; the SD color space is always used, regardless of the setting for either SDYPBPR or HDYPBPR. The HDYPBPR mode is only used for sources that upscale SD material to HD but fail to properly convert the color space to match the HD standard.

The analog-to-digital converter for these inputs is calibrated at the factory. However, since source levels vary, these inputs should be calibrated with the intended source device to achieve optimal performance. If the source is capable of displaying a 100 IRE Window Pattern, use the "*Calibrate Component/RGB Input*" command to calibrate the input.

Standard Definition Input Type Selection

Inputs 8 and 9 are SVideo, but can be programmed to use the Y-channel of the connector as a composite input. Input 0 can also be programmed as a composite input. In this case cvS6 is used as a composite input (the SDI input is disabled). The command format is:

> **MENU ® IN ® TYPE ®** (**VID**, **SVID**) **OK**

Linking an Input Memory to an Output Configuration

NOTE:

See the Multiple Output Mode section (page 34)
for information on using output configurations.

If the output mode is set to independent (**INDEP** or **AUTOIND**), each SD input memory uses one of the eight independent output configurations. For HD capable inputs, each memory has four resolution "sub-memories" (PC, 480i/480p (or 576i/576p), 720p, 1080i). The PC memory is used for any other single input resolution For these HD inputs, when *Multiple-Output-Mode* is enabled, the output-configuration numbers for each of these is listed as four numbers separated by a "/" in the order shown above. The output-configuration number for each sub-memory must be set independently, but all submemory selections can be set independent of which input submemory is active.

First select the desired input memory. Then use this command to select the desired output configuration. The command is:

> **MENU ® IN ® OUTSEL ®** (**0 – 7**) **OK**

Black and White Levels

To set the black-level (also referred to as brightness) and white-level (also referred to as contrast) using the Lumagen controls, select the needle pattern in *AVIA* (*Advanced AVIA → Video Test Patterns → Gray Scale & Levels → Black and White Levels → Needle Pulses*). Follow the instructions on the *AVIA* disk. The command format is:

> **MENU ® IN ® CONFIG ® COLR ®** (**BLCK**, **CONT**) → [▲,▼] **OK**

Color and Hue

NOTE:

Set the display's Color and Hue to their default values.

Use the *Advanced AVIA* color test pattern to set Color and Hue (*Advanced AVIA → Video Test Patterns → Color*). Follow instructions on the *AVIA* disc. Calibrate using the blue color bars and blue filter (**COLR** and **HUE**). Then calibrate using the red color bar image and red filter (**COLRED** for **HUERED**), and then the green color bar image and green filter (**COLGRN** and **HUEGRN**).

If an RGB (analog or DVI) output mode is used to drive the display, and if the display uses RGB color-space through its entire data path, enter the Lumagen service mode. This will disable the two primaries not being adjusted, which eliminates the need to use the color filters for this adjustment. If it is uncertain whether the display has an all RGB data path, leave the Lumagen in user-mode and use the filters. The command format is:

> **MENU ® IN ® CONFIG ® COLR ® COLR ®**
> (**COLR**, **HUE**, **COLRED**, **HUERED**, **COLGRN**, **HUEGRN**) → [◄, ►, ▼, ▲] **OK**

Chroma-Upsample-Error Correction

Some digital video sources, such as some DVD players, have an error in design that affects the Chroma video quality. The CUE filter can be enabled to mitigate this error. For high quality sources that do not have the CUE artifact, disabling the CUE filter may increase Chroma resolution. The CUE filter is on by default. The command format is:

MENU ® IN ® CONFIG ® COLR ® CUE ® (**ON, OFF**) **OK**

Color-Temperature and Gamma Calibration

Lumagen video processors can correct the color-of-gray (also called grayscale, color-temperature or white-balance) and gamma using the internal 2, 5, or 11 point parametric grayscale calibration function. This adjustment requires the appropriate test equipment and training, so has been put in the service menu. Contact Lumagen for details.

Input Sizing

Input sizing can be used to compensate for active image size differences in the source. Note; the input size command does **not** affect the output size or position. Rather, it affects which input pixels are captured for processing.

Use the **TOPL** command to select the top left most active input pixel. Use the **BTMR** command to select the bottom right most active pixel. For these commands, the active corner is temporarily moved toward the center of the screen. Select the scanline using the ⌃ and ⌄ arrows, and the pixel using the ◄ and ► arrows. The command format is:

MENU ® IN ® CONFIG ® ADJ ® SIZE ® (**TOPL**, **BTMR**) **® [◄, ►, ⌄, ⌃] OK**

Mask

The mask command allows you to cover up the sides of the video source. It is different then cropping in that the video is not stretched to fill the screen. It can be useful for pass-through modes where you do not wish the video processor to scale the picture but there is some video noise on side(s) of the picture you wish to cover up. Another situation may be that you wish to cover up the letterbox gray from a DVD player with black instead.

When you select the command you must first select which mask # you wish to use. There are 15 available. They can be shared among different input memories. The number of times each mask has been used is displayed as "# USES". This allows you to decide to use an unused mask or share a previously set up mask. After selecting the MASK # you then can adjust how much the mask covers of the 4 sides of the input. Use the left/right arrows to select the edge you're adjusting and the up/down arrows to adjust the amount of masking. The last step is to alter the gray level for the 4 sides. Note that the gray level for masks is overridden if aspect bars are present by the gray level setting of the aspect bar (aspect bar colors can be adjusted under OUT->MISC->GBAR). Also, if aspect bars are requested (via differing input and output aspects) the masking is added to the aspect bar width. The command format is:

MENU ® IN ® CONFIG ® ADJ ® SIZE® MASK® (**OFF, 0 ... 15**) **OK**

Non-linear Stretch

Non-linear-stretch (NLS) is used to horizontally stretch a 4:3 aspect ratio source to fit a display that has a wider aspect, such as 16:9. The image is stretched by a constant amount in the center and by an increasing amount approaching the left and right edges. This eliminates the black sidebars normally seen when viewing 4:3 material on a 16:9 display.

The goal is to stretch the image to fill the screen in a way that looks as natural as possible. The Lumagen NLS command is very flexible and allows the image to be adjusted to user preferences to achieve this goal. The NLS adjustments are center width, center stretch, top cropping and bottom cropping. The center section of the image is stretched by a constant amount from 0 to 24% (CENTER STR%). The width of the center section can be set from 15% to 75% (CENTER SIZ%). By programming the center section width and stretch amount, the amount of non-linear stretch in the left and right sections can be optimized. In addition, the top (CROP TOP%) and bottom (CROP BTM%) cropping can be set from 0 to 12%. Increasing the amount of cropping reduces the amount of stretch near the left and right edges of the image. When setting the cropping parameters, it is recommended that the satellite/cable box menu be checked to assure that critical parameters remain visible.

The NLS feature is off by default, and must be enabled before any of its parameters can be changed. Also, it is only active when the input aspect ratio is set to 4:3. The command reports the NLS status as "OFF," "NLS1", "NLS2" or "USER" mode. It is recommended that NLS2 be used as a starting point before setting user preferences. After selecting NLS2 or NLS1, changes to any parameter automatically selects USER mode.

Some 4:3 sources fill the entire source image (e.g. DVD 16:9 movies), but other sources place a 4:3 image in the center of a 16:9 image (e.g. HDTV with up-scaled SD source). This latter case is seen as a "pillar-boxed" image with black bars on the left and right. The "PILLARBOXED" parameter must be enabled for this case. The Lumagen will then crop the pillbox bars and stretch the active 4:3 image.

When enabled, the NLS command is only active when the 4:3 input source aspect ratio is selected. Since it is often desirable to view a 4:3 source as transmitted, without stretching it; the NLS command allows either the 1.85 (or LBOX), input aspect ratio button to be reprogrammed to turn off NLS (using the "NLS OFF BTN" parameter). This is global to all configuration memories which have NLS enabled. Note, the 1.85 (or LBOX), source aspect button still selects the respective input aspect ratio for configuration memories that have NLS disabled. When this feature is enabled, a 1.85 (or LBOX), source aspect ratio can still be selected using the left and right arrows buttons to step through the aspect ratios while the menu is not visible on the screen.

When NLS is enabled, the image will fill the screen with the 4:3 (1.33) source for any output aspect ratio up to 1.85. If the output aspect ratio is greater than 1.85, software limits the maximum width to the equivalent of 1.78 and adds left and right sidebars.

Select the parameter to adjust using the ⋀ and ⋁ arrows, and change the value of the selected parameter using the ◄ and ► arrows. The command format is:

MENU ® IN ® CONFIG ® ADJ ® SIZE ® NLS ® [◄, ►, ⋁, ⋀] OK

Pass-Through mode

The source image is scaled by default, even if the input and output resolution match (i.e. 1080i in and 1080i out). The SCALE command allows scaling to be disabled if the input and output resolutions match. Note that since the general case is to have a single output resolution that matches the native resolution of the display, any source input resolution that does not match the output resolution is still scaled.

MENU ® IN ® CONFIG ® ADJ ® SIZE ® SCALE ® (NORM, PASS) OK

Y/C Delay

Adjust the horizontal Chroma timing in relation to Luma. It is suggested that you use the Y/C-delay calibration image from the *Special Tests* section of *Advanced AVIA*, to calibrate the Y/C-delay. The C_B and C_R channels are adjusted separately.

> **MENU ® IN ® CONFIG ® ADJ ® YC-DLY ® [◄, ➤, ▼, ▲] OK**

Sharpness

This command is used to adjust the sharpness for all inputs It is generally best to leave this at the factory default setting. The command format is:

> **MENU ® IN ® CONFIG ® ADJ ® SHARP ® [◄, ➤] OK**

Input Level

This command specifies if an analog input has a black pedestal, and if DVI inputs use video levels or PC levels. I you are unsure, it is better to leave these at 0 IRE for analog, or PC level for DVI-D. The analog command format is:

> **MENU ® IN ® CONFIG ® ADJ ® LEVL ® (7.5 IRE, 0 IRE) OK**

The DVI input command format is:

> **MENU ® IN ® CONFIG ® ADJ ® LEVL ® (VIDEO, PC) OK**

Input Name

Each input configuration memory can be named. Follow the on-screen directions. The ◄ and ➤ arrows select which input to change and then which character to change. The ▲ and ▼ arrows change the selected character. The command format is:

> **MENU ® IN ® CONFIG ® NAME**

Select Deinterlacing Mode

The default deinterlacing mode, for both SD and HD material, is to automatically detect film or video source material and deinterlace accordingly. Since this can never be a perfect detection, the Lumagen processor allows the user to force deinterlacing to assume the source material is video. For SD material the choices are AUTO1, AUTO2, Video and FILM. For HD the choices are AUTO1, AUTO2, VIDPP and VIDNC. The AUTO2 mode is similar to AUTO1 but will more quickly switch to video mode and can be better suited if the source tends to have more video material than film.

The HD VIDPP mode uses a "per-pixel" motion adaptive deinterlacing algorithm (as used for SD deinterlacing), and the VIDNC uses a scaling deinterlacing method. While the VIDPP mode generally provides the best image, the Lumagen will not comb in VIDNC mode, and so VIDNC is sometimes preferable.

The deinterlacing mode command format for SD inputs is:

> **MENU® IN® CONFIG® CNTRL® DEINT® MODE® (AUTO1,AUTO2,VIDEO,FILM) OK**

For HD inputs, the mode for SD and HD sources are selected independently. The SD portion is the same as for SD only inputs. The HD selection command is:

> **MENU® IN® CONFIG® CNTRL® DEINT® MODE® (AUTO1,AUTO2,VIDPP,VIDNC) OK**

Flip Input Field

Some source devices do not follow conventions for the order of video fields. This can be seen as excessive combing in the video. While it's generally not required, this command allows the input fields to be swapped so that the images can be properly deinterlaced. The command format is:

MENU ® IN ® CONFIG ® CNTRL ® DEINT ® FIELD ® (NORM, FLIP) OK

Genlock

Genlock is the ability to exactly lock the output rate to the input rate, or to a multiple of the input rate.

For a typical system with an NTSC source (nominally 59.94 Hz) and outputting a 59.94 Hz rate to the display, the clocks of the NTSC source and the Lumagen will never match exactly. Because of this very slight mismatch, there will be a dropped (or doubled) frame once every few minutes. When genlock is enabled, the Lumagen output clock is varied slightly to keep its output rate locked to the input rate. This avoids any dropped/doubled frames. This may not be observable by most users, but genlock corrects this issue for users who are sensitive to it. Another benefit of using genlock is that it slightly reduces the video delay (aka lip-sync delay) going through the video processor. It also makes the delay constant through the Lumagen. When genlock is off, the delay varies over time by about one field time.

To check the genlock status, press the OK button on the remote several times until the genlock status is visible. This must be done when no onscreen menu is present. Possible states are OFF, DISABLED, LOCKING and LOCKED. Genlock is disabled if the output is not an appropriate multiple of the input. For NTSC, genlock is able to lock output rates of 24sF (actually 23.976Hz), 47.95Hz, 59.94Hz, or 71.93 Hz. For PAL sources, 50 Hz and 75 Hz outputs can achieve lock.

Genlock can be enabled/disabled on a per-input memory basis. The command format is:

MENU ® IN ® CONFIG ® CNTRL ® GENLOCK ® (YES, NO) OK

DVI input HDCP Capability Setting

Some DVI sources limit functionality when driving HDCP capable devices by disabling analog outputs on the source, even though the analog outputs do not require HDCP capability. This command can disable reporting HDCP capability for the current DVI input memory.

NOTE:

When HDCP capability is disabled, HDCP encrypted sources are not displayed.

MENU ® IN ® CONFIG ® DVI ® HDCP ® (YES, NO) OK

DVI input EDID Display Information

EDID is information that can be read over DVI/HDMI cables to influence how source devices send video over the HDMI/DVI cable and this can then result in a better picture. Enabling this feature does not guarantee the source will use the EDID. There are 5 basic settings for the Lumagen EDID interface. The OFF setting means the source plugged into the Lumagen DVI input will see no info when it tries to read the EDID. With the PASS setting the Lumagen will read the EDID from the display and pass that back to the source. The DFLT setting enables some basic display modes such as 480p, 720 and 1080i. The DFLT+EXT mode enables all of the display modes currently available and disables advertising the 422 and 444 YCbCr mode. The USER setting allows the user to individually select which capabilities will be advertised to the connected source. You can scroll through the list of capabilities with the up/down arrows and toggle advertising the feature with the left/right arrows. Press "ok" when done. The command format is:

MENU® IN® CONFIG® DVI® EDID® (**USER, DFLT+EXT, DFLT, PASS, OFF**) **OK**

NOTE:

After you change the EDID information, many sources require you to cycle power on the source or unplug the DVI cable to get the source to re-read the EDID.

DVI input Hotplug Mode

Each Lumagen DVI input sends a signal (Hotplug) back to the DVI source to inform the source to drive its DVI output. However, some sources behave differently to the *Hotplug* signal. This command selects how the Lumagen DVI input *Hotplug* signal functions. The **NORM** option asserts *Hotplug* only when the respective Lumagen input is selected. The **ON** option always asserts the *Hotplug* signal, at all times, while the Lumagen is turned on. Typically, **NORM** is used to connect to an HDCP encrypted source and **ON** is used to connect to a PC.

MENU ® IN ® CONFIG ® DVI ® HOTPLG ® (**NORM, ON**) **OK**

Serial-Digital-Interface Video Input

The Serial-Digital-Interface provides a digital connection for a DVD, or other source, that is equipped with an SDI output. The setup is similar to other inputs, except SDI does not require some of the setup controls that are needed for other inputs. The SDI input is set for a default cable length of ≤10 meters. If a longer cable is used, enable the SDI cable equalization as follows:

MENU 0 9 7 4   Toggle SDI cable equalization (default is off)

Copy Input Settings

Copy the input setup (contrast, etc.) from the active memory, to the selected memory or memories. Copying the first input memory calibrated to other input memories can speed up the calibration process. Note that copying a SD input to a HD input, copies the SD memory to (only) the SD submemory of the HD input. The HD submemories for the PC, 720p and 1080i resolutions are not changed. Copying a HD input memory to a SD input memory copies the SD submemory of the HD input to the SD memory. Copying a HD input memory to another HD input memory copies both the SD submemory and the HD submemory to the other HD input memory.

The input memory copy command can copy all memory parameters (COPY -> ALL), or just the color (COLR) menu (COPY -> COLOR) parameters. This later function is useful when color and grayscale are calibrated after the geometry calibration has already been completed for each input. The color parameters are black, contrast, color, Hue, color offsets, Hue offsets, and grayscale. The command format is:

MENU® IN® COPY® (**ALL, COLOR**) **®** (**ALL, ALLMEMA – ALLMEMD, 1A – 0D**) **OK**

Miscellaneous Commands

Calibrate Component/RGB inputs (5 and 6)

Input 5 and 6 use a high-quality fixed-gain analog-to-digital converter. Because of this, variations between different sources should be taken into account. This command can calibrate the analog-to-digital converter for component/RGB inputs and compensate for differences in source levels. Select the input (5 or 6) to be calibrated and the input type. Display a 100-IRE "Window" test pattern and enter the command. The command format is:

      MENU 0 9 6 6   Calibrate active input using a 100-IRE Window Pattern.

On-Screen-Display Enable

Enable or disable On-Screen-Display (OSD) activation after user commands. If enabled, the OSD shows the selected input, input aspect ratio, and zoom. The command format is:

      MENU ® MISC ® OSD ® (**OFF**, **ON**) **OK**

Initial Power State

When power is first connected, the unit can be set to turn on (**ON**), or it can be set to start in standby mode (**STBY**). The command format is:

      MENU ® MISC ® POWR ® AUTO ® (**ON**, **STBY**) **OK**

Power-On On-Screen Message

Change power-on message. The ◄ and ► arrows select which character to change. The ▲ and ▼ arrows change the selected character. The command format is:

      MENU ® MISC ® POWR ® MSG ® [◄, ►, ▼, ▲] **OK**

Power-On and Power-Off RS232 Output Message

Change the power-on, or power-off, message to transmit on the RS232 serial port. Each message can be up to 40 ASCII characters long. When either the power-on or power-off serial output message is enabled, the default RS232 command echo is disabled.

The message being edited can be cleared by pressing the **5** button. The last character that is to be sent is highlighted by a small up-arrow below the character, and its position, from 0 to 39, is displayed on the screen. Press the **7** button to move the last-character "mark." For normal text, the ASCII character is display. The "@" symbol is displayed as a solid box. Other values are displayed as a pattern, so the hex value for that character must be used to identify which character is to be transmitted.

In addition the BAUD rate (BAUD), byte-parity (PAR) and character spacing (GAP) can be selected. The BAUD rate is entered in bits/second (e.g. 9600). Parity can be set to no-parity, even-parity or odd-parity. The character spacing gap can be set to 0 or 450 mS.

The ◄ and ► arrows select which character to change. The ▲ and ▼ arrows change the selected character. By default no message is sent. The command format is:

      MENU® MISC® POWR® RS232® (**PWRON, PWROFF**) **®** [◄, ►, ▼, ▲, 5, 7] **OK**

Lock the Configuration

The configuration can be locked to prevent unintended changes. When locked, the input selection functions normally, but setup parameters are fixed. The command format is:

MENU ® MISC ® LOCK ® (**UNLOCKED**, **LOCKED**) **OK**

The following command can be used to unlock the configuration memories if the on-screen menu cannot be displayed. The command is:

MENU 0 9 1 5   Same as **MENU ® MISC ® LOCK ® UNLOCKED OK**

Test Patterns

Warning:
Test patterns can cause screen burn-in if left on-screen for more then a few seconds.

Activate test pattern. The ◄ and ► arrows select the test pattern. The intensity is adjusted from 10 to 100 IRE, in 10 IRE steps, using the ▲ and ▼ arrows. The command format is:

MENU ® MISC ® TPAT ® OK [◄, ►, ▼, ▲]

Menu Timeout

The **MENU** timeout can be changed. The command is:

MENU 0 9 0 5   Toggle menu timeout. Short (default) or long

Front Panel LED Function

The front panel LED is illuminated for a short time after a command and then turned off. This behavior can be changed so the LED light stays on while the unit is on. The command is:

MENU 0 9 2 5   Toggle LED as "activity" (default) or "power."

Zoom Step

A smaller zoom step of about 5% can be selected instead of the normal step of about 15%. The command is:

MENU 0 9 2 3   Toggle zoom-step between default and 5%.

Sidebar Pan

To help reduce screen burn-in with 4:3 sources on widescreen displays, the output can be slowly moved left and right a fractional pixel step every few minutes. The command is:

MENU 0 9 8 7   Toggle Sidebar-pan for anti-burn. Default = off.

Other Commands

Freeze frame	**MENU 0 9 0 0**	Freeze picture (RS232 code = 'z'). Any button exits
S/W Rev	**MENU 0 9 0 3**	Display software revision, save-count and serial-number
Video/Film flag	**MENU 0 9 1 8**	Display input type on screen as video (V) or film (F)
Input Reselect	**MENU 0 9 1 9**	Ignore reselection of same input
TV Black	**MENU 0 9 3 6**	TV decoder black
TV Contrast	**MENU 0 9 3 7**	TV decoder contrast
TV MV Black	**MENU 0 9 3 8**	TV decoder Macrovision black offset
TV MV Contrast	**MENU 0 9 3 9**	TV decoder Macrovision contrast offset
In 3,4 sync level	**MENU 0 9 4 4**	Adjust sync-sense level for input 5 or 6

Saving the Configuration

Save

NOTE:

If a save command is not executed, any changes will be lost when the unit is put into standby power mode, or if power is interrupted.

Permanently save the current configuration. Note that, once saved, the configuration is retained even if the unit is disconnected from power. Configuration from previous save is retained to allow one-level of save-undo. The command format is:

MENU ® SAVE ® SAVE OK OK

Save Undo

Revert to the configuration over-written by the last save. Repeating the save undo command toggles between the last two saved configurations. The command format is:

MENU ® SAVE ® UNDO OK OK

Revert To Factory Settings

Set all parameters to factory defaults. A **SAVE** is required to make permanent. The command is:

MENU 0 9 9 9   Same as **MENU ® SAVE® FCTRY OK**

Restore Configuration Saved during calibration

During calibration, the video technician can save the resulting Lumagen configuration to a special hidden configuration memory. This command restores that configuration in the event that the user inadvertently changes the configuration. A **SAVE** is required to make the restore permanent. The command format is:

MENU ® SAVE® RESTORE OK

Revert To Defaults For Current Output Resolution

Sets output parameters to defaults for the current output resolution. A **SAVE** is required to make permanent. The command is:

MENU 0 9 9 8   Same as **MENU ® SAVE® FCTRY OK**

Serial RS232 Command Interface

The RS232 serial interface is used to enter commands using the same command format as the infrared remote. The serial rate is 9600 BAUD with 8 data bits, no parity bit and one stop bit. No hardware or software flow-control is used. The ASCII commands are:

ASCII	Remote	Function
%	ON	Power on
$	STBY	Power to standby
M	MENU	Activate menu
X	EXIT	Exit. Often acts as a cancel key
!	CLR	Force menu off (e.g. can use to assure menu is off for input selection)
i	INPUT	Choose input (i.e. i2 <enter> for input 2)
P	PREV	Display previous input
k	OK	Accept command
<enter>		Accept command (uses the PC "ENTER" keycode)
<	◄	Left arrow ("less-than" key on keyboard)
>	►	Right arrow ("greater-than" key on keyboard)
v	▼	Down arrow (lower-case v, as in "vote")
^	▲	Up arrow (shift 6 key on keyboard)
0 - 9	0 - 9	Enter a digit 0 through 9
n	4:3	Input is 4:3 format. Use previous zoom setting
[	4:3NZ	Input is 4:3 format. No zoom

l	LBOX	Input is 4:3 letter-box format (lower-case L). Use previous zoom setting
]	LBOXNZ	Input is 4:3 letter-box format (lower-case L) . No zoom
w	16:9	"Enhanced for 16:9 televisions" format. Use previous zoom setting
*	16:9NZ	"Enhanced for 16:9 televisions" format. No zoom
j	1.85	Input is 1.85 format. Use previous zoom setting
/	1.85NZ	Input is 1.85 format. No zoom
W	2.35	Input is 2.35 format. Use previous zoom setting
a	MEMA	Select MEMA
b	MEMB	Select MEMB
c	MENC	Select MEMC
d	MEND	Select MEMD
g		Onscreen messages on
s		Onscreen messages off
z	FREEZE	Freeze-frame. Any other character resumes
Y	YPRPB	Output type is HD color-space YPRPB (component)
R	RGBHV	Output type is RGBHV. **\<enter\>** completes command
S	RGBS	Output type is RGBS. **\<enter\>** completes command
T	RGsB	Output type is RGsB. **\<enter\>** completes command
A	480P	Select Vertical Resolution = 480p
B	540P	Select Vertical Resolution = 540p
C	600P	Select Vertical Resolution = 600p
D	720P	Select Vertical Resolution = 720p
E	768P	Select Vertical Resolution = 768p
F	840P	Select Vertical Resolution = 840p
G	1080P	Select Vertical Resolution = 1080p
I	1080I	Select Vertical Resolution = 1080I
V	VRES	Set Vertical Resolution (e.g. V960 **\<enter\>**, for 960p)
~	VRATE	Set Vertical rate (e.g. ~5994 **\<enter\>**, for 59.94 Hz)
H	HRATE	Set Horizontal Rate (e.g. H45000 **\<enter\>** for 45KHz)
=	ASPECT	Set Output aspect ratio (e.g. =178 **\<enter\>** for 16:9 displays)
tXMM		Test Pattern command: X is a letter 'a'-'p' corresponding to the 16 available patterns. MM is the ire level divided by 10, so 0-10. Sending 'X' will exit the pattern display.
ZT1xxxx		Print a message on the screen for 5 seconds. The command always begins with the characters "ZT", followed by a single digit which sets the duration of the message. '0' for 2 seconds, '1' for 5 seconds, '2' for 10 seconds and so on, with '9' leaving the message onscreen until a "ZC" is sent or a Lumagen remote control command clears the message. The message string "xxxx" which follows the duration digit can be up to 30 characters in length. The '@' character font is replaced with a solid block for use as a volume bar. Legal characters must be in the range of ' ' thru 'z' (which is 0x20 - 0x7a in hex). Anything outside that range such as carriage return or even the '{' can be used to terminate the message command.
ZC		Clear any onscreen messages .
ZY0M		Set zoom factor to M. Where M can be 0-2, or 0-7 if zoom is set for 5% steps.
ZY1MMM		Set output aspect ratio to MMM. Where valid range is 110-250 which corresponds to 1.10 to 2.50.
ZY1MMMNNN OOOPPP		Set output shrink parameters. Where MMM=top, NNN=left, OOO=bottom, PPP=right edge. Range is 0-255 for each.

Menu tree

NOTE: When selecting among several options for a control, the active selection is highlighted in red.

<u>Press Menu</u>
IN →
    TYPE ®   Input type selection as appropriate for current input
        DVI-D   Digital-Video-Interface (HDMI compatible)
        4:4:4   Digital-Video-Interface (HDMI 4:4:4 compatible)
        4:2:2   Digital-Video-Interface (HDMI 4:2:2 compatible)
        DVI-A   Digital-Video-Interface (HDMI compatible)
        SDYPBPR   Component using the SDTV color-space
        HDYPBPR   Component using the HDTV color-space
        RGBS   RGB with separate composite sync
        RGsB   RGB with composite sync on green
        SDI   Serial Digital Interface
    OUTSEL   If output in INDEP mode, select one of 8 output configurations
    CONFIG ®
        COLR →
            BLCK   Use display black for selected input
            CONT   Use display contrast for selected input
            COLR →
                 COLR   Color saturation (Use "blue" color bar pattern)
                 HUE   Hue (Use "blue" color bar pattern)
                 COLRED   Red Color saturation offset (Use "red" color bar pattern)
                 HUERED   Red Color Hue offset (Use "red" color bar pattern)
                 COLGRN   Green Color saturation offset (Use "green" color bar pattern)
                 HUEGRN   Green Hue offset (Use "green" color bar pattern)
             CUE   Chroma-Upsample-Error mitigation filter
            CTMP   Grayscale and gamma calibration (**Service mode only**)
        ADJ →
            SIZE →
                 TOPL   Position top-left of input
                 BTMR   Scale to position bottom-right corner of input
                 NLS   Select 4:3 input as normal or Non-Linear-Stretch
                 SCALE   Disable scaling if input resolution matches out resolution
                 MASK   Adjustable Mask to cover the four sides of the video.
            YC-DLY   Y/C delay independently for C_B and C_R
            SHARP   Select image sharpness. Not available for most VisionDVI inputs
            LEVEL   DVI-D levels or Analog black-pedestal (PC or Video)
        NAME   Name input memory by following on-screen instructions
        CNTRL →
            DEINT →   Deinterlacing control
                MODE   Select deinterlacing mode
                FIELD   Flip input fields (i.e. swap odd and even fields)
            GENLOCK   Select genlock mode
        DVI →   For DVI inputs, select modes
            HDCP   Select if DVI input reports HDCP capability
            EDID   Select EDID as Lumagen default, monitor values, or off
           HOTPLG   Select if "hotplug" remains asserted when input not selected
    COPY ®
        ALL   Copy current input memory to selected input memories
        COLOR   Copy the current input memory's color parameters (only)

OUT →
    RES ®
        VRES   Vertical active resolution
        VRATE   Vertical refresh rate
        HRATE   For analog output only: Horizontal rate (normally not used)
        HRES   For digital output only: Horizontal active resolution
        TIMING   Set output timing parameters in pixel increments
        SIZE   Set output size
        POS   Output position
    ASPCT   Output aspect ratio (1.33 to 2.35 in hundredths)
    MISC ®
        GBAR →
            SIDE   Side gray-bar intensity (0 to 49 ire)
            LBOX   Top/bottom letter-box-bar intensity (**Service mode only**)
        LEVL →
            PDSTL   Analog output black pedestal (0 IRE or 7.5 IRE)
            DVILVL   DVI-D output level (VIDEO or PC)
        SHRINK   Shrink any edge of the picture to fit in mask
        SYNC ®
            DVI   Select DVI output sync polarity (use direct command for analog out)
        MODE ®   Single (default) or multiple-output-timing mode
        SAME   Single output configuration. All memories share output timing, etc.
        INDEP   Eight independent output configurations.
        AUTOIND   Automatically select output configuration for NTSC or PAL input.
    COPY   Copy current output configuration to selected output configuration(s)

MISC →
    LCD ®   Visible for VisionHDQ only
        BKLGHT   LCD backlight enable
        CNTRST   LCD contrast
    OSD   Toggle OSD-enable. Shows status when input selected if enabled
    LOCK   Lock or unlock the configuration
    POWR ®
        AUTO   Unit can go to either "ON" or "STBY" when power is applied
        MSG   Change power-on on-screen message by following instructions
        RS232 →   Transmit message out RS232 serial port on power on or off
            PWRON   Power-on RS232 serial output message
            PWROFF   Power-off RS232 serial output message
            BAUD   Power on/off message BAUD rate
            PAR   Power on/off message parity
            GAP   Power on/off message character spacing

    TPAT ®   Test and warm-up patterns
        PATS   Test patterns
        WARMUP   Warm-up patterns

SAVE →   Note: Unsaved changes can be discarded by going to STBY
    SAVE   Save current configuration to flash ROM.
    UNDO   Toggle between current saved and previous saved configurations
    RESTORE   Restore from calibrator's hidden configuration
    FCTRY   Reset to factory defaults

For Optimal Picture Quality

- Proper calibration is as important for attaining the best picture as deinterlacing and scaling. If you don't have one, purchase a DVD setup disc, such as AVIA® or Digital Video Essentials® and watch the training lessons provided. Then follow the calibration instructions on the disc and in this manual.

- Using high-quality cables is a very important part of video quality.

- Use a power conditioner for the video source, video processor and the display. Power line noise is at least as important an issue for video as it is for audio.

- Use the DVI-D output if supported by the display. For analog displays, RGBHV is preferable to component.

- For display of PC generated data, such as spreadsheets, the PC resolution should be set to match the native resolution of the display and the Lumagen should be in "pass-through" mode (MENU → **IN** → **CONFIG** → **ADJ** → **SCALE** → [∨, ∧] OK).

- Avoid running video signals through the video switch inside receivers, as these tend to degrade video quality. Also, the Lumagen provides independent configuration memories for each input. Using the Lumagen to switch the video allows these configuration memories to be automatically selected for each source.

- Component inputs on some displays do not work with standard width HSync pulses. When using component video to drive the display, if there is a "green cast", the likely cause is the circuitry inside the display. Making the HSync pulse narrower with the Lumagen *HSync Width* command (MENU 0 9 4 0) may eliminate this problem.

- A system's "ground loop noise" can cause visible horizontal banding, or other problems. Since the Lumagen case "floats" with reference to ground, it may need to be grounded to the video source or display. Use approximately 18-guage wire to connect the case of the Lumagen to a chassis ground on the video source or display. Eliminating the ground connection on the Lumagen wall plug can also resolve the issue, but check local electrical codes before trying this.

- For standard definition programming using cable/satellite set top boxes, it is best to have the set top box output standard definition interlaced video (480i or 576i). This allows the Lumagen to deinterlace and scale the video rather than the set top box. If this is not supported, use 480p output for standard definition programming. When the set top box outputs standard definition material as 1080i or 720p, the Lumagen can do much less to improve the quality of the image.

- Each input has four configuration memories. These are memory A (**MEMA**), memory B (**MEMB**), Memory C (**MEMC**), memory D (**MEMD**). These memories can be used to have four independent configurations, such as for day (bright room) and night (dark room). In this example, the black level would be set higher for viewing in a bright room than for viewing in a darkened room. To use MEMA and MEMB for day/night, first setup MEMA normally, SAVE the settings. Then use the input copy command to copy the setup to MEMB. Then adjust MEMB as desired for a different black level setting.

Selecting the Output Resolution

The Society for Motion Picture and Television Engineers (SMPTE) standards for 480p, 720p, 1080i and 1080p are used as reference points for output timing. Other resolutions and vertical-refresh-rates are derived from these standards.

It is important that the optimal output resolution is selected on the Lumagen. For a DVI-D output which is connected to a plasma, DLP, or LCD display, the output resolution should be the native resolution of the display. To find the native resolution of the display, check the user manual provided with the display. Use the instructions in the *Installation Commands* section of this manual to select the appropriate resolution.

For CRT projectors, and other analog interface displays, the best choice of output resolution is more involved. The best choice depends on tube size, focus, phosphor spot size, and video-bandwidth. For CRT projectors, some suggested starting points, based on tube size, are 720p for 7 inch, 840p for 8 inch, and 960p for 9 inch. Use the instructions in the *Installation Commands* section of this manual to select the appropriate resolution.

High-definition, direct-view and rear-projection televisions typically support 480p and 1080i. Some also support 540p or 720p. If 720p is supported, it is the recommended resolution, because 1080i suffers from display interlace-artifacts that reduce the perceived vertical resolution to roughly the same as 720p. Since the output is over-sampled horizontally, 720p provides nearly equivalent perceived vertical and horizontal resolution as 1080i, and it eliminates interlaced-display artifacts.

A vertical-refresh-rate of 59.94 Hertz works well for NTSC and PAL M material. For PAL (except PAL M) and SECAM, 50 Hertz generally provides the best picture. Note that the selected rate must be supported by the display at the selected vertical resolution.

NOTE:
The maximum resolution depends on the vertical rate, the output aspect ratio, and on whether the output size is reduced from factory defaults.

The software attempts to prevent illegal combinations of resolution, vertical rate and aspect ratio, but given that there are millions of combinations, not all cases could be checked.

Multiple Output Mode

The default configuration uses a single output mode for all inputs and input memories. This works well for fixed pixel displays. However, for CRT projectors, and some fixed pixel projector configurations, such as when a movable Anamorphic-lens is used, having more than one output mode may be desirable. For example, in this case, 16:9 source material is viewed with a different output aspect ratio than 2.35:1 material.

After the first output configuration is programmed, and saved, select multiple output mode (**MENU ® OUT ® MODE ® INDEP OK**). This enables eight output configurations.

NOTE:

When multiple-output-mode is enabled, all input memories, including the HD input "per-resolution" sub-memories, are set to output configuration 0. So, at that point, changes to the output setup still affect all the input memories. Select a new Output Configuration Number before making changes if they are not supposed to affect all memories.

To create a new output configuration, select an input and input memory to be changed. Then select a different output configuration number (e.g. **MENU ® IN ® OUTSEL ® 1 OK**). For SD inputs, there is a single output configuration selection. However, for HD capable inputs, each memory has four resolution "sub-memories" (PC, 480i/480p/576i/576p, 720p, 1080i). The PC memory is used for any single input resolution other than those listed above. For these HD inputs, when *Multiple-Output-Mode* is enabled, the output-configuration numbers for each of these is listed as four numbers separated by a "/" in the order shown above. The output-configuration selection can be made for all four submemories independent of input resolution.

NOTE:

Each HD input submemory must be configured independently

while the respective input resolution is active.

As an example consider a system with two sources, a DVD player and a set top box. It is desired that the output resolution be 960p when the DVD is the source, 960p output when the source is the satellite receiver and it is receiving SD material (480i, 480p, 576i or 576p), and 1080p when the satellite receiver is receiving 720p or 1080i material. This can be achieved as follows (this example assumes that the Lumagen is at factory default state and that the set top box is set to output at the source's native resolution – i.e. 480i or 480p for SD source, 720p for 720p source and 1080i for 1080i source). Do the following steps:

1. Select 960p output resolution and configure.
2. Select multiple-output mode
3. View a 720p or 1080i set top box source channel
4. Change the 720p submemory output configuration to 1 (see page 19)
5. Change the 1080i submemory output configuration to 1 (see page 19)
6. With a 720p or 1080i source from the satellite, select 1080p output and configure
7. Save the configuration

After this, when the DVD player is selected the output will be 960p. When the satellite is selected and it is outputting 480i, 480p, 576i or 576p the output will be 960p. When the satellite is selected and it is outputting 720p or 1080i the output will be 1080p.

Troubleshooting

Following are some common problems, along with suggestions to help resolve them. Also, check the www.lumagen.com website for updated troubleshooting information.

No picture is visible:

- Are all components properly connected to power, outlets switched on and all components powered on?
- Are all of the video cables connected to the correct inputs and outputs?
- Is the menu visible when the MENU button is pressed? If it is, the problem is with the inputs. If it is not, the problem is with the output connections or settings.
- Does the display support the programmed vertical and horizontal timings?
- Is the correct output type (DVI-D or analog) selected?
- Is the correct color-space (RGB or YP$_B$P$_R$) selected?
- For analog output, is the correct synchronization type and polarity selected?
- For analog output, if used, are the separate horizontal and vertical sync signals misconnected? For VGA breakout cables, the signal order at the BNC connectors is generally red, green, blue, horizontal-sync and vertical-sync, but this may vary.
- Is the source HDCP encrypted? Then the display must have HDCP capability.
- If these steps fail to resolve the problem, contact your home theater specialist for assistance.

A PC will not drive the DVI input of the Lumagen video processor:

- The correct Lumagen DVI input must be selected while booting the PC for the PC to be able to read the EDID data from the Lumagen video processor.

Objects appear to be too tall or too wide:

- Make sure the video output aspect ratio is programmed correctly.
- Make sure the correct input aspect ratio is selected.
- Make sure input size is adjusted correctly.
- Make sure the "television aspect ratio" setting is 16:9 in the setup menu of all source devices that support this feature (DVD players, satellite receivers, etc.).

NOTE:

Choose 16:9 in the setup menu of the source

even if the display is not 16:9.

Colors appear incorrect:

- Is the correct output color space (RGB, SD YP$_B$P$_R$, HD YP$_B$P$_R$) selected?
- If input 5 or 6, and color have a slight color "cast": Has the input been calibrated using the "*Calibrate Component/RGB Input*" command?

Updating Software

Lumagen video processor software can be upgraded by downloading update software from the Lumagen website. To upgrade the software:

1. Download the update from http://www.lumagen.com/update_hdp.htm

2. Connect the Lumagen to the PC using the supplied "DB9F to DB9F null-modem cable."

3. Turn the Lumagen on.

4. Wait for at least 30 seconds after power on.

5. Double-click on the update program, select the appropriate serial port (default is COM1), select the desired BAUD rate (default is 28.8K), and then click the START button to begin the update. Desktop PCs generally work well with an update BAUD rate of 57.6K BAUD, but a slower rate may be necessary.

6. When complete, the update program will generally shut the Lumagen processor off. If the Lumagen processor remains on for several minutes after the download has completed, remove and then reconnect power.

On rare occasions, such as a power interruption during update, the update may fail in a way that prevents the Lumagen from functioning normally. For this case, there is a special recovery mode. The Lumagen has a small boot program that runs when power is first connected. Since this "boot kernel" is never updated, it remains intact even if an update fails after the system flash memory is erased. To recover from a failed update:

1. Download the update from http://www.lumagen.com/update_hdp.htm

2. Disconnect power from the Lumagen.

3. Connect the Lumagen to the PC using the supplied "DB9F to DB9F null-modem cable."

4. Double-click on the update program, select the appropriate serial port, and select the desired update BAUD rate, but do **not** click START.

5. Connect power to the Lumagen.

6. Within 10 seconds of connecting power to the Lumagen, click START in the update program. Then quickly respond to its request for product type by clicking the appropriate product name and selecting the OK button.

7. When complete, the update program will generally shut the Lumagen processor off. If the Lumagen processor remains on for several minutes after the download has completed, remove and then reconnect power.

If you experience difficulty, email support@lumagen.com for assistance.

VisionHDQ^{TM} User Manual and Installer Guide

Specifications

Inputs
- Ten standard inputs: One composite, two SVideo, two SD/HD component/RGB, four DVI-D/DVI-A inputs and one SDI input.
- Composite, SVideo and component inputs support NTSC (M, Japan, 4.43), PAL (B, D, G, H, I, M, N, Nc) and SECAM (B, D, G, K, K1, L).
- Component input color-space can be selected as SDTV or HDTV.
- Absolute maximum rating is ±2 volts, referenced to case ground, for analog video inputs.

Processing
- Per-pixel motion adaptive deinterlacing and inverse-telecine for SD and HD sources.
- Proprietary scaling algorithms provide detail-enhancement.
- Adjustments for sizing, black-level, contrast, color, Hue, color/Hue offset, and Y/C delay.
- 11-point parametric grayscale and gamma calibration.
- Source aspect ratio selection of 4:3, 4:3 nonlinear-stretch, letterbox, 16:9 and 1.85.
- Supports two zoom steps for each source aspect ratio.
- Four independent configuration memories per input.

Output
- DVI-D/HDCP and analog outputs to 1920 by 1080 at up to 60 Hertz.
- The analog output supports RGB and YP_RP_B. Both formats support bi-level and tri-level sync. RGB also supports discrete horizontal and vertical, or discrete composite, sync with programmable polarities.
- YP_RP_B output color-space can be selected as SDTV or HDTV.
- For red, green, blue and Luma, the nominal output is 1.0 volts peak-to-peak with embedded sync, and 0.7 volts. For P_R and P_B, the peak-to-peak is 0.7 volts, including sync. Output levels are specified driving an external 75-ohm load.
- Discrete sync outputs drive TTL levels into an external 75 ohm load.
- Eight independent output configuration memories are supported.
- Resolution is programmable from 480p to 1080p in scanline increments, plus 1080i.
- Vertical refresh rate is programmable from 48 to 120 Hertz in steps of 0.01 Hertz. This varies with resolution.
- Output aspect ratio is programmable from 1.33 to 2.35 in steps of 0.01.
- Output size and position are programmable in pixel increments.

Miscellaneous
- Menu based setup.
- Infrared remote, or RS232 serial control interface.
- Dimensions: 17″ (W) by 10″ (D) by 3.5″ (H).
- Power consumption: 25 watts nominal.
- The power supply input rating is from 100 to 240 volts at 47 to 63 Hertz.
- Silent operation (no fan).