Radiance Pro™
Video Processor

Owner's Manual

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Name: _____

Address: _____

_____

Email: _____

Product name: _____

Serial Number: _____

Purchase date: _____

Dealer name: _____

Place in envelope and mail to:

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This equipment has been tested and found to comply with the limits for a class B digital device, pursuant to Part 15 of the FCC rules, Canadian ICES-003, and CISPR 22. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Unauthorized modifications to this equipment may void Lumagen's limited warranty and the user's authority to operate this equipment.

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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, and make sure there is adequate cooling around unit.**
- **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 on CRT and plasma displays. Consult a home-theater specialist for help setting gray-bar intensity.**

Contents

<u>Section 1 – Introduction</u>

Thank you for purchasing a Lumagen® Radiance Pro™ video processor. The award winning Lumagen Radiance video processor family boasts the highest-performance video switching, processing, and calibration, available. This makes it ideal for premium quality high-definition home and commercial theater applications. Lumagen's Radiance series refines and enhances the video images presented by projectors, and flat panel displays.

The Radiance family offers 10-bit front-end processing, 12-bit back-end processing, standard definition (SD) and high definition (HD) video deinterlacing. It includes the Lumagen No-Ring™ scaling technology which does not add "Halos" around edges, unlike competing products. It supports 4k60 sources using HDMI 2.0, with HDCP 2.2. It uses uncompressed audio formats for Dolby-Digital TrueHD™ and DTS Master-Audio™ Bitstream formats.

Radiance processors can function as a central switching hub for the audio video system. The Radiance Pro family of video processors have 2 to 8 inputs, and 2 to 4 outputs, depending on the model.

NOTE:
Features and descriptions in this manual apply to software releases posted to the Lumagen website on or after this manual's revision date (shown at bottom of page). Not all features are available in prior releases.

Key Features

- Up to 10 inputs (5348), with resolutions up to 4k60 HDMI 2.0a with HDCP 2.2
- Standard inputs are 9 GHz max upgradable in pairs to 18 GHz (except 5XXX has 18G inputs)
- Up to four outputs at resolutions up to 4k60 HDMI 2.0a with HDCP 2.2
  - o The 5348 model has two 18 GHz outputs and one audio only output
  - o The 444X models have up to four processed 9 GHz outputs (standard), which can be upgraded to two 18 GHz outputs and two audio only outputs
  - o The 424X models have up to two processed 9 GHz outputs (standard), which can be upgraded to one 18 GHz output and one audio only output
- Proprietary Lumagen No-Ring™ scaling
- HDR Dynamic Tone Mapping (DTM) for improved quality HDR sources on HDR, or SDR, displays
- CMS (Color Management System) using a 4913-point 3D Look Up Table (3D LUT) RGB color palette
- 21-point parametric grayscale and Gamma
- 10-bit processing for deinterlacing plus a 12-bit calibration pipeline
- Low latency Game Mode
- Vertical Keystone correction
- Darbee Digital Visual Presence™ (DVP™) enhancement technology (for up to 1080p60 input rate)
- Support for both 2D and 3D anamorphic scaling with, or without, an anamorphic lens
- Convert common optional 3D formats to a required 3D format that is supported by the display
- Each input has 4 user configuration memories
- Each input user configuration memory has 8 resolution sub-memories
- Each resolution sub-memory is linked to one of 8 output configurations
- 2:2, 3:2 and 3:3 pull-down for SD/HD film sources
- SD/HD video de-interlacing
- User programmable non-linear-stretch (NLS) mode
- 4:3, LBOX, 16:9, 1.85, 1.90, 2.00, 2.20, 2.35, 2.40 and NLS input aspect ratios
- Programmable output aspect ratio from 1.10 to 2.50
- Large suite of test patterns
- Programmable input/output color-space
- Y/C-delay calibration
- CUE and ICP filtering
- Eight channel audio up to 192 kHz, DD True-HD™ 5.1, ATMOS™, DTS Master Audio™ and DTS:X™
- IR and RS232 control inputs (See Tech Tip 11 and 12 on the Lumagen.com support page)
- USB-B port with internal USB-to-serial adaptor for command input or software updates.
- Wired IR format command input
- Radiance Pro 4242 comes in a 1U case (standard), or can be ordered in a compact case (4242-C)
- Rack mount 1U height (except Radiance Pro 4242-C)
- Optional rack mounting ears (except Radiance Pro 4242-C)
- Universal, 100-240V, ~50/60Hz external 12 VDC 5 Amp power supply

Section 1 – Introduction`

Document Conventions and Menu Navigation

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. See the Serial RS232 Command Interface section for information on serial commands. The infrared remote-control command notation is described below:

- Remote buttons are named as shown 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.** Generally, the ◄ arrow key (or **EXIT**) steps up one menu level.
- Numerical entries are listed as **value**. For numerical entries, the ◄ arrow key acts as backspace.
- Some commands are activated immediately without the need to press **OK**. Other commands must be explicitly accepted by pressing **OK**. If needed, **OK** is listed as part of the command, and will complete the command and return the menu to one level higher in the menu system. Note that, at default settings, pressing **OK** when it is not required will bring up the Radiance Status Screen.
- For many commands, pressing **EXIT** cancels a partially completed command and returns to one level higher in the menu system. For advanced commands changes are completed from within the command and **EXIT** just 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. 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 associated input is selected.
- Before changes are saved, they can be discarded by entering standby (**STBY**) mode.
- A "Save" must be performed after any changes or all changes will be discarded the next time the unit enters standby (**STBY**), or power is lost. To save press **MENU, ▲**, **OK, OK, OK**.

Unpacking

- Unpack the box.
- Save the box and packing materials in case you need to ship your Radiance.

Verify that your box contains the following items

- Lumagen Radiance video processor.
- Universal, 100-240V, ~50/60Hz, 12 VDC 5 Amp power supply
- Remote control.
- AAA Batteries (2).
- USB cable.
- If purchased with the Radiance Pro, the optional 19 inch rack-mount ears.

Remote Control Battery Installation

1. Locate the battery compartment on the back of the remote control.
2. Move the locking tab to open the door.
3. Remove the old batteries (if applicable).
4. Install two new AAA batteries, observing the battery polarity shown in the battery compartment.
5. Replace the battery compartment cover.

Installation Guidelines

- Disconnect wall power from all electronics before plugging in, or removing, HDMI cables
- Select a cool, well-ventilated, dry location.
- Install the Radiance on a flat, level surface such as a table, shelf, or in a 19" rack
- Verify that the cooling vents are clear of obstructions to provide adequate cooling.
- Use only the Lumagen approved power supply.
- Avoid sudden temperature changes, temperature extremes and excessive humidity.
- Unplug power to the Radiance before cleaning

Section 2 – Overview

Section 2 – Overview

Front Panel for Radiance Pro (current models)

The front panel has a light-emitting-diode (LED) indicator, which is red when the unit is in "standby" and, by default, is blue when the unit is "on." Note: The blue "on" indicator can be disabled in the menu.

Rear Panel for Radiance Pro 5348

Rear Panel for Radiance Pro 4446

Rear Panel for Radiance Pro 4242

Rear panel connections are:
- Four HDMI 2.0 inputs (4242), or up to eight HDMI 2.0 inputs (444X), with HDCP 2.2
- Two HDMI 2.0 outputs (424X), or four HDMI 2.0 outputs (444X), with HDCP 2.2
- 18 GHz input and output options available
- IR format command input (See Tech Tip 9 on the Lumagen.com website)
- RS232 for commands and software update (See Tech Tip 6 & 11)
- Internal USB-to-serial adapter for commands and software update (See Tech Tip 6 & 11)
- Power Input (12 Volts DC, 5 Amp power supply)

Section 2 – Overview

Remote Control

Power / Standby

Input Aspect Ratio

Help

Navigation Controls

Numeric Entry

Misc Buttons

Configuration Memories

Picture-In-Picture (PIP)

Note: PiP/PoP is planned for the 444x model
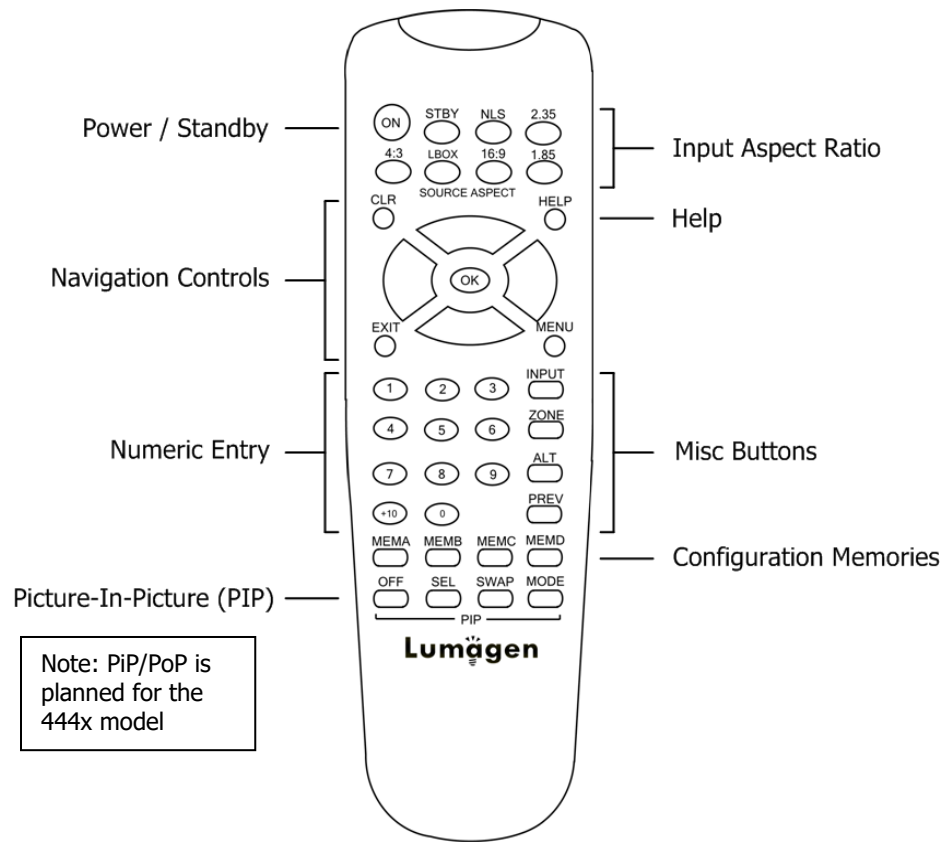
Power / Standby
ON   Power On
STBY   Standby

Navigation Control
CLR   Clear menu or partial commands
HELP   Display context-sensitive help
EXIT   Go back one menu level
OK   Enter/Accept command, display info screen
ʌ   Menu navigation / zoom in
v   Menu navigation / zoom out
◄   Menu navigation / input aspect
➤   Menu navigation / input aspect

Numeric Entry
1-**9**   Input 1 to 9
+10   Input 10 and greater

Picture-In-Picture (PIP)
OFF   Not applicable
SEL   Not applicable
SWAP   Not applicable
MODE   Not applicable

Input Aspect Ratio
4:3   4:3 (1.33) aspect ratio
LBOX   Letterbox
16:9   16.9 (1.78) aspect ratio
1.85   1.85 aspect ratio
2.35   2.35 aspect ratio
NLS   Non-Linear-Stretch
Alt, 4:3   2.00 aspect ratio
Alt, 16:9   2.20 aspect ratio
Alt, 2.35   2.40 aspect ratio

Help
HELP   Displays info for menu item

Misc Buttons
INPUT Precedes input # selection
ZONE   <Not used>
ALT   Alternate key functions
PREV   Previous input

Configuration Memories
MEMA   Memory A
MEMB   Memory B
MEMC   Memory C
MEMD   Memory D

Section 2 – Overview

Block Diagram

The function of the Radiance is to act as a video switch, process the selected video source, and then output video in the appropriate format and resolution. Input rates from standard definition up to 4k60 are supported. Video inputs are converted to progressive video, if necessary, and are then scaled to the video output resolution, which can be up to 4k60.

Interlaced video has been in use for more than 70 years and is still a 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 Radiance is comprised of the following major functional sections:

- Video/Audio input selection
- Video deinterlacing (if required)
- Video processing and scaling
- Video/Audio output

The functional blocks are shown below. Note that the number of HDMI inputs and outputs can vary. The Radiance Pro 4242 four-input, two-output, configuration is shown.
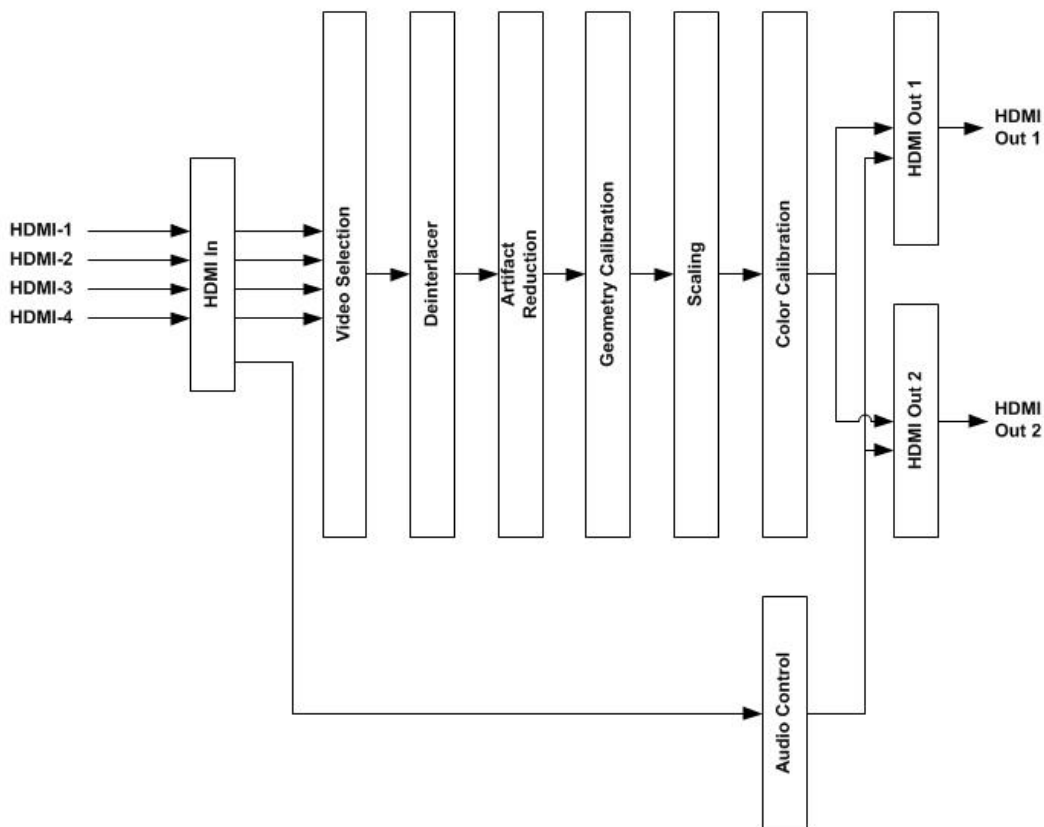
Commands can be sent to the Radiance by infrared remote or via the serial RS232 port. The RS232 port, or the USB port, can be used for software updates. Setup is done with the on-screen menu. User functions (e.g. select input) use direct commands to make macro programming simpler.

Section 2 – Overview

Configuration Memories

To understand how the Radiance functions, it is important to understand that the setup and calibration parameters are split into "input memories" and "output configurations." Input memories control the video source setup. Output configurations control the display setup and calibration. The Input Memory selects the Output configuration for that input, and input memory by selecting a Config, CMS and Style for each input, input memory, input resolution, HDR/SDR, and 2D/3D mode.

Each Radiance Pro input has four input memories (**MEMA**, **MEMB**, **MEMC** and **MEMD**). Each input memory has sub-memories for each supported input resolution and rate which are automatically selected based on the input resolution and vertical-rate. The "Other" entry is selected for input resolutions and vertical rates not specified explicitly. Each input resolution and vertical rate has 8 sub-memories which are programmable on a per-input and per-input-memory basis. For example, as shown in the block diagram below there can be 8 different input configurations for 480i/p sources. Different inputs and input memories can each be independently programed to one of the 8 sub-memories for each listed resolution and vertical rate.

Each input sub-memory can be independently linked to any one of the 8 Output **Mode** configurations, 8 **CMS** memories, and 8 **Style** memories. These store setup data for the video display setup and calibration. In the factory default condition, all input sub-memories are linked to **Auto** output **Mode**, **CMS 0** (for SDR sources), **CMS 1** (for HDR/Rec2020 sources), and **Style 0**.

To change these linkages, use the **Output Setup** menu. Settings can be changed for each input sub-memory. Make sure to "Save" any changes you want to keep (**MENU → Save → OK → OK → OK**).

NOTE:
By default, for a Rec 709 source, all sub-memories point to Auto output mode CMS0 and Style0. For a HDR/Rec2020 source, all sub-memories point to Auto output mode, CMS1 and Style0. For the majority of systems this default set of configuration pointers does not need to be changed.

NOTE:
Changes must be Saved. If changes are not Saved the Radiance Pro will revert to the previously Saved settings when turned off. So, if you make a configuration mistake you can revert to Saved settings with a Power Cycle.
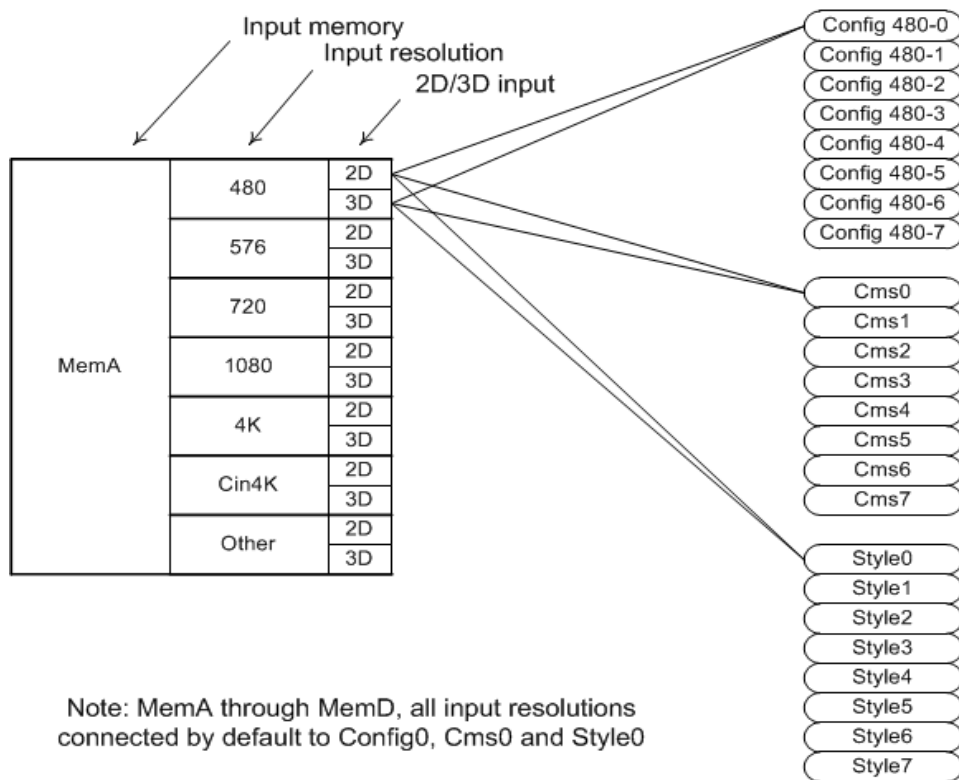
Input memory to output configuration block diagram

Section 3 – Quick Start Guide

Installation Instructions

1. Install two AAA batteries in the Lumagen Remote Control.
2. Disconnect all power in the system before connecting any A/V cabling to minimize the chance of damaging equipment.
3. Connect audio/video sources as appropriate.

NOTE:

Using the highest quality 18 GHz "Certified" HDMI cables is essential for proper operation. For Radiance Pro HDMI connections, use 6 to 10 foot (2 to 3 meters) passive 18 GHz "Certified" HDMI cables, such as the Tributaries UHD or Ethereal Velox. For Radiance Pro output lengths over 10 feet (3 meters), Lumagen recommends using a 18 GHz fiber HDMI cable, such as the RUIPRO (amazon.com), or the Tributaries active UHDT "Titan" cable.

NOTE:

The default configuration is, as shown below, to connect Radiance Pro HDMI Output 1 to the audio receiver, and HDMI Output 2 (424X) or Output 4 (444X) to the primary TV or projector. This configuration insures EDID information for audio and video are read and passed back to sources as appropriate. Lumagen recommends that the Radiance be used as the switching device for ease of operation, fastest video switching, and best video quality.
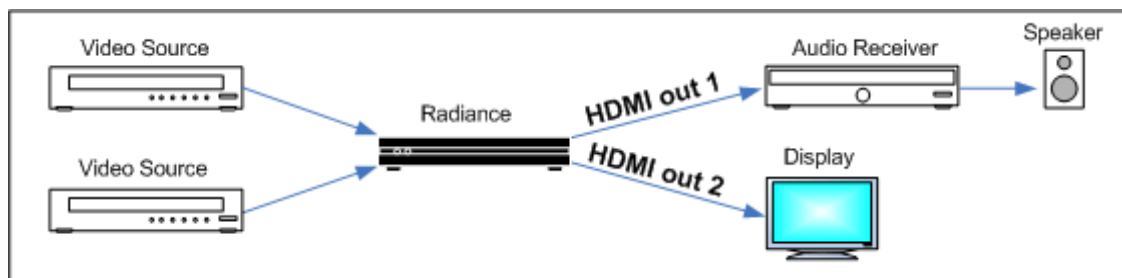
Default connections for Radiance Pro 4242 with AVR plus display/projector

4. Connect the Radiance outputs. If using an AVR, or audio PrePro, connect it to Radiance Pro Output 1. Connect the main display/projector to the highest number Radiance Output. If using only one Radiance output, connect the display to the highest numbered Output. Then, if necessary, change the highest numbered output to both audio and video (using the Output->Output Setup menu), and enable the appropriate audio modes manually (See Direct Commands, MENU 0943 and MENU 0944), and do a "Save".
5. Reconnect power. Plug the DC power cord from the Radiance power supply into the DC power jack on the back of the Radiance. Then connect the power cord to the Radiance power supply and plug it into a wall outlet.
6. Turn the other equipment on and use the Radiance remote control to turn the Radiance on.
7. Select the desired Radiance input using the Radiance remote control. The video inputs are numbered from 1 to 8. To select a input press the "**Input**" button and then press the corresponding number button on the remote. Make sure the selected source device is outputting active video.
8. You should now have an image on your display/projector. The Radiance automatically selects the appropriate output resolution and frame rate for HDMI/DVI displays/projectors (including 24p when supported), when connected according to these instructions.
9. The default output aspect ratio is 16:9 (i.e. 1.78:1). No output aspect ratio selection is needed for 16:9 displays or projectors. For other output aspect ratios, please see the User Manual for information on how to set the output aspect ratio. For 2.35 anamorphic screens the Radiance Pro can control the aspect ratio without the use of an anamorphic lens. See Tech Tip 16 for information on how to set up the Radiance Pro for a 2.35 screen.

Section 4 – System Configuration Examples

Section 4 – System Configuration Examples

The most common configurations using the Radiance are shown below. Note, examples below refer to the Radiance Pro 424X units. For other models use Output 1 for the AVR and the highest number Output for the main TV/projector.

Receiver after Radiance (most common configuration)

The default configuration is to connect all the video sources to the inputs of the Radiance Pro and connect the receiver, or preamp, to HDMI Output 1, and the display/projector to the highest number Radiance Pro Output. Only after all audio and video connections have been made, connect power, then turn everything on. The Radiance automatically detects the video EDID from the highest number output and the audio EDID from output 1 and reports the appropriate EDID modes back to all source devices. You can manually override this behavior.

By default, Output 1 is set to "Audio Only". With this setting, Output 1 will output audio with blank 1080i or 720p video using HDCP 1.X. In the "Output Setup" menu, for 9 GHz output cards, you can change the settings for each output to "**A**udio Only", "**V**ideo Only", "**B**oth Audio and Video", or "**N**o Audio or Video". For 18 GHz output cards, the odd numbered output is always Audio-only, or off. If the odd output is enabled for audio the even numbered output is always both audio and video at up to 18 GHz. If the odd numbered output is off, then the even numbered output can be programmed for video only, or both video and audio, at up to 18 GHz using the Output Set Menu.

This configuration can improve switching delays by using the Radiance Pro's input switching and guarantees that the receiver does not degrade the video. It also minimizes the work needed to configure the Radiance, for the TV/projector output, because audio is off by default.
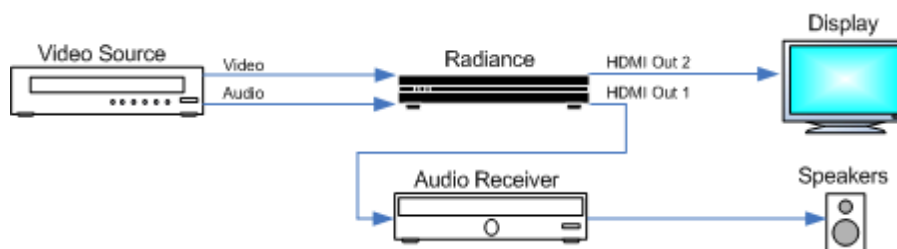
Audio and Video routed separately

Route the audio and video separately to the Radiance and a receiver. Connect the TV/projector to the highest number Radiance Pro Output. You can set the display output to "**V**ideo Only", if necessary.
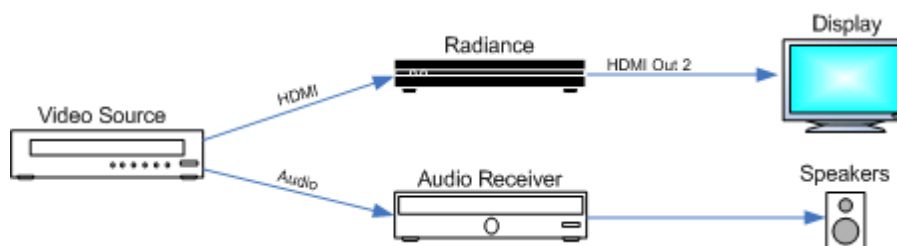
Receiver in front of Radiance

You can use an AVR in front of the Radiance to switch the video sources. Note that some AVR's add artifacts to the video, so turn off all video processing in the AVR. Connect the TV/projector to the highest number Radiance Pro Output. You can set the display output to "**V**ideo Only", if necessary.
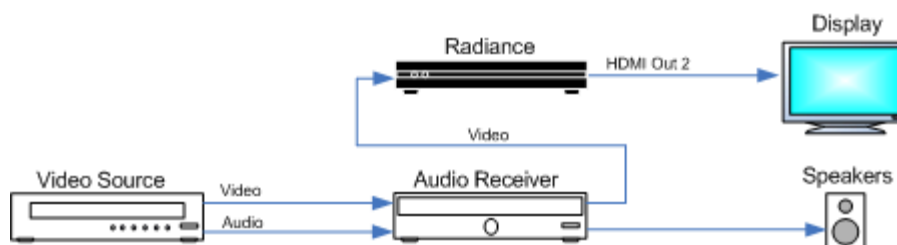
Section 5 – Basic Commands

Power

Turn power on by pressing the **ON** button. Place the Radiance in standby mode by pressing **STBY**.

Input Selection

Press the **INPUT** button and then press the corresponding input number button on the remote.

SHORTCUT:
If the menu or status is not displayed on the screen, a new input can be
selected by pressing the corresponding number button on the remote.

SHORTCUT:
The Radiance Pro 5348 has ten inputs. As a shortcut, selecting "Input 0" using the remote selects Input 10.

Configuration Memory Selection

Each input has four configuration memories. These are referred to as memory "**A**", "**B**", "**C**" and "**D**". To select one of these memories, press **MEMA**, **MEMB**, **MEMC**, or **MEMD**. Note, RS232 codes are provided to directly access these memories. Each input memory has eight input "sub-memories" that are automatically selected based on the input resolution and 2D/3D input video format.

Each configuration memory, and sub-memory, is independent of the other memories. To allow the memories to be used for mode selection (i.e. day/night), by default, the memory type remains unchanged when a new input is selected. (i.e. If input 2 memory B is active, pressing "**INPUT, 3**" selects input 3 memory B).

Input Aspect Ratio Selection

NOTE:
Set the "display aspect ratio" to 16:9 in the setup menu of all videos sources such as UHD players,
Bluray players, or set top boxes, even if your display is not 16:9.

NOTE:
Video sources output widescreen movies as a 16:9 raster image. This image
consists of a 2.40 active image with black bars on the top and bottom.

Select the input source aspect ratio by pressing one of the **4:3**, **LBOX**, **16:9**, **1.85**, or **2.35** aspect buttons. To use the **NLS** feature, press "**4:3, NLS**", "**16:9, NLS**", or "**1.85, NLS**".

	Original Remote	New Remote	
•	**4:3**	**4:3**	Standard definition full-screen material
•	**LBOX**	**LBOX**	"letterbox" standard definition movies shown with letterbox bars
•	**16:9**	**16:9**	Material labeled as "Aspect ratio 16:9"
•	**1.85**	**1.85**	Material labeled as "Aspect ratio 1.85"
•	**'Alt' 1.85**	**'Alt' 1.85**	Material labeled as "Aspect ratio 1.85"
•	n/a	**1.90**	Material labeled as "Aspect ratio 1.90"
•	**'Alt' 4:3**	**2.00**	Material labeled as "Aspect ratio 2.00"
•	**'Alt' 16:9**	**2.20**	Material labeled as "Aspect ratio 2.20"
•	**2.35**	**2.35**	Material labeled as "Aspect ratio 2.35"
•	**'Alt' 2.35**	**2.40**	Material labeled as "Aspect ratio 2.40"
•	**NLS**	**NLS**	Non-linear stretch 4:3 to 16:9, or 16:9 or 1.85 to 2.35 or 2.40

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, by default, the ∧ arrow button zooms in by about 15% and the ∨ arrow button zooms out by about 15%. The Zoom amount can be changed to 5% steps.

Section 5` – Basic Commands

Status Screen

Pressing "**OK**" when the menu is off displays an on-screen information message as shown in the example below.

```
Radiance Pro    Info Pg 1    (for Pg 2, press Ok)
   SW Rev.xxxxxx        Serial:xxxxxxxxx
                  Input 1A    Out1       Out2

 Mode:         480i       1080p      1080p
 Rate:         59.94Hz    59.94Hz    59.94Hz-2D
 Format:       YCbCr 422  RGB        RGB-SDR709
 HDCP:         1.x        1.x        2.x
```

Pressing **"OK"** when the information screen is displayed, will display several additional status screens.

NOTE:

*The OK button is equivalent to the RS-232 <cr> character (carriage return). Sending a <cr>
character after a command that does not explicitly require it, treats it as a separate command and
will bring up the status screen. When using RS-232 control do not send a <cr> unless it is required
by the command being sent. If the control code has been written such that unnecessary <cr>
characters are being sent you can disable this "Status on <cr>" feature by entering **MENU 0927**
and doing a Save.*

On-Screen Help

Pressing, "**HELP**" when the menu is displayed, displays on-screen help information, for the currently highlighted menu item, for many of the menu options. Additional information is displayed which can enhance your understanding of the settings and choices.

Quick Keys

Provides a menu to use for basic remotes that have limited buttons, The 'Quick Keys' menu has buttons for input aspect ratio (4:3, LBOX, 16:9, 1.85, 2.35, NLS), set zoom (Zoom+, Zoom-) and select the user memory (MemA, MemB, MemC, MemD). The "Quick Keys" menu duplicates the function of pressing the corresponding buttons on the Lumagen remote. There are also buttons to control 3D (off, SbyS, TopB).

MENU → Quick Keys → (4:3, LBOX, 16:9, 1.85, 2.35, NLS, Zoom+, Zoom-, MemA, MemB, MemC, MemD, '3D'Off, '3D'Sbys, '3D'TopB)

Section 6 – Video Output Menu

By default, the output is set to "Auto 2" (424X), "Auto 3" (5348), or "Auto 4" (444X). "Auto 2" means the Radiance reads the video EDID from the devices connected to Output 2 and selects the appropriate output resolution.

For "Auto" modes the output vertical rate is selected based on the input vertical rate. For example, input formats 480i60, 720p60, and 1080i60 automatically select a vertical output rate of 60 Hertz. Input formats 576i50, 720p50, and 1080i50 automatically select a vertical output rate of 50 Hz. For a 24p input formats, a 24p output vertical rate is selected, if the display supports a 24p vertical rate, otherwise a 60 Hz output rate is selected.

Output Setup

The *Video Output Setup* menu is used to select output settings (*Mode*, *CMS*, and *Style*) based on the input number, input memory, input video resolution and input video rate. The *Video Output Select Menu* does not affect the audio settings. See the *Audio Configuration* section for information on configuring audio modes.

NOTE:
The Video Output Setup Menu is not needed for typical systems

To select the output settings based on input, input memory, and input video mode, press **MENU → Output Setup→ Ok**. This will display the Input Conditions and Output Selections.

Input Conditions
Input: 1A Mode: Other, 2D, Rec601
Output Selections
Mode: Custom0(Auto 4)
CMS: CMS0
Style: Style0
Out Enables: ABBV (1-4)

Press **"OK"** again to display the *Video Output Select Menu*. Highlight the **'2D'** or **'3D'** row and press "**Ok**" to edit.

In Condition			-	Video Output Selection					
	In	Mode		Mode	3D Type	601/709 CMS	HDR/2020 CMS	Style	Enable 1 2 3 4
*2D:	1A	1080p24	-	Custom0 (Auto 4)		CMS0	CMS1	Style0	A B B V
3D:	1A	1080p24	-	Auto 4	Auto	CMS0	CMS1	Style0	A B B V

Next highlight the input condition entry that you want to edit.

2D In Condition			-	2D Video Output Selection				
In#	Mem	Mode		Mode	601/709 CMS	HDR/2020 CMS	Style	Enable 1 2 3 4
1	A	1080p24	-	Custom0 (Auto 4)	CMS0	CMS1	Style0	A B B V

SHORTCUT:
For any of the three input conditions you can press the number "4" button which then selects 'All' as the condition and steps to the next column so you to apply the changes to multiple input conditions.

Once selected, the parameters for the *Mode*, *CMS*, and *Style* can be changed. Press the ⌃ and ⌄ buttons to set the input number, input memory, and input mode. When making settings that apply to multiple input conditions you can leave any of the output settings unchanged by selecting the '---' option for that output setting. The 9 GHz Video Output card has selections for "A" audio only, "B" both audio and video, "V" video only, "N" no output, and "-" to leave unchanged.

NOTE:
For the 18 GHz output card, the odd output is audio-only or off. The even output is always audio and video if the odd output audio is enabled, and can be audio and video, or video only, if the odd numbered output is off.

Section 6 – Video Output Menu

Custom Modes

Custom Modes store settings for the timing of HDMI video mode that drives the display. There are menus to select standard HDMI modes or custom timings.

NOTE:
By default, the Radiance Pro automatically selects the appropriate output modes based on the EDID reported by the display on the primary video output.

Output Mode – Direct Commands

Note that these direct commands are meant as *temporary* overrides, not as permanent selections and affect only the current input, input resolution and input memory. The *Output Setup* menu should be used to program the output modes if the *Auto* output mode is not being used. The direct commands to select output resolution are:

480p60: **MENU 0 2 1 OK**   720p60: **MENU 0 2 4 OK**   1080p24: **MENU 0 2 0 OK**
1080p60: **MENU 0 2 7 OK**   4k24:   **MENU 0 2 3 OK**   4k50:   **MENU 0 2 5 OK**
4k60:   **MENU 0 2 9 OK**

Select Mode

Select the output mode from a list. I after selecting you lose the picture press Exit of wait 15 seconds for the displayed mode to revert to the previous mode. Setting the mode to "Auto xx" will get data for the display about it's preferred mode. Select which output get priority by choosing the Auto mode. The command is:

MENU → **Output** → **Custom Modes**→ **[Custom]** → **Select Mode**

Custom Mode Timing

If a Custom Output Mode Output Timing is selected, using the Output Setup Menu, the timing can be modified on a pixel basis. Do not change the timing using this menu unless it is really needed.

Warning:
Some digital displays lose picture if the timing is changed by even a single pixel.

The command is:

MENU → **Output** → **Custom Modes** → **[Custom]** → **Mode Timing**

Output Label

You can change the output mode labels. Use the ◀ and ▶ buttons to highlight a letter. Use the ▲ and ▼ buttons to change the letter. Capital letters, small letters, numbers, symbols, and blank are available. The command is:

MENU → **Output** → **Custom Modes** → **[Custom]** → **Label**

CMS's

The Color Management System (CMS) stores settings used to calibrate the color of the display. There are menus to calibrate the position of the primary/secondary color points, calibrate grayscale tracking, calibrate the gamma curve, and compensate for red/green push errors.

Gamma Factor

The Gamma Factor adjusts the gamma curve of the Radiance video output up or down. The Radiance is in the middle of the video chain and the default setting of 1.00 leaves the output gamma unchanged. Changing the Gamma Factor allows the Radiance to make a "coarse correction" of the display Gamma. It should be set to (Desired_Gamma / Measured_Gamma). Note: You should check and potentially adjust the Black Level after adjusting the Gamma Factor. The command is:

MENU → **Output** → **CMS's** → **[CMS]** → **Gamma Factor**

Color Gamut

Allows primary and secondary color point calibration, or calibration of 4913-points throughout the RGB color cube, using a 3D color lookup table (3D LUT) Color Management System (CMS). You must enable Service Mode to make changes using this menu.

Section 6 – Video Output Menu

The command is:

MENU → Output → CMS's → [CMS] → Color Gamut

Colorspace

Select the output ***Colorspace***, output ***HDR Flag***, and if colorspace conversion is applied. The choices for ***Colorspace*** are Auto, SDRP3, SDR2020, HDR2020, SDR709, and SDR601. The default setting of "Auto" sets the output color space to match the input dynamic range and colorspace. For HDR you should select "SDR2020", "SDRP3," or "SDR709." The best choice depends on the native "color Gamut" of the display, and if you are going to do a 3D LUT calibration. Generally, the ***HDR Flag*** is set to Off. The exception is that for JVC projectors the HDR Flag can be used to select a different projector memory while leaving its tone-mapping off. Set the ***2020 <-->601/709*** = Auto Convert, except while calibrating. If the LUT is used to convert between 2020 and 601/709 then set the "2020<->601/709" option to "off". See the *HDR Mapping* and *Calibration* sections for more information. The command is:

MENU → Output → CMS's → [CMS] → Colorspace

Grayscale and Gamma

Allows the parametric adjustment of 2, 5, 11, 12 or 21 color temperature points to adjust the grayscale and gamma for the display. You need a colorimeter and preferably color calibration software to use this command. The command is:

MENU → Output → CMS's → [CMS] → Gray/Gamma

Color Decoder

Used to correct color decoder errors in the display that have red and/or green push. This adjustment is generally not used in conjunction with Color Gamut 3D LUT based calibration. However, if you know your display has a color decoder error, you can use this command before the 1D and 3D LIT calibration to compensate for the color decoder error. The command is:

MENU → Output → CMS's → [CMS] → Color Decoder

Black Level

This command allows for accurate calibration of the black level. Normally the "Brightness" (or "Black Level") control in the display is used to set the black background level, and then the Radiance Pro Adjustable Contrast 2 pattern is used to set the black video reference. This command is also useful when a second black level is desired (using a second output CMS) for a "day" or "night" mode. The command is:

MENU → Output → CMS's → [CMS] → Black

White Level

Used to set the white level for the display. Normally the "Contrast" control on the display is used to set the white level. It is recommended that the Radiance Contrast Pattern 1 (White and Black squares pattern) be used to set the display's white level. The command is:

MENU → Output → CMS's → [CMS] → White

HDR Mapping Initial Setup

HDR Dynamic Tone Mapping (DTM) can map an HDR source for optimal viewing on either a SDR or HDR TV/projector. DTM is always disabled for SDR sources. By default, the **CMS0** output configuration memory is automatically selected for SDR sources and the **CMS1** output configuration memory is automatically selected for HDR sources. When using the Radiance Pro Tone Mapping, **CMS1->HDR Mapping** should be set to SDR2020 and HDR mapping enabled (**"Menu->Output->CMSs->CMS1->HDR Mapping->OK->Enable->On->Ok"**).

Section 6 – Video Output Menu

NOTE:
A key concept to understand for HDR sources and HDR Tone Mapping is that data manipulation in the pipeline does not always have to be in "HDR Gamma." Just as DCI/P3 movies are put into a "Rec 2020 container" for HDR, it is possible to put the HDR content into an "SDR container" if this is accounted for so that the onscreen image is correct. This is not somehow converting HDR to SDR. Instead it is putting the "HDR in an SDR container."

Set the **CMS1->Colorspace->Colorspace** to SDR2020, SDRP3, or SDR709. Which one is best for your system depends on the native color Gamut of the projector/TV, and whether a 3D LUT calibration will be done. If your projector has a color Gamut limited to Rec709, select SDR709 independent of if a 3D LUT calibration is planned, or not. If your projector/TV color Gamut exceeds P3 you may want to select SDR2020. If, and only if, you plan to do a 3D LUT calibration, and your projector/TV has a color Gamut near P3, then you may want to choose SDRP3 as the Output Colorspace setting.

Set the **CMS1->Colorspace->HDR Flag** to off for CMS1, unless you have a JVC projector. If you have a JVC projector you can select the HDR Flag = On in CMS1, to select a different projector memory for HDR than is used for SDR. Then make sure to select the projector Gamma as 2.4 (rather than Bt.2084) in the JVC projector memory selected when the HDR flag is asserted so the projector's tone mapping is disabled.

Set the **CMS1->Colorspace->2020<-->601/709** to *Auto Convert*. If Auto Convert is enabled and the output colorspace is different than the input colorspace, the Radiance Pro automatically converts the data to appropriate values for the selected output Colorspace. For example, if you have a projector that is limited to a Rec709 color Gamut, select the output Colorspace as SDR709, and enable Auto Convert so the Radiance Pro will convert the data so that the HDR "2020" colors within the physical Rec 709 limit of the projector appear correctly to the best ability of the projector.

In current releases, **HDR Intensity Mapping** is enabled by default. It is enabled/disabled in **Output->CMSs->CMS1->HDR Mapping** menu. When **HDR Intensity Mapping** is enabled you should also make certain that the output CMS1->Colorspace is selected as an SDR mode.

Changing the **Display Max Light** adjusts the HDR source to display light ratio. The **Display Max Light** is set in the same menu. You can increase or decrease the **Display Max Light** using the arrow keys in 100 nit steps, or you can use the number keys to enter a value from 50 to 9990 in 10 nit steps.

With **HDR Intensity Mapping** control parameters at default values, use the **Display Max Light** as a coarse "brightness" control. You can set it to 5 to 6 times the measured light output in nits (for a projector), to about 1 to 2 times the light output for a HDR TV. Or you can adjust it while watching a (paused) very bright scene.

See the **Video Input Menu** and **Calibration** sections for more information on adjusting **Display Max Light**.

The command is:

> **MENU → Output → CMS's → [CMS] → HDR Mapping**

CMS Label

You can change the CMS memory labels. Use the ◄ and ► buttons to highlight a letter. Use the ▲ and ▼ buttons to change the letter. Capital letters, small letters, numbers, symbols, and blank are available. The command is:

> **MENU → Output → CMS's → [CMS] → Label**

Styles

The Style memory stores settings for the HDMI format used to drive the display. There are menus to set the HDMI format, size, position, aspect ratio, and gray-bars for the image on the display. These output styles (Style0 through Style7) can be selected for use in the Output Setup menu.

Type

You can specify the digital output range as "RGB-PC level" (e.g. for 8-bit 0 to 255) or "RGB-Video level" (e.g. for 8-bit 16 to 235). "YCbCr 422" is the recommended output format. For the HDMI RGB output, setting the level as *video* allows blacker-than-black and whiter-than-white video levels to be output from the Radiance.

When using 4k50 or 4k60 output modes with 9Ghz output cards, the output type is forced to YcbCr 420 regardless of this setting. If the main display does not support 18Ghz, that may also force YcbCr to be used. The command is:

> **MENU → Output → Styles → [Style] → HDMI Format → Type → (Auto-18Ghz, Auto-9Ghz, RGB/Level=Vid, RGB/Level=PC, YCbCr444, YCbCr422)**

Section 6 – Video Output Menu

Rate Match

Often streamers use a 60.00 Hertz output rate for their OSD, instead of the video standard of 59.94. In addition, a small fraction of source material is sourced at 24.00/60.00 Hertz refresh rates instead of the standard 23.98/59.94 Hertz rates. In this case it may be desirable to slightly alter the output rate to match the input rate. However, operation is smoother, and switching faster, if these are output at the video standard rates.

While the difference between 59.94 and 60.00 is small, if the OSD is 60.00 and the video 59.94 an HDMI output restart is necessary due to the change in frequency. To eliminate this, you can select *Rate Match* = No. Note, that if you watch material that is truly 60.00 or 24.00, there will be some dropped frames with this setting.

Most displays handle slightly different rates. Set this to "off" if your display won't take the altered rates. If the output mode is set to "Auto XX" this setting is ignored and rate matching is used if needed. The EDID override commands, "Menu 0873" and "Menu 0874" force this off. The default setting is 'Yes.' The command is:

>**MENU → Output → Styles → [Styles] → HDMI Format → Rate Match**

Reduce Max Output Bandwidth

For some systems, video modes at the displays maximum rate may be marginal. Making a small reduction in the blanking region (no reduction in the pixel dimensions) may improve reliability and get a picture to display more quickly. The bandwidth is reduced by approximately 5% when enabled. Since this alters standard mode timings it may not work with all displays. The command is:

>**MENU → Output → Styles → [Style] → HDMI Format → Reduce Max**

Dither

Some displays show contouring on images that have gradients because the physical pixel depth of each pixel, or processing precision, is limited. The dither control can be used to enhance the resolution of the display and reduce contouring. Dither position sets the bit size of the pixel for dithering. Orientation controls the frame-to-frame randomization. It can be set to fixed or dynamic. Masking can be turned on to clear the lowest bits after the dither addition. The command is:

>**MENU → Output → Styles → [Style] → HDMI Format → Dither**

Mask

Allows you to "blank" the edges of the video image on the output without changing its position or scaling. This is useful to blank bad pixel data from the source that shows on screen, when you want to keep the "pixel perfect" setup (i.e. no scaling). You can also use the Mask function to adjust overscan to match the projection screen. The command is:

>**MENU → Output → Styles → [Styles] → Mask/Shrink → Mask**

Shrink

Adjust the image size to fit inside a screen masking system. This command is used when outputting to a 2.35 screen when no Anamorphic lens is used. The command is:

>**MENU → Output → Styles → [Styles] → Mask/Shrink → Shrink**

Vertical Keystone

Adjust for a "keystoned" image which is caused by a projectors vertical placement offset. The command is:

>**MENU → Output → Styles → [Styles] → Mask/Shrink → Keystone**

Section 6 – Video Output Menu

Note:
Use this control *only* if the projector does not have enough optical lens shift adjustment, because it will reduce the resolution of the image since it "down scales" to correct the Keystone.

Gray Level

Sets the gray level of borders created by the shrink or output mask commands. The gray level is adjustable from black to white in sixteen steps. The command is:

MENU → Output → Styles → [Styles] → Mask/Shrink → Gray Level

Display aspect ratio

Select the screen aspect ratio. The screen aspect ratio range is 1.10 to 2.50 and is entered in units of hundredths. For example, 16:9 is an aspect ratio of 1.78 which is entered as "**178**". If you have a normal fixed aspect display, select the "Single output aspect" which is the default setting. If you have a movable anamorphic lens or a projector with programmable lens-shift and focus that you are using, select "Output aspect per input aspect."

For the "Output aspect per input aspect" mode, there is a special case when you use NLS. When the input aspect is 4.3+NLS the output aspect assigned to the 16:9 is used. When the input aspect is LBOX+NLS, 16:9+NLS, 185+NLS, 1.90+NLS, 2.00+NLS, or 2.20+NLS the output aspect assigned to 2.35 is used. The command is:

MENU 0 6 (Single output aspect, Output aspect per input aspect)
or **MENU → Output → Styles → [Style] → Aspect Ratio → (Single output aspect, Output aspect per input aspect)**

Graybar Intensity

Some degree of burn-in can occur on any susceptible CRT or plasma display, and even some LCD displays. You can minimize burn-in by setting the bars, on the sides and top/bottom, of the image to a grey color. The default is "0" for black. The command is:

MENU → Output → Styles → [Style] → (Sides, Top/Bottom) → Graybar

Screen Soft Edge

Rolls-off the outside edges of the video toward black. This gives movies a bit more of a theater look and can mitigate overscan issues at the edges of the screen. It can also make the edges of a projected image less visible on the screen masking. The command is:

MENU → Output → Styles → [Styles] → Soft Edge

Style Label

You can change the Style memory labels. Use the ◄ and ► buttons to highlight a letter. Use the ▲ and ▼ buttons to change the letter. Capital letters, small letters, numbers, symbols, and blank are available. The command is:

MENU → Output → Styles → [Styles] → Label

3D Options

3D Output Options

By default, when set to "Auto", the display's 3D capability is automatically detected using its EDID information. However, some 3D displays do not properly report their 3D capability in their EDID. This command allows the 3D output capability to be manually set. The command is

MENU → Output → 3D Options→Output List →(Auto, Yes, No)

Copy

Copy Output Settings

This command copies the current output Mode/CMS/Style settings to the selected output Mode/CMS/Style. The command is:

MENU → Output → Copy→ OK

Section 7 – Video Input Menu

The Video Input Menu is used to configure independent settings for each input, input memory, and input resolution.

Note:
Often no changes are needed using the Input Menu.

Input Setup

The *Input Setup Menu* is used to select input settings based on the input resolution and vertical rate. For each Input, Input Memory, and Input Resolution, there are 8 input configuration memories. The *Video Input Select Menu* does not affect the audio settings. See the *Audio Configuration* section for information on configuring audio modes. "4k" is the most common 4k format and is 3840x2160. "Cin4k" refers to Cinema 4k and is 4096x2160.

This menu uses the concept of "indirection." It allows many inputs and input memories to use the same setup. For example, if you want to crop the top few lines for SD sources to eliminate the "closed caption text" lines on the screen you can do this for one input, and it will apply to all SD sources.

Sometimes you might want to apply a change to a single input and/or a single input memory (e.g. Day/night mode). In this case you would change which of the eight memories the input and/or input memory points to for the resolution you want to change For example, use 1080-0 for the normal case, and 1080-1 for the special case. Then you can change the 1080-1 input configuration memory and it will only affect the selected "special case" input and/or input-memory.

First highlight the '2D' or '3D' row and press "Ok" to edit.

Input Condition			->	Input Config Selection
	In	Mode		Config
*2D:	1A	1080	->	1080-0
3D:	1A	1080	->	1080-0
^ Selects 2D or 3D setup, press OK to edit				

Next highlight the input condition entry that you want to edit.

2D Input Condition			->	2D Input Config Selection
In#	Mem	Mode		Config
1	A	1080	->	1080-0
(Input to edit output settings of)				
<> Select, ^v Change, OK to set, Exit quits				

The ◄ and ► buttons change the active column. The ▲ and ▼ buttons select the input number, input memory, and input mode. In each Input Condition column one of the selections is "*All*."

SHORTCUT:
You can press the number "4" button to select "All" as the condition for any column of the Input Condition. This applies the setup to multiple input, input memories, or input resolutions.

HINT:
Most menus will bring up some use information about that specific menu if you press the "HELP" button on the remote. Press HELP again to remove the help menu from view.

Input Configs Setup

The *Base Input Resolutions* are 480, 576, 720, 1080, 4K, Cin4K, Other. The *4K* mode is automatically selected for sources that send 3840x2160, and the *Cin4K* mode is automatically selected for sources that send 4096x2160. Each *Base Input Resolution* has 8 user programmable configuration memories 0 to 7.

For each input sub-memory adjustments include *Picture*, *Size*, *Control*, and *Enhance*.

Section 7 – Video Input Menu

Input Picture Controls

Black and White Levels

To set the input's black-level (also referred to as brightness) and white-level (also referred to as contrast) using the Lumagen controls, select the "Contrast Group" Contrast2 test pattern. Note, the input memory black and contrast are intended to compensate for variations in video source levels, not to calibrate the display. The command is:

> **MENU → Input → In Configs → [Resolution] → [#] → Picture→ (Black, White)**

Colorspace

Since all inputs are HDMI, by default the appropriate color space is automatically selected ("Auto" mode) for standard-definition (Bt.601), high-definition (Bt.709), UHD (Bt.709), or HDR (Bt.2020), based on information in the HDMI Info Frame. The "Auto" mode is generally best. The command is:

> **MENU → Input → In Configs → [Resolution] → [#] → Picture→ Colorspace**

Color Decoder

> ***NOTE:***
> *It is recommended that the display's Color and Hue to their default values, and that the Radiance Pro's Color and Hue setting also be set to 0. The exception is to correct an error in the color decoder in the projector or TV.*

Normally not used if the Color-Gamut is calibrated using the Radiance CMS system, unless the source has an error in its color decoder. Use Radiance internal color-bar pattern, a test pattern generator, or a test disc test pattern, to set color, Hue, color, and Hue offsets, if necessary. The command is:

> **MENU → Input → In Configs → [Resolution] → [#] → Picture→ Color Decoder**

Y/C Delay

Adjust the horizontal Chroma timing in relation to Luma. Range is +/- 1.9375 pixels in 1/16 steps. It is suggested that you use a Y/C-delay calibration image from a test pattern generator of test disc to calibrate the Y/C-delay. The C_B and C_R channels are adjusted independently. The command is:

> **MENU → Input → In Configs → [Resolution] → [#] → Picture→ YC Delay**

CUE Filter

This filter can minimize Chroma issues for sources with a Chroma up-sample error. The command is:

> **MENU → Input → In Configs → [Resolution] → [#] → Picture→ CUE Filter**

Input Sizing

Input sizing can be used to compensate for active image size differences between sources.

> ***Note:***
> *The input size command does not affect the output size or position.*
> *Rather, it affects which input pixels are captured for processing.*

Crop

Use the **Crop TopLeft** command to select the top-left-most active input pixel. Use the **Crop BotRight** command to select the bottom-right-most active pixel. Select the scanline using the ⋀ and ⋁ arrows, and the pixel using the ⋖ and ⋗ arrows. The command is:

> **MENU → Input → In Configs → [Resolution] → [#] → Size → [Aspect Ratio] → (Crop TopLeft, Crop BotRight)**

Vertical Shift

The vertical shift moves the image up and down without changing the *Input Sizing* settings. There are 15 vertical settings that are shared between all input memories. Select the vertical shift setting and then the shift value. The command is:

> **MENU → Input → In Configs → [Resolution] → [#]→ Size → [Aspect Ratio]→ Vert Shift**

Section 7 – Video Input Menu

Non-linear Stretch

Non-linear-stretch (NLS) is used to horizontally stretch a 4:3 aspect ratio source to fit a 16:9 aspect-ratio display, or to stretch a 16:9/1.85/1.90/2.00/2.20 source to fit a 2.35 aspect-ratio display. The image is stretched by a constant amount in the center section, and by an increasing amount approaching the left and right edges. This eliminates the black sidebars normally seen when viewing smaller aspect material on a higher aspect display. To use NLS press the "4:3", "16:9" or "1.85" button as appropriate for the source aspect ratio, and then press the "NLS" button.

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 ratio from 0% to 24%. The width of the center section can be set from 15% to 70% of the display width. 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 and bottom 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, check the satellite/cable-box menu to ensure that critical information remains visible.

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 Radiance Pro will then crop the pillbox bars and stretch the active 4:3 image.

For a 16:9 display, when 4:3 NLS is enabled, the image will fill the screen with a 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 1.85 and adds left and right sidebars.

For a 2.35 display, when 16:9 NLS is enabled, the image will fill the screen with a 16:9 or 1.85 source for any output aspect ratio up to 2.40. If the output aspect ratio is greater than 2.40, software limits the maximum width to the equivalent of 2.40 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 is:

MENU → Input → In Configs → [Resolution] → [#] → Size → [Aspect Ratio] → NLStretch

Input Masking

The masking command allows you to cover up the edges of the video source. It is different than cropping in that the video is not stretched to fill the screen. It can be used for pass-through modes, where you do not want the Radiance to scale the picture, to cover up some video noise on top/bottom/side of the picture. Another situation is to cover up and change the gray level of the black bars added by a video source, surrounding a letterboxed image.

When you select this command, you must first select which mask number you wish to use. There are 15 available masks that can be shared among different input memories. After selecting the mask number, you can adjust how much the mask covers the 4 sides of the input. The last step is to alter the gray level for the 4 sides. If an input mask is on, its gray level takes precedence over the gray level of the aspect bar. The aspect bar gray level can be adjusted under **Output→Configs→[Config]→Other→Graybar**. If aspect bars are requested (via differing input and output aspects) the masking is added to the aspect bar width. The command is:

MENU → Input → In Configs → [Resolution] → [#] → Size → [Aspect Ratio] → Masking

Letter Box Zoom

By default, Letter Box Zoom is enabled. Aspect ratios that are higher than the output aspect will zoom the image to fill the height of the output. For example, for a 16:9 output aspect ratio, pressing the 2.35 will zoom the 2.35 letter box image to the height of the screen and crop the left and right edges to fit the screen. The Letter Box Zoom command can disable the Zoom for these input aspect ratio selections.

NOTE:
You can globally enable or disable Letter Box Zoom using the command MENU 0966 and selecting on or off. This also globally sets "Auto Aspect" Letter Box Zoom mode to on or off.

The command is:

MENU → Input → In Configs → [Resolution] → [#] → Size → [Aspect Ratio] → LBox Zoom

Section 7 – Video Input Menu

Input Deinterlacing Control

Deinterlace

Deinterlacing converts interlaced sources to progressive. Depending on the source type, the deinterlacer can bias the algorithms to either film or video to obtain the best picture. The command is:

> **MENU → Input → In Configs → [Resolution] → [#] → Control → Deinterlace→ Mode**

Deinterlacing Field Flip

Some source devices do not follow conventions for the order of video fields. This shows as excessive combing in the video. While generally not required, this command allows the input fields to be swapped so these out-of-spec sources can be properly deinterlaced. The command is:

> **MENU → Input → In Configs → [Resolution] → [#] → Control → Deinterlace → Field**

Reinterlace

Converts 480p and 576p sources back to interlaced so the Radiance can do the deinterlacing. This can provide dramatic improvements to a picture that has been poorly deinterlaced, prior to coming into the Radiance. Reinterlacing also allows for taking in 480p/576p movies and going out at 24/48/72Hz.

With this command you can "allow" or "disallow" quick remote key control for a specific resolution as well as turn it on/off. If "Reinterlace <> Keys" are set to 'allow' the left/right arrow buttons on the remote can then be used to control reinterlacing. The left arrow toggles reinterlacing on/off and the right arrow toggles the field order. Depending on how the picture was deinterlaced, the field order may or may not be important, but it can be quickly toggled to see if there is any difference. The command is:

> **MENU → Input → In Configs → [Resolution] → [#] → Control → Reinterlace**

Input Enhancement

Darbee

With Factory Settings the ➤ button is a short cut to bring up the Darbee menu.

See the Darbee DVP™ Section for more information. The command is:

> **MENU → Input → In Configs → [Resolution] → [#] → Enhance → Darbee**

> ***Note:***
> *Darbee DVP supports sources up to 1080p60.*

Sharpness

Sharpness works for all source resolutions. There are independent settings for each source resolution, and input resolution memories. With Factory Settings, the ➤ button is a short cut to bring up the Sharpness menu. The command is:

> **MENU → Input → In Configs → [Resolution] → [#] → Enhance → Sharpness**

Copy Enhancement Settings

You can copy the local enhancement settings to other resolutions and memories. The command is:

> **MENU → Input → In Configs → [Resolution] → [#] → Enhance → Copy**

Input Options

Often the HDMI Input setup features are not required. However, for special cases or non-conforming sources, they are available to optimize each input. If required input setup should occur after the output setup is complete.

Physical to Virtual Input Mapping

A user selected input can be assigned to different physical HDMI input. This "Virtual Input" feature can be useful if a receiver or HDMI switcher is used to send several HDMI sources to a single input on the Radiance. The command is:

> **MENU → Input → Options → HDMI Setup → Physical In**

Section 7 – Video Input Menu

Video EDID Display Information for HDMI inputs

EDID is information that can be read over DVI/ HDMI cables to influence how source devices deliver video, which helps produce an optimal picture. The default setting enables all of the display modes the Radiance supports. These menu settings allow the user to individually select which capabilities will be advertised to the source. You can scroll through the list of capabilities with the up/down arrows and toggle advertising the feature with the left/right arrows. With the Passback setting, the Radiance will read the EDID from the display/AVR connected to the selected output and pass that back to the source.

NOTE:
Some older SD/HD sources do not correctly parse EDIDs if 4k and/or 18 GHz are reported. The issue typically affects audio, but it can affect video. For these select Max Rate as 1080.

The command is:

MENU→ Input→ Options → HDMI Setup→ Video EDID → (Interlaced, Rec2020, HDR, HLG, Video Limit)

HDCP 2.2, or HDCP 1.X, Input Mode Selection

The Radiance Pro accepts HDCP 2.2 sources. A HDCP 2.2 capable source is required to output using HDCP 2.2 encryption if the downstream device supports HDCP 2.2. This is an issue if the output of the Radiance Pro is connected to a HDCP 1.X TV, or projector, since the Radiance Pro will then be required to disable video, because the TV, or projector, is not HDCP 2.2.

Generally, if a HDCP 2.2 capable set top box or UHD Bluray player sees a HDCP 1.X device on its output, it will downgrade the video resolution and output as HDCP 1.X. This command allows the user to tell the Radiance Pro to report only HDCP 1.X capability back to the source so at least a downgraded video format will be output from the set top box or UHD Bluray player for 4k sources, and the Radiance Pro can output the HDCP 1.X video to the HDCP 1.X TV, or projector. The command is:

MENU → Input → Options → HDMI Setup → HDCP

HDMI Video Type

By default, the HDMI input format is detected automatically using the *HDMI Info Frame*. For DVI sources, the Auto mode selects RGB format. For sources that do not report their format correctly, the input format can be selected manually. Set to "Auto" for YCbCr 420.The command is:

MENU → Input → Options → HDMI Setup → Type → (Auto, YCbCr 444, YCbCr 422, RGB)

Rec 2020 HDMI Info Frame Flag usage

By default, if either the HDMI Info Frame HDR flag, or the Rec 2020 flag, are asserted the Radiance Pro uses the CMS memory under the HDR/2020 column in the Output Setup Menu (default is CMS1). However, in some cases sources incorrectly set the Rec 2020 flag when they should not. This command can tell the Radiance Pro to ignore the Rec 2020 flag, and use only the HDR flag to select the CMS memory for HDR content. The command is:

MENU → Input → Options → HDMI Setup → Type

Input Level

This command specifies if RGB HDMI inputs use video levels or PC levels. The input video level should be set to match the expected range of the video source. A mismatch can cause the image to be too dark or too bright. The command is only applicable for the RGB input format. The command is:

MENU → Input → HDMI Setup → Level → (Video, PC)

Auto Aspect Selection

For HDMI sources (not DVI), aspect information may be sent from the source. Enabling HDMI Auto-Aspect allows the source to select the input aspect ratio using the HDMI Info Frame aspect ratio information. The Radiance Pro can also automatically detect the input aspect ratio by analyzing the image to see if it fills the height of the source raster. Options for Auto Aspect are Off (default), HDMI (only), Image (only) or HDMI plus Image based auto aspect.

Note:
This feature is intended to be used to detect changes from OSD to movie/program, and not to detect changes in aspect ratio within a movie. There is a hysteresis time of several seconds

Section 7 – Video Input Menu

before a change takes effect. This is not an issue at the beginning of a program, but it is not fast enough to use when the aspect ratio of the source changes within the program.

Since the image-based auto aspect analyzes the video, it is possible in rare cases that one aspect ratio might be mistaken for another. This typically only occurs with very poor-quality video originally shot, and or edited, in the analog domain.

If the user manually selects an aspect-ratio, by default, that aspect-ratio will be used until the next aspect ratio change is detected by the Radiance Pro. If enabled, the **Sticky Aspect Override** feature will disable the image-based aspect-ratio detection and the selected aspect will be used until the input is reselected, the **Input** button is pressed, or a memory (e.g. **MEMA**) button is pressed.

Some users prefer that, for example, 16:9 sources use the NLS function to always stretch the image to fill an anamorphic screen. If the *NLS when applicable* feature is enabled, when the Radiance Pro detects 4:3, 16:9, or 1.85 as the source aspect, the NLS features is automatically applied if appropriate.

Since 1.78 and 1.85 content as very similar in size, they can be "merged" into a single setting for auto aspect. This is also true for 2.35 and 2.40 source. Merging these prevents misdetection between 1.78 and 1.85, and also between 2.35 and 2.40 which could result in small size changes.

The user can also select whether the automatic aspect ratio detection applies Letterbox Zoom to letterboxed sources, or not. See the Letterbox Zoom section for more information on letterbox zoom.

NOTE:
You can globally enable or disable Letter Box Zoom using the command MENU 0966 and selecting on or off. This also globally sets "Auto aspect" to on or off.

The command is:

MENU → Input → Options → Aspect Setup→ Auto Aspect

Input Aspect Setup

By default, the input aspect ratio can be unique for each input resolution. When a control system is used to control the input aspect ratio it may be desirable to have a common aspect ratio for a given configuration memory and allow the control system to select it without regard to the input resolution. This command controls whether the input aspect is common for all input resolutions for a given configuration memory, or if each input resolution has a unique aspect ratio. The command is:

MENU → Input → Options → Aspect Setup→ Aspect Set

Input Genlock Control

Genlock is used to provide a constant video delay from input to output, to avoid an occasional dropped or repeated frame. With ***Genlock*** on the input to output video delay remains constant within a few milliseconds. Note that ***Genlock*** increases switching delay. It also increases output jitter slightly.

Note:
Some TVs and projectors do not work well with Genlock. To stay in "lock" the Radiance Pro varies the pixel clock slightly over time. Some TVs and projectors are not tolerant of this very slight variation. If it is to be enabled, do enough testing to ensure your TV/projector works.

By default, ***Genlock*** is off. ***Genlock*** can be set to off for all input rates, on for only 24p and 25p input rates, or on for all input rates. There are two Genlock modes, Normal and Fast. Normal uses the input video clock as the clock source for the Genlock PLL. Fast mode uses an internally generated clock for Genlock and steps this clock rate up or down by small increments to keep the input and output clock to the same delay. Some TVs and projectors will work better with one or the other, but which one works best needs to be determined by experimentation. The command is:

**MENU → Input → Options → Genlock → (Off, Auto24-Normal, Auto24-Fast,
Auto-Normal, Auto-Fast)**

Note:
*Due to additional switching delay, Lumagen suggests not enabling **Genlock** for 50 or 60 Hertz sources for faster "channel surfing." If you choose to use **Genlock** Lumagen recommend using **Auto24-Normal**. An exception to this is that, for the lowest video delay for Gaming you may want to enable **Genlock**. Another option is to program Genlock Off for one input memory (e.g. MEMA), and then once a program has started you select a different memory (e.g. MEMB) that has Genlock enabled.*

Section 7 – Video Input Menu

Input Scale Bias

Scaling is normally on to adjust the source to exactly fit the output resolution. If the scale bias is set to "On", scaling is enabled unless the input and output resolution match exactly. Scaling is disabled/enabled independently for horizontal and vertical. If the scale bias is set to "Off" scaling is disabled if the input and output resolutions are close. This is useful when using the Radiance Pro to control aspect ratio for an anamorphic screen. This case uses *Output Shrink* and since it is difficult to match the input and output exactly for the 2.35 input to 2.35 output aspect case, turning Scale Bias to off will ensure scaling is disabled when possible, providing the best possible image quality. One of the Info screens indicates whether scaling is active (Press **OK** on the remote when no Menu is displayed until the scaling page is visible).

The command is:

MENU → Input → Options → Scale Bias

HDR Setup

See Manual "Section 8- HDR Setup".

Audio Video Delay

In the past video has often lagged the audio causing lip-sync issues. However, now with advanced audio codecs, such as ATMOS, and DSP enabled speakers, sometimes it is the audio that lags the video. The Radiance Pro can delay the video in frame increments up to about 116 mS for 60 Hertz sources, or about 250 mS for 24 Hertz sources. The *Video Delay* setting is labeled in 16 mS increments (steps of 60 Hertz frames). The *Video Delay* allows selecting the amount of additional video delay (above base video delay). Since this delay is in source frame increments the Pro then chooses the closest number of frames to the selected delay. As an example, for selection of 83 mS, the additional delay would be 5 frames at 60 Hertz, or two frame times at 24 Hertz. The audio processor audio delay can be used in conjunction with the frame-based Video Delay to achieve the desired video to audio lip-sync. For example, for a 24 Hertz source the video might be delayed by two frames (83 mS), and the audio delayed by 33 mS, making the net lip-sync correct 50 mS of video delay. This can be changed on a per-input and per-input memory by changing the programmed video delay. The command is:

MENU → Input → Options → A/V Delay → Add internal video delay

Game Mode

Game Mode reduces the internal video delay through the Radiance Pro to the minimum possible. This minimizes video delay through the Radiance Pro for playing video games. Note that for the lowest video delay, **Genlock** can be enabled. See the **Genlock** section for information on using **Genlock**. The default for *Game Mode* is Off. The command is:

MENU → Input → Options → A/V Delay → Game Mode → (On, Off)

Input Label

Input Label

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

MENU → Input → Label

Copy

Copy Input Settings

This command can be used to copy input settings from one input, and one, or all, input memories to another input and input memory, or all inputs for one memory, or all inputs for all input memories. The command is:

MENU → Input → Copy

Section 8- HDR Setup

Dynamic Tone Mapping (DTM) analyzes the brightness of every HDR frame, and detects scene cuts. It then sets the transfer function for each scene based on this data. It also adjusts the transfer function during a scene if it sees changes in brightness level. This has the benefit of not depending on the source's often incorrect HDR10 Metadata for MaxCLL. This also allows optimization on both a scene-by-scene, and a frame-by-frame, basis so that every scene looks as good as the capabilities of the TV/projector allow.

To simplify access to the **DTM** parameters, press the "left arrow" when the Radiance Pro OSD is not on the screen. You can also access HDR setup parameters in the **MENU → Input → Options → HDR Setup**.

Generally, the "Left Arrow" **DTM** parameter menu is used to adjust DTM parameters. The HDR Setup Menu can be used to make changes and has a additional options:

Lumagen recommends not changing the additional setup controls in these sub-menus.

Note:
More HDR parameters are available in Service Mode. However, Lumagen strongly advises *against* changing the additional values available in Service Mode since any changes are likely to degrade the image.

HDR Intensity Mapping

Low Display Ratio

The **Low Ratio** parameter adjusts the TV/Projector's reported effective **Display Max Light** for dark scenes. When the **Low Ratio** is selected in the "Left Arrow" menu, the menu reports both the dark and bright scene Max Light effective values. **Low Ratio** has a range of -31 to 31, and the default is 31. Lumagen recommends this be adjusted so the reported Low Max Light is about equal to the projector's max light output. If needed, adjust while watching a very dark scene. Note: **Low Ratio** affects the active input and input-memory only. The command is:

> **MENU → Input → Options → HDR Setup → HDR Mapping → Low Display Ratio**

High Luminance Desaturation

To model human vision for very bright objects, the Radiance Pro DTM can desaturate extremely bright colors for the very few scenes where this might better represent these objects on a projector (or TV) that. For example, a 3500 nit explosion in a movie, shown on a 100 nit projector cannot naturally show the desaturation. The **DeSat** control allows the user to adjust these very bright saturated colors in the few scenes that have them. One example is Mad Max: Fury Road at 0:28:29 where a pickup explodes in the air. The content shows the explosion as burnt orange. Some argue in real life there would be more yellow in the explosion. Increasing the **DeSat** control can change the explosion to have more yellow. Many use the default value of 4, but you can set this to your preference. Note that **DeSat** has no effect at all on most scenes. **DeSat** settings are Off, Auto, Low, Med, High. Note: This affects the active input and input-memory only. The command is:

> **MENU → Input → Options → HDR Setup → HDR Mapping → High Luminance Desat**

Crossover Point

HDR Mapping Crossover Point

Not used for Dynamic Tone Mapping (**DTM)**. Activate for Static Tone Mapping (**STM**). The Crossover point sets the MaxCLL value where the Static Tone Mapping uses the Low settings or the High settings. The command is:

> **MENU → Input → Options → HDR Setup → Crossover Pt → Crossover**

Max Light Default

Some HDR sources do not set Max CLL (Maximum Content Light Level) or do not have the correct HDR metadata. This default value is used, when needed, in Auto mode. Set "Use Default" to "Always". HDR10 Max CLL to use if MaxCLL is not reported by the source

Section 8 – HDR Setup

MaxCLL

The value for ***Max Light*** in the active **CMS HDR Mapping** menu is shown in the left arrow menu to make it easier to adjust. See the **Max Light** section of the **Output CMS** menu for more information. In the Left-arrow menu up and down arrows are used to adjust ***Max Light***. The step size varies based on the current ***Max Light*** value. Lumagen recommends Max Light setting of about 5 to 6 times the measured light output for projectors. For TVs, Max Light can be from 1X to 3X the measured maximum light. View high MaxCLL content and adjust if necessary. Changes to ***Max Light*** affect all inputs and input memories that use the active CMS memory. The command is:

> **MENU → Input → Options → HDR Setup → Max Default→ Default**

Dynamic Controls

Dynamic Pad

Select the Dynamic Pad (***DTM Pad***) to be added to the calculated scene brightness to minimize the chances of clipping. Since the Radiance Pro **DTM** sets the transfer function for a scene at the first frame, if a scene gets brighter there is a chance the scene could clip later in the scene. ***DTM Pad*** selects how much pad the Radiance Pro adds to the calculated scene brightness to account for this case.

The Radiance Pro **DTM** now adapts the transfer function within a scene. So, the amount of ***DTM Pad*** needed to prevent clipping is much less than when **DTM** was first introduced. So, the recommended value for ***DTM Pad*** has been reduced over time as the adaptation has been optimized. There are 8 possible settings for the "Dynamic Pad" for DTM (0 to 7). Lumagen recommends using the default value of 3 to 5. Note: This affects the active input and input-memory only. The command is:

> **MENU → Input → Options → HDR Setup → DynamicCtrls → Dynamic Pad**

Set Defaults

Reset input HDR options to default values. You. The command is:

> **MENU → Input → Options → HDR Setup → Set Defaults**

Section 9 – Audio Configuration

The Radiance video processor supports the HDMI 2.0 audio formats. This means that Dolby Digital TrueHD™ and DTS Master-Audio™ Bitstream formats are available.

By default, the audio EDID from the device on HDMI Output 1 is passed back to all source devices. If the audio processor is not connected to Output 1, or to help with any power-on order or EDID issues, the Audio EDID reported back to sources can be manually selected as follows:

MENU 0745   Report 2 channel PCM at 44.1 and 48 KHz in EDID back to sources
MENU 0746   Report 2 channel PCM at 44.1 and 48 KHz, and DD 5.1, in EDID back to sources
MENU 0747   Report all HDMI audio modes, except ATMOS and DTS-X, in EDID back to sources
MENU 0748   Report all HDMI audio modes in EDID back to sources
MENU 0943   Report common HDMI audio modes from Radiance EDID back to sources (feature toggle)
MENU 0944   Report basic HDMI audio modes (2-Ch PCM and DD 5.1) back to sources (feature toggle)

You can also select which audio modes to report back to sources in the Options menu independently for each input.

Audio Mute Control

Audio is muted when changes are detected on the input. Some audio receivers need to be muted longer in these situations to avoid unintended noise. Range 0.0 to 7.5 seconds. The command is:

MENU → Global → Audio→ Mute Control

Section 10 - Calibration

Whether you use a TV or a projector, your theater system needs to be calibrated to provide the best image quality. To brighten the image in the show room, most display manufacturers intentionally change the display calibration away from industry standards to make the display brighter. Unfortunately, most displays do not have the controls necessary to undo these errors. Often their calibration controls are not mathematically correct, making proper calibration impossible without an external calibration device such as the Radiance Pro.

Correcting these intentional errors, and other unintentional errors so you "See what the director intended™" is a primary function of the Radiance Pro.

It is recommended that you hire a professional calibrator, to perform the calibration. An experienced professional calibrator who has the necessary tools and experience, with both 1D and 3D LUT based calibration, is necessary to extract the best performance from your theater. However, you can improve your picture without hiring a professional. You just need to learn how to use the Lumagen test patterns. Then you need to spend time learning how various calibration controls interact and how they affect image quality. The most important step is to properly adjustment the **Black Level** in the TV or projector menu.

To understand Radiance calibration, it is important to note that setup and calibration parameters are split into "input memories" and "output configurations." Input memories are for source specific setup and adjustment. Output configurations are for display setup and calibration.

Lumagen recommends using the internal Radiance test patterns to calibrate the output configuration. This will ensure that any variance between sources does not affect the calibration. Note that the Radiance Pro test patterns are in "Source-Gamma" space for all source formats.

Calibration training is beyond the scope of this document. Training classes for calibration are provided by Professional Video Alliance, and by the Imaging Science Foundation. We recommend you take one of these courses if you are interested in learning about calibration. The recommended Lumagen calibration sequence for Rec.709 is discussed in TechTip 2 on the Lumagen support "Manuals and Tech Tips" page at http://www.lumagen.com/testindex.php?module=manuals.

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Note:
Tech Tip 2 is for SDR calibration and does not have information specific to HDR. There is also a Setup Slide Set you can request from Lumagen.

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The Radiance Pro calibration-pipeline, consists of Color/Hue controls (generally not used), and a 3D LUT (Look-Up-Table) which is followed by a 1D grayscale/Gamma LUT.

It is best to calibrate your system using automated calibration software because the Radiance Pro's 17x17x17 (4913) point 3D LUT used for Gamut calibration has too many points to calibrate manually. Companies such as Light Illusion, Portrait Displays (Calman), and Chromapure, provide calibration software and workflows for automated display calibration using the Radiance Pro.

Supporting HDR and Rec 2020 color Gamut increases the complexity of calibrations. However, once calibrated using the Radiance Pro video processor, your theater can take advantage of the latest UHD movies including support for the HDR and Rec 2020 standards. It is even possible to watch HDR/Rec2020 sources on non-HDR displays (to the best ability of the display for brightness and color Gamut). With proper calibration, your Radiance Pro will be able to drive your Rec 709 TV/projector to its full capabilities, to allow a wider color Gamut, if the display exceeds the Rec 709 standard.

The **HDR** standard supports display brightness up to 10000 Nits and the Rec 2020 color standard has a much larger color Gamut than Rec 709. *Tone Mapping* can adapt the source to the projector/TV maximum brightness and is a critical aspect of HDR and Rec 2020 viewing. Calibrating using the Radiance Pro 3D LUT implements the color portion of Tone Mapping. The Radiance Pro **HDR Intensity Mapping** implements the intensity (grey scale) portion of Tone Mapping. See the **HDR Intensity Mapping Control** section for additional information on how HDR sources are adapted for viewing on TVs and projectors.

The Radiance Pro uses the source's HDR/Rec2020 Info Frame flags to select either a Rec 709 CMS memory (default is CMS0) or an HDR/Rec2020 CMS memory (default is CMS1). Which CMS memory is selected for each of these cases can be changed using the **Output Setup** menu.

When viewing HDR source material it is recommended that the Radiance Pro be set up to output "HDR in a SDR container" by setting **CMS1 → Colorspace → Colorspace = SDR2020**. In this case the Radiance Pro output HDR Info-Frame is not used. Setup the display by making sure that the optimal display mode and settings are selected for HDR sources. Select a wide Gamut and a bright output mode that still has

Section 10 - Calibration

excellent black levels. It is also recommended that the Radiance Pro Dynamic Tone Mapping (DTM) be enabled for HDR sources.

For a non-HDR display you need to set the Radiance Pro video EDID to report support for HDR and Rec2020 to the video source. Select the "Yes" options for HDR, HLG, and Rec 2020 in **MENU → Global → Video** and do a "**Save**". If you have a HDR display you should still set these to "Yes" as it can help with Power-On order dependencies. Reporting HDR, HLG, Rec 2020, mode support is not the default.

Some 4k HDR players do not read the EDID/HDR information when the Hotplug connection on the HDMI output, is toggled, as they are supposed to. This makes these players power-on order dependent. By manually enabling HDR and Rec 2020 the HDR display can be off, or even disconnected, and the Radiance Pro will still report HDR and Rec 2020 back to the video sources.

The HDR Intensity Mapping has output conversion curves for the HDR10 EOTF (Electro Optical Transfer Function) output mode and for SDR EOTF output mode, for displaying HDR on SDR displays. In SDR output mode (**CMS1 → Colorspace → Colorspace = SDR2020**), the **HDR Intensity Mapping** modifies the data so the image adapts the EOTF of the source such that the image looks as correct as possible on a SDR display. The CMS **Colorspace** selection, along with the **Gamma to 3D LUT** is then used by **HDR Intensity Mapping** to select the appropriate output EOTF. Additional information on selecting the **Gamma to 3D LUT** and **Colorspace** can be found in the **Output CMS HDR Mapping** section.

HDR calibration hints:

1. In **Output Setup Menu → 2D** select both 601/709 and SDR/2020 CMS columns **= CMS1**
2. Press OK to accept
3. **Set CMS1 → Colorspace → Colorspace = SDR2020**
4. **Set CMS1 → Colorspace → 2020 <-> 601/709 = Off**
5. In the calibration software select the Radiance Pro as the pattern generator and "TV"
6. In the calibration software, select Rec 2020 primaries, Gamma = 2.4
7. Set the display to neutral settings.
8. Set the display to a reasonable color Gamut mode.
9. NOTE: Even though calibration is for HDR, the test pattern mode is SDR.
10. Turn off all video sources that are connected to the RadiancePro. Active sources can create interrupts which lengthen draw time. Calibration software may not account for this extra time
11. Calibrate Black as described below
12. Calibrate "Contrast" using Adjustable->Contrast1. No need for >100% white since tone mapping limits output to 100% white
13. Calibrate CMS1 1D LUT and, if desired, 3D LUT
14. After 3D LUT, check Grayscale and adjust if necessary
15. Enable CMS1 HDR Mapping, and set Display Max Light
16. In the **Output Setup Menu → 2D** select 601/709 column **= CMS0**, and HDR/2020 CMS column **= CMS1**
17. Press OK to accept
18. Calibration software saves its changes
19. Save any manual adjustments

SDR calibration hints:

1. In **Output Setup Menu → 2D** select 601/709 column **= CMS0** (default)
2. Set **CMS0 → Colorspace → Colorspace** = SDR2020
3. During calibration set **CMS0 → Colorspace 2020<-> 601/709 = On**
4. Press OK to accept.
5. Select Rec 2020 mode in the projector/TV. This works because the Pro converts the 709 data to 2020 data. When displayed in 2020 mode by the TV/projector, the 709 point are correct.
6. In the calibration software select the Radiance Pro as the pattern generator and "TV"
7. In the calibration software, select Rec 709 primaries, Gamma = Bt.1886
8. Set the display to neutral settings.
9. Set the display to a reasonable color Gamut mode.
10. Turn off all sources. Active sources can create interrupts which lengthen draw time. Calibration software may not account for this extra time
11. Calibrate Black as described below
12. Calibrate "Contrast" using Adjustable->Contrast1
13. Calibrate CMS1 1D LUT and, if desired, 3D LUT
14. After 3D LUT, check Grayscale and adjust if necessary
15. Press OK to accept
16. Calibration software saves its changes

17. Save any manual adjustments

For both HDR and SDR calibration, setting the black level correctly is the first and most important step in calibration. An incorrectly set black level will make the image look "washed out." Having the correct black level will increase the image contrast ratio and provide an improved image. Setting the black level is something that should be done at the time of installation for every installation, even if no other calibration is planned. Adjusting the black level does not require any special equipment or training.

To adjust the black level, select the "Reference Pattern" mode "*Video Black"* test pattern (see Tech Tip 5 for information on test patterns) from the "Other" menu. Then increase the display's Brightness (black) control until the black-field area becomes visible. Then reduce the display's Brightness control until this black background area does not get any darker with an additional click of the control.

After adjusting the display's Brightness control, select the Radiance Pro's "Adjustable Pattern" *Contrast 2*. Then the Radiance Pro **MENU** button to bring up the Radiance **Black** setting for the current CMS memory. Then press **OK** to enable editing the black level. Look for the vertical bars in the middle of the screen. There are nine of these, which are a black (0%) vertical bar in the very center of the image, four vertical bars (1%, 2%, 3%, and 4%) just to the right of this center black bar, and four vertical bars (-1%, -2%, -3%, -4%) just to the left of the center black bar. If necessary, increase or reduce the **Black** level, for the current CMS memory, until the +1% to +4% bars to the right of the center black bar are visible versus the center black bar, and the -1% to -4% bars to the left of the center black bar are not visible versus the center black bar. If the black levels are not good enough in the display, the -1% and +1% bars may either be both visible or both not visible for various settings. In this case it is most important that the -1% bar is not visible as compared to the center black bar. Once you have this adjusted, press **OK** to accept. The black level should be adjusted for both CMS0 (SDR) and CMS1 (HDR).

Typically, the calibration software makes two sets of measurements, one in the display mode that will be used for SDR/Rec709 material and one in the display mode that will be used for HDR/Rec2020 material. Alternately it is possible to use a single bright mode with a large Gamut for both HDR and SDR sources. For this you select the output Colorspace as SDR2020, SDRP3, or SDR709, depending on the native Gamut of the projector or display, for both CMS0 and CMS1.

Once calibration has been completed enable the **CMS1 → Colorspace → Colorspace = Auto Convert**. For **CMS1 → HDR Mapping** enable **HDR Intensity Mapping** and set the CMS HDR **Display Max Light**.

You should try several **Display Max Light** values using it as a coarse "brightness" control to see which gives the best HDR image with default **HDR Mapping** parameters. With Dynamic Tone Mapping enabled, pick a scene in a high "MaxCLL" HDR movie with both dark and bright areas (e.g. pickup truck explosion in Mad Max Fury Road™ at 28:29) to adjust HDR Intensity Mapping parameters. Pause the scene and then adjust the **Max Light** entry in the **CMS1 → HDR Mapping** menu.

For projectors with light output from about 16 to 30 foot-Lamberts **Display Max Light** settings roughly in the range of 300 to 600 range are typical. The correct choice for your system is affected by the projector light output, the screen "gain," and your personal preference concerning trading off normal scene detail versus highlight detail.

NOTE:
There are several other HDR Tone Mapping controls, but for most systems only Display Max Light needs to be adjusted since the default parameters work well. However, the other controls are available to tune the image for specific screens or projector/TVs, or if you want to use the available intensity range more for mid-tones, or for highlights. Use the HDR Mapping parameter input menu to adjust to your preference.

Section 11 – Miscellaneous Commands

System Settings

Menu Control

Menu Mode

The menu mode controls what settings can be changed in the menu. In Locked Mode nothing can be changed; in the User Mode, Service Mode (temporary) or Service Mode (permanent). The default setting is User Mode, which allows access to all the basic controls. The Service Mode allows access to all controls including the color gamut controls. The configuration can be locked to prevent unintended changes. When locked, input selection functions normally, but setup parameters are fixed. The command is:

MENU → Other → Menu control → Menu Mode → (Locked, User mode, Service mode temporary, Service mode permanent)

Timeouts

In the "Normal" setting the menu and test patterns will timeout in approximately three minutes. The "Slow" setting extends the timeout by x10. Test patterns also have a setting for "Never" timeout. The command is:

MENU 0 9 0 5 (Normal, Slow) Ok
Or
MENU → Other → Menu control → Timeouts → (Normal, Slow, Never)

OSD Enable

On-Screen-Display (OSD) shown after each user command. Shows the selected input, input aspect ratio, and zoom. The command is:

MENU → Other → Menu control → OSD enable → (On, Off)

Input Reselect

By default, when the currently active input is reselected the input will be reinitialized and the input number will be displayed. This can be turned off so reselecting the active input has no affect. The command is:

MENU → Other → Menu control → In Reselect → (On, Off)

Menu Placement

In the "Standard" placement the menu is in the center of the screen. Choose "Center open" to move the menu so that the center of the screen is open for display calibration measurements. The command is:

MENU → Other → Menu control → Menu Options → Menu placement→ (Std, Cntr Open)

Input Menu

Enables pop up list of inputs to select from when "Input" button is pressed on the remote. The command is:

MENU → Other → Menu control → Menu Options → Input Menu → (Off, On)

Menu Size

Sets the size of the menu. The command is:

MENU → Other → Menu control → Menu Options → Menu Size → (Small,Med,Large,Full)

OnOff Setup

Initial Power State

When power is connected, the unit will turn "on" automatically, or go to "standby-mode". The command is:

MENU → Other → OnOff Setup → Auto On → (Standby, Turn On)

Section 11 - Miscellaneous Commands

Initial Input Selection

Sets which input and input memory is selected when the unit is turned on, either after power has been removed or the unit has been put into standby. The command is:

MENU → Other → OnOff Setup → Input Select→ (After Power Removed, After Standby)

Initial Input Selection Delay

For streamers that go into an unusual state after prolonged sleep mode (e.g. overnight), the Radiance Pro can delay activating the input selected at power-on by an additional 3 seconds. This helps with power on for such sources. The command is:

MENU → Other → OnOff Setup → Input Select→ Delay Selection → (On, Off)

On Message

A programmable string can be sent to another device via the RS-232 connector to turn the device on. When using On/Off messages it is recommended to either turn off echoing in the receiving device or to enable RS232 delimiters on this unit so echoed back characters are not confused for commands. The command is:

MENU → Other → OnOff Setup → On Message

Off Message

A programmable string can be sent to another device via the RS-232 connector to turn the device off. When using On/Off messages it is recommended to either turn off echoing in the receiving device or to enable RS232 delimiters on this unit so echoed back characters are not confused for commands. The command is:

MENU → Other → OnOff Setup → Off Message

Message Control

Sets the RS-232 parameters that are used for sending a power on/off message to another device. The command is:

MENU → Other → OnOff Setup → Message Ctl

Standby Power

Power used when unit is in standby mode. If the 'Lowest" setting doesn't work in your system, use the "Normal" setting. The command is:

MENU → Other → OnOff Setup → Stby Power → (Lowest, Normal)

Test Pattern

The Radiance Pro can generate test patterns in the video modes that will be used for your display. The input colorspace (Rec.709 or Rec.2020), HDR (On, Off) output mode (480p60 through 2160p60), 3D type (Off, SbyS, TopB, FrmP), CMS, and Style can be selected. You can calibrate your display without the need to switch to a particular video source and having it generate a specific video mode. You must select "Ref w/Mode" or "Adj w/Mode" to generate patterns with your test mode settings.

Warning:

Some test patterns can burn plasma and CRT displays if left on for more than a few seconds.

The Radiance Pro has large selection of test patterns. Similar test patterns are organized into "Test Pattern Groups." Reference test patterns are only affected by the Radiance Pro output PC/Video level setting and are the same as the patterns produced by a video test pattern generator. Adjustable patterns allow viewing the effect of the Radiance Pro output color management settings. The Warm Up test pattern displays a 20 IRE to 50 IRE gray screen. See Radiance Tech Tip 5 for more information. The command is:

MENU → Other → Test Pattern→ Pattern → (Reference, Adjustable, Warm up)

◄ and ► arrows step to the previous or next Test Pattern Group.
▲ and ▼ arrows can adjust the intensity of many test patterns from 0 to 100 IRE.
"HELP" Pressing the HELP button brings up a Help Menu.
"4" Pressing the number 4 steps through the patterns within the current Test Pattern Group.
"Prev" Toggle between the source and the pattern.
"**OK"** Exit the test pattern command but leave the pattern on-screen. You can then adjust various parameters to judge their effect on the pattern.

Section 11 - Miscellaneous Commands

 "ALT" Jump back into the pattern command.

Note: "PREV" and **"Alt"** functions are only valid if you leave the pattern on-screen by pressing **"Ok."**

Reference Test Pattern

The Reference test patterns are only affected by the Output PC/Video level setting. The command is:

        MENU → Other → Test Pattern → Reference → OK

Adjustable Test Pattern

The Adjustable test patterns allow viewing the affect of all the Output Color Management settings To exit the test pattern command, but leave the pattern up, press "OK". You can then see the affect of Output settings on the pattern. Press "Prev" to toggle between the source and the pattern. Press "Alt" to jump back into the pattern command. The "Prev" and "Alt" functions are only valid if you exited the pattern command by pressing "OK". The command is:

        MENU → Other → Test Pattern → Adjustable → OK

Display warmup Pattern

Displays a warmup pattern of IRE 20 to 50. Use the arrow buttons to change the IRE level. The command is:

        MENU → Other → Test Pattern → Warm up → OK

Reference Test Pattern with Test Mode

Displays the Reference Test Pattern using the selected output "Test Mode". The command is:

        MENU → Other → Test Pattern → Ref w/Mode → OK

Adjustable Test Pattern with Mode

Displays the Adjustable Test Pattern using the selected output "Test Mode". The command is:

        MENU → Other → Test Pattern → Adj w/Mode → O

Test Mode

Select the input colorspace, output Mode, CMS and Style to generate test patterns in modes which will be used, without the need to switch to a particular video source and having it generate a specific mode. Select "Ref w/Mode" or "Adj w/Mode" to generate patterns with the test mode settings. The command is:

        MENU → Other → Test Pattern → Test Mode → OK

Options

Display "R" of "A" with the test pattern to indicate if it's a Reference or Adjustable pattern. The command is:

        MENU → Other → Test Pattern → Options → Show R/A onscreen → (Yes, No)

I/O Setup

Remote Control Arrow Buttons

This command changes the default usage of the arrow buttons on the remote. By default the Up/Down arrow buttons control zoom, the left arrow displays the **HDR Mapping** parameter menu, and the right arrow displays the **Darbee** menu. The default behavior can be changed. The command is:

        MENU→Other→I/O Setup→Remote Ctl→(Up/Down arrows, Rt/Left arrows)

LED Setup

Controls the operation of the Blue LED on the front panel. The LED can be set to "Blue" to be a power on indicator or set to "Dark" so that it is off when the Radiance is operating. The command is:

        MENU → Other→ I/O Setup → LED Setup → (Blue, Dark)

Section 11 - Miscellaneous Commands

RS-232 Setup

With echo on the Radiance will echo all characters sent to it. With echo off the Radiance will only send a message at power on/off. With echo set to off with status, the power on/off messages are changed to status responses. See Tech Tip 11 for delimiter usage and more details. The command is:

MENU→Other→I/O Setup→RS-232 Setup→(Echo,Delimiters,Report change)→(On, Off)

Auto Input Select

When enabled, this list can be used to auto switch to an active input when the current video source is turned off. The priority 1 input is the first input tried when the current video source is turned off. HDMI inputs can be auto selected when turned on by setting "Select when On" to "Y". Disable auto selection by deleting all entries in the list. The command is:

MENU → Other → I/O Setup → Auto Select

Kaleidescape

For most projectors changing the video mode (i.e. 4k24 to 4k60) is slow. The Kaleidescape Strato player always uses 60hz for its menu but when playing a movie it's preferable to have it set to play at 24Hz. So, going between menu and movies can leave the viewer sometimes waiting 30 seconds with a blank screen while the equipment syncs up to the new output mode.

There is a way to detect the special case of Kaleidescapes' menu screen and with a new option in the Pro we can eliminate this slow resync time between menus and movies and keep 60Hz videos looking good. Note that this mode shows Strato menus at 24 Hertz. So, they will not be as smooth as showing them at 60 Hertz.

To make the OSD to movie transitions faster for the Strato, make a change in the Kaleidescape players advanced video setup menu and set the HDMI Content Type Metadata to 'Transmit content type metadata' (the Kaleidescape will now output a special graphics flag over HDMI when in its menu). In the Pro menu under **Input → Options → HDMI Setup → Type**, set the **Graphic Flag Use** setting to "Use." Now when the Kaleidescape is in its menu the Pro will detect and use the graphics flag to classify the input mode as "Other."

The last setting to make is in the Pro's Output Setup menu. For the input mode condition of 'Other' change the Pro's output mode, CMS's and Style selection to match what is setup for when 24Hz input mode is detected. The Pro will now stay in the same 24Hz output mode when Kaleidescape changes between 60Hz OSD and 24Hz movies, but still allow the Pro to change to a 60Hz mode when 60Hz videos are played. With this setup the time the Starto takes to start or stop a movie becomes the limiting factor. This time has been measured at about 6 to 7 seconds, compared to 20 or more seconds if the Pro output switches from 60 to 24 for the movie.

Zoom Step

Zoom Step

Sets the size of the Zoom step to 5% or 15%. The command is:

MENU → Other → Zoom step → (5%, 15%)

Memory Usage

Configuration Memory Usage

By default, when a configuration memory (A-D) is chosen the selection applies to all inputs. For example if input 1A is active, then input 2 is selected followed by selecting "MemB," if input 1 is again selected, it would use configuration memory 1B. This is called the "Common" configuration memory mode. Generally, this mode is used when specific day and night calibrations are desired and used for all inputs.

Alternately, you can set the memory usage to be "Per Input." That is the configuration memory selection is independent for each input. In this mode, using the example above, starting with input 1A, changing to input 2, pressing "MemB" and finally selecting input 1, results in using configuration memory 1A.

The command is:

MENU → Other → Memory Usage → (Common, Per Input)

Section 11 - Miscellaneous Commands

Fan Control

Fan Control

The target FPGA ("Chip") temperature can be selected as well as the minimum fan speed. It is recommended that the target FPGA Chip temperature is selected as 84C, which is the default. Temperatures up to 94C can be selected, and for most systems work fine, but system speed is rated at 85C.

The minimum fan speed helps maintain a more consistent FPGA temperature.

The FPGA temperature is shown in the menu and on the Info Screen page 2. The command is:

> **MENU → Other → Fan Control**

Info

Displays four pages of status information about the input video, output video and operation of the Radiance Pro. This information is particularly useful for installation and trouble shooting. Press the **"OK"** button to display the next info screen. You can also display these status screens by pressing the **"OK"** button, when no menu is displayed.

Quick Keys

Quick Keys

There is an easily assessable, top-level, menu called "Quick Keys", which gives access to functions that are normally selected using buttons on the Lumagen remote. This menu can be used with programmable remotes that have limited buttons. You can use the arrow buttons on the remote to highlight one of the functions and press "Ok" to execute the function. Alternately you can use a number button on the remote to highlight one of the functions and then press "Ok" to execute the function. (0)4:3, (1)LBOX, (2)16:9, (3)1.85, (4)2.35, (5)NLS), (6)Zoom+, (7)Zoom-), (8)MemA, (9)MemB, (n/a)MemC, (n/a)MemD, (n/a)3D Off, (n/a)3D SbyS, (n/a)3D TopB. The command is:

> **MENU → Quick Keys → (function) → Ok**

Save

Saving the Configuration

> ***NOTE:***
> *If a Save command is not executed after making changes, the changes will be discarded when the unit is put in standby mode, or power is interrupted.*

Permanently save the current configuration. Note that, once saved, the configuration is retained even if the unit is disconnected from power. The configuration from the previous save is retained to allow one level of save-undo. You can use the Radiance Configuration Utility found on the Lumagen.com support page to download a configuration file to your PC. The command is:

> **MENU → Save → OK → OK → OK**

Undo

Revert to the configuration over-written by the last **SAVE** command. Repeating the Save Undo command toggles between the last two saved configurations. The command is:

> **MENU → Save → Undo → OK**

Restore from Internal Backup memory

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

> **MENU → Save→ Restore Backup → OK**

Section 11 - Miscellaneous Commands

Load Factory Settings

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

MENU 0 9 9 9

Or **MENU** $\rightarrow$ **Save**$\rightarrow$ **FactoryReset** $\rightarrow$ **OK**

Section 12 – 3D Support

The Radiance supports HDMI 1.4 "3D". This includes 3D video source switching, 3D processing, 3D scaling, 3D aspect ratio control, and a number of 3D format conversions. The Radiance can stretch 3D images for a 2.35 screen. The Radiance can accept HDMI 1.4 "3D" material and output either the left-eye or right-eye image, for dual projector 3D systems that use passive 3D glasses. The Radiance can also be used to display 3D on many 2D displays, such as a CRT display or projector.

If HDMI Output 1 on the Radiance is connected to a non-3D AVR the Radiance can automatically turn off video on that output when selecting a 3D video source. Most non-3D AVR's get confused if you try to send them a 3D video signal.

Any HDMI cable, with good electrical characteristics, will work for displaying HDMI 1.4 3D video on 3D displays.

3D Types

The Radiance can receive all the commonly used 3D types. The Radiance has options to convert 3D types, which are not supported by your 3D display, to a format supported by the display. For example, the Radiance automatically converts optional 3D formats into required 3D formats. For CRT displays all supported 3D formats are converted to 3D Frame Sequential. This allows 2D CRT displays/projectors to display 3D images.
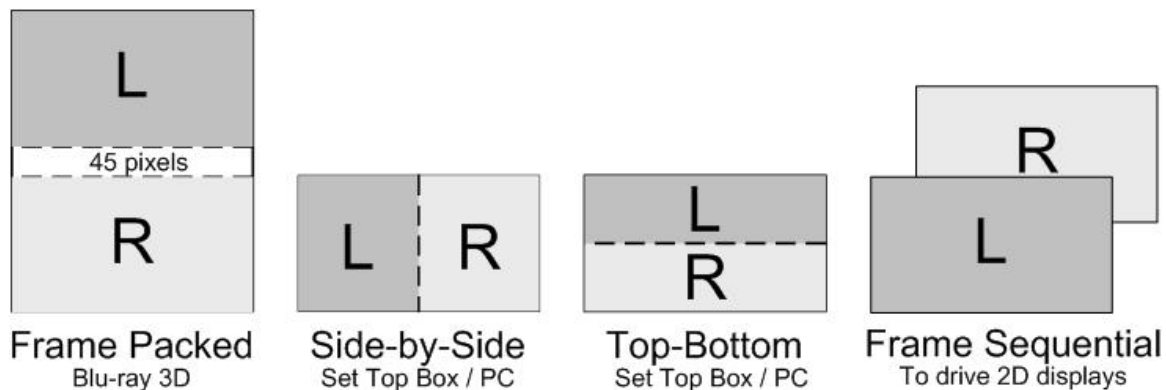
Frame Packed

The 1080p24 3D frame-packed mode consists of a frame that contains a full resolution left eye image, 45-pixel active buffer, and a full resolution right eye image. Bluray movies use this 3D type and are stored on the disk at 1920x2205/24.

Side-by-Side

Consists of a frame that contains Side-By-Side sub-frames for the left eye and right eye images. Set top boxes and PC's use this 3D type.

Top-Bottom

Consists of a frame that contains Top-Bottom sub-frames for the left eye and right eye image. Set top boxes and PC's use this 3D type.

Frame Sequential

Consists of individual frames of left eye and right eye images that are transmitted sequentially. Some 2D CRT and other 2D digital displays can be driven with this 3D type in order to display 3D images. For this case, an external IR Glass Driver is needed to drive the 3D active glasses.

Section 12 – 3D Support

Separate Left and Right

The Radiance can accept HDMI 1.4 "3D" video and output either the left-eye or right-eye image for a dual projector 3D system that uses passive 3D glasses. This 3D system configuration uses two Radiance video processors.

3D Output Settings

The Radiance has support for all of the commonly used 3D video sources. If you connect a HDMI 1.4a compliant 3D video source and compliant 3D display, to the Radiance, you should automatically get a 3D image, using the Radiance default settings.

The Radiance has settings that you can use to display 3D video, using non-compliant 3D video sources and displays. The Radiance has settings to optimize the video on your 3D display. The Radiance also has settings to display 3D video on some 2D displays (See section titled "3D Support for 2D Displays" for further details).

3D Input Setup Menu

You can select the 3D output settings based on the input number, input memory, and input video mode. For any of the three input conditions you can select 'All" to apply the output setup to multiple input conditions. When making settings that apply to multiple input conditions you can leave any of the output settings unchanged by selecting the '---' option for that output setting. Press "4" for 'All' and press "5" to see the current settings. The command is:

> **MENU → Input → Input setup → 3D: → Ok**

3D Output Mode = Auto

By default the output is set to "Auto 2,1." The selection "Auto 2,1" means the Radiance automatically reads the EDID for the devices connected to both outputs, giving priority to Output 2, and automatically selects the appropriate output resolution. That is, if an active device is connected to output 2, the EDID from that device is read to determine the optimal video output resolution and the Radiance automatically selects the specified resolution. If no device is connected to output 2, or the device connected to output 2 is turned off, the Radiance uses the EDID from the device connected to Output 1 and sets the output resolution appropriately. Output 1 can have priority by selecting "Auto 1,2" from the *Video Output Select Menu*.

For "Auto" modes the output vertical rate is selected based on the input vertical rate. For example, input formats 480i60, 720p60, 1080i60 automatically select a vertical output rate of 60 Hertz. Input formats 576i50, 720p50, and 1080i50 automatically select a vertical output rate of 50 Hz. For a 1080p24 input format a 24 Hz output vertical rate is selected if the display supports a 24 Hz output vertical rate, otherwise a 60 Hz rate is selected.

If the priority output is connected to a 3D device, and the secondary output's device is not 3D, when a 3D source is detected the Radiance automatically disables video to the 2D output.

For analog displays and digital displays, that do not properly support EDID, the output mode must be selected.

The Radiance has support for all of the commonly used 3D Types (Frame Packed, Side-by-Side, Top-Bottom, and Frame Sequential). When the output 'Type' is set to 'Auto' the Radiance will convert all 3D modes and types to HDMI 1.4a mandatory 3D format.

3D Output Mode = Specific Format

The Radiance will convert all 3D input formats to the specified 3D output format. For example all 3D input modes can be converted to a 1080p60 side-by-side output mode. The command is:

> **MENU → Output → Output setup → 3D: → Ok**

3D Output Type = Specific 3D Type

The Radiance will convert all 3D input types to the specified 3D output type. i.e. All 3D input types can be converted to 3D Frame Sequential to drive a CRT display/projector. The command is:

> **MENU → Output → Output setup → 3D: → Ok**

Section 12 – 3D Support

3D EDID Configuration

By default the display's 3D capability is automatically detected using its EDID information. However, some 3D displays do not properly report their 3D capability in their EDID. This command allows the 3D output capability to be manually enabled (or disabled). The command is

MENU → Output → 3D Options → (Out1, Out2, Out3, Out4) → (Auto, Yes, No)

3D Setup Procedures

Normal Setup

For most new 3D video sources and displays, just connect the source and display to the Radiance. You will get a 3D image, with the Radiance default settings of 3D output 'Mode=Auto' and 3D 'Type=Auto'.

1. If starting with a unit in an unknown state, press "**MENU 0999**" to restore factory default settings and save the new settings by pressing "**MENU → Save → Save → OK → OK".**

2. Connect the *Radiance* outputs. If using only one *Radiance* output, use Output 1 if the *Radiance* needs to pass audio, or Output 2 if not. If using an AVR, or audio Pre/Pro, connect it to *Radiance* Output 1 and the display to Output 2.

3. Connect a video source that supports 3D to a HDMI input on the Radiance.

4. Turn on power to the display and video source.

5. You should now have a 3D image on your display.

Display Optimization

To get the best quality 3D image, on some displays, it is necessary to convert some or all of the 3D video modes to a specific 3D output mode. Research the display specifications, to determine the optimum 3D modes and types for your display.

For example; If a display shows 720p 3D video as a letterboxed image. You can set the Radiance to convert 720p 3D video to 1080p60 Side-by-Side 3D video, which is shown full screen on the display.

1. Set the appropriate Radiance output to "3D Capable" by pressing "**MENU → Output → 3D Options → Ok → (Out1/Out2) → Yes → Ok".**

2. For example; to set the Radiance 3D output to "1080p60" "Side-by-Side", press **"MENU → Output → Output Setup → 3D → Ok → Mode → 1080p60 → Type → SbyS → Ok".** Note: You need to select a 3D output mode before you can select a specific 3D output type.

3. Save the new settings by pressing "**MENU → Save → Save → OK → OK**".

Setup for Non-Compliant Displays

The Radiance also has settings to display 3D video on non-compliant displays.

1. If starting with a unit in an unknown state, press "**MENU 0999**" to restore factory default settings.

2. Connect the *Radiance* outputs. If using only one *Radiance* output, use Output 1 if the *Radiance* needs to pass audio, or Output 2 if not. If using an AVR, or audio Pre/Pro, connect it to *Radiance* Output 1 and the display to Output 2.

3. Connect a video source that supports 3D to a HDMI input on the Radiance.

4. Turn on power to the display, Radiance and video source.

5. Set the appropriate Radiance output to "3D Capable" by pressing "**MENU → Output → Output Setup → Ok → (Out1/Out2) → Yes → Ok".**

6. Save the new settings by pressing "**MENU → Save → Save → OK → OK".**

Section 12 – 3D Support

Setup for Non-Compliant 3D Video Sources

The Radiance also has settings to display 3D video using 3D video from non-compliant video sources. It is only necessary to manually set the 3D input mode on the Radiance if the video source doesn't transmit that it's displaying a 3D mode.

1. If starting with a unit in an unknown state, press "**MENU 0999"** to restore factory default settings.

2. Connect the *Radiance* outputs. If using only one *Radiance* output, use Output 1 if the *Radiance* needs to pass audio, or Output 2 if not. If using an AVR, or audio Pre/Pro, connect it to *Radiance* Output 1 and the display to Output 2.

3. Connect a video source that supports 3D to a HDMI input on the Radiance.

4. Turn on power to the display, Radiance and video source.

5. The Quick Key Menu has settings to set the Radiance input to 2D, 3D Side-by-Side, or 3D Top Bottom mode, press "**MENU → Quick Keys → (3D Off, 3D SbyS, 3D TopB) → Ok".**

6. The direct commands to set the Radiance input to 2D, 3D Side-by-Side, or 3D Top-Bottom is:

2D	"**MENU 030"**
3D Side-by-Side	"**MENU 031"**
3D Top-Bottom	"**MENU 032"**

7. This setting isn't saved. Use the Quick Key Menu or a direct command to set the 3D input mode on the Radiance, when using a non-compliant 3D video source.

Section 13 – Darbee Visual Presence™

The Darbee Visual Presence (DVP™) feature can improve the perceived visual quality of an image. It does this by adding definition and contrast to the image.

> **NOTE:**
> *Darbee DVP is supported for input rates up to 1080p60.*

By default, the Darbee video enhancement is turned on at a normal level. You can experiment with the gain setting to find the appropriate level, for your video source and display. Many users find that "HD" mode with a "Gain" setting in the range of 25, to 40, provide the best overall results.

> **NOTE:**
> *The Darbee video processing is automatically turned off when a Radiance test pattern is displayed. When using an external test pattern, turn off DVP by setting "Enabled" to "No" in the Darbee menu.*

Darbee menu

There are two ways to access the Darbee menu as shown below:

> ➤ That is, press the right-arrow while menu is not displayed. **NOTE:** *This is the default behavior, but this can be changed to a different function.*

Or **MENU → Input → In Configs → [resolution] → [#] → Enhance → Darbee → Ok**

Darbee menu control

Press ➤, or ◄, arrow buttons as needed to select the setting to modify. Press the up and down arrow buttons to change the selected setting. Press the **EXIT** button to leave the Darbee menu.

Gain

The gain control range is from 0 to 120. Most people prefer a gain from 25 to 55 but the optimum setting varies for different video sources, displays, and based on personal preference. A gain setting of 0 effectively turns Darbee off, and has the same effect as setting "Enabled" to "Off".

Mode

- **HD** The "High Def" mode can be used for watching high definition video. It has the least aggressive processing and is virtually free from processing artifacts. This is also a good general-purpose mode to use for all types of video content.

- **Full** The "Full-Pop" mode can be used for watching low-resolution or lower-quality video. It has the most aggressive processing and isn't appropriate to use for watching high definition video or games. You may notice more image artifacts than Game Mode.

- **Game** The "Game" mode can be used for playing video games. It is also a good mode to use for watching Computer Generated Imagery (CGI) and other clean video sources.

Enabled

Set "Enabled" to "Yes" or "No" to turn the Darbee video enhancement on or off. Use this control to compare an image with and without the Darbee video processing.

View

Set "View" to "Full" for normal viewing with Darbee processing. Set "View" to "Split" to display a split-screen image, with Darbee processing on the right half of the screen. The split-screen can be used to demonstrate or evaluate Darbee DVP processing.

Section 14 – Direct Commands

Section 14 – Radiance Pro Direct Commands

Direct Commands can be used for initial configuration or for settings not in the menu. Direct Commands are entered using the Lumagen remote control or RS232 interface. Make sure to do a Save after changes.

Miscellaneous Direct Commands

MENU 0727	Erase Configuration Memory: In Service Mode enter command, answer question, remove power. More aggressive than Factory Reset. No Save needed. Cannot be undone.
MENU 0745	Report 2 channel PCM at 44.1 and 48 KHz in EDID back to sources
MENU 0746	Report 2 channel PCM at 44.1 and 48 KHz, and DD 5.1, in EDID back to sources
MENU 0747	Report all HDMI audio modes, except ATMOS and DTS-X, in EDID back to sources
MENU 0748	Report all HDMI audio modes in EDID back to sources
MENU 0811	Set current input to report HDCP 1.X back to sources
MENU 0819	Set all inputs/memories to report HDCP 1.X back to sources
MENU 0821	Set current input to report HDCP 2.2 back to sources
MENU 0827	Set output aspect to 2.35 (no Anamorphic-lens). This command implements all steps of the "Fixed 2.35 Output Aspect" section of Tech Tip 16
MENU 0829	Set all inputs/memories to report HDCP 2.2 back to sources
MENU 0850	Load original 18 GHz output microcode. Unit flashes output microcode and reboots
MENU 0851	Load new 18 GHz output microcode. Unit flashes output microcode and reboots
MENU 0860	Globally turn Darbee processing off
MENU 0861	Globally turn Darbee processing on
MENU 0870	Set default Auto output mode. This clears manual output overrides
MENU 0871	Set output as 4k24, 4k25, 1080p50, 1080p60 based on input rate
MENU 0872	Set output as 4k24, 4k25, 4k50, 4k60 based on input rate, rate match off
MENU 0873	Set output as 4k50/4k59.94, 9 GHz max, based on input rate, rate match off
MENU 0874	Set output as 4k50/4k59.94, 18 GHz max, based on input rate, rate match off
MENU 0875	Set HDMI output format as 4:2:2 on all styles (as appropriate)
MENU 0876	Set output as 2048x1080 at 24, 50, 60 Hertz, rate match off
MENU 0877	Set output as 4096x2160 at 24, 50, 60 Hertz, rate match off
MENU 0878	Set output as 18 GHz, even if not in display EDID, at 50, or 60 Hertz, rate match off
MENU 0879	Set output as 18 GHz, even if not in display EDID, at 24, 50, or 60 Hertz, rate match on
MENU 0910	Temporary Service Mode (see *Other->Menu Mode* which has Permanent Service Mode)
MENU 0927	Disable/Enable the "Show Info Page on RS232 <cr>" (carriage return) character
MENU 0940	Reinterlacing off
MENU 0941	Reinterlacing on. Reinterlacing only available for 480p and 576p source modes.
MENU 0943	Report all HDMI audio modes in EDID back to sources (feature toggle)
MENU 0944	Report basic HDMI audio modes (2-Ch PCM and DD 5.1) back to sources (feature toggle)
MENU 0966	Globally set Letter Box Zoom on or off, also globally set Auto Aspect to on of off.
MENU 0995	Disable IR commands. Repeat to re-enable IR commands. This is the only IR command accepted when IR commands are disabled. IR disable mode cannot be Saved
MENU 0999	Load Factory Settings (temporary Factory Reset unless Saved)
ALT PREV	Restart the Radiance Pro outputs. Use if TV/Projector has trouble locking on the signal

Output Voltage and EQ Control (Radiance Pro 5348 only)

MENU 07NV	N=Output Number (1, 2, 3). V=Output Voltage (2 through 9, 5=nominal (default). 2 is smallest swing, 8 is largest, and 9 has output EQ). Changes made must be "Saved".

Section 14 – Direct Commands

Output Resolution Direct Commands

The following output mode commands are intended for temporary testing only and affect only the current input, input memory and input resolution. These revert to Saved setting if a new input is selected and are not saved. Use the **Output Setup** Menu to program the output mode, or modes, if the "Auto" setting is not being used (or use **MENU** 0873, **MENU** 0874, **MENU** 0872 or **MENU** 0877 above).

480p:	**MENU 021**	Progressive with 480 active scanlines
720p:	**MENU 024**	Progressive with 720 active scanlines
1080i:	**MENU 028**	Interlaced with 1080 active scanlines
1080p24:	**MENU 020**	Progressive with 1080 active scanlines
1080p:	**MENU 027**	Progressive with 1080 active scanlines
4k24:	**MENU 023**	Progressive with 2160 active scanlines
4k50:	**MENU 025**	Progressive with 2160 active scanlines
4k60:	**MENU 029**	Progressive with 2160 active scanlines

IR Command List

See Radiance Tech Tip 12 "IR Command Interface" which contains a complete list of IR commands. This Tech Tip is available for download at http://www.lumagen.com.

RS-232 ASCII Command List

See Radiance Tech Tip 11 "RS232 Command Interface" which contains a complete list of RS232 commands. This Tech Tip is available for download at http://www.lumagen.com.

Section 15 – Specifications

Inputs

- Radiance Pro 424X: Up to four HDMI 2.0 with HDCP 2.2 up to 4k60, 9GHz std. upgradable to 18GHz
- Radiance Pro 444X: Up to eight HDMI 2.0 with HDCP 2.2 up to 4k60, 9GHz std. upgradable to 18GHz
- Radiance Pro 5348: Ten HDMI 2.0 with HDCP 2.2 up to 4k60, 18GHz standard

Processing

- Input resolutions up to 4k60 HDMI 2.0 with HDCP 2.2
- Inputs are 9GHz standard, upgradable to 18GHz in pairs. 5348 inputs are 18GHz standard
- Proprietary Lumagen No-Ring™ scaling
- HDR Dynamic Tone Mapping for HDR sources on HDR, or SDR, displays
- Vertical Keystone correction
- Darbee Digital Visual Presence™ (DVP™) enhancement technology (up to 1080p60 input)
- Full CMS (Color Management System) using a 4913-point 3D linear-gamma RGB color palette
- 21-point parametric grayscale and Gamma
- 10-bit processing for deinterlacing, plus a 12-bit calibration pipeline
- Reduced latency Game Mode
- Support for HDMI® "3D" including anamorphic lens scaling
- Convert common 3D formats to a required 3D format that is supported by the display
- Each input has 4 user configuration memories
- Each input user configuration memory has 8 resolution sub-memories (for HD inputs)
- Each resolution sub-memory is linked to one of 8 output configurations.
- 2:2, 3:2 and 3:3 pull-down for SD/HD film sources
- Per-pixel SD/HD video deinterlacing
- User programmable non-linear-stretch (NLS) mode to fill 2.35 screen using 16 :9 source
- 4:3, LBOX, 16:9, 1.85, 1.90, 2.00, 2.20, 2.35, 2.40 and NLS input aspect ratios
- Programmable output aspect ratio from 1.10 to 2.50
- Extensive support for anamorphic without need for an anamorphic lens
- Large suite of test patterns
- Programmable input/output color-space
- Y/C-delay calibration
- CUE and ICP filtering
- Eight channel audio up to 192 kHz, DD True-HD™ 5.1, ATMOS™, DTS Master Audio™ and DTS:X™ Bitstream

Outputs

- Output resolution up to 4k60 HDMI 2.0 with HDCP 2.2
- Radiance Pro 424X: Up to two 9 GHz HDMI outputs. Optionally one 18 GHz and one audio-only output.
- Radiance Pro 444X: Up to four 9 GHz HDMI outputs. Optionally two 18 GHz and two audio-only outputs.
- Eight channel audio at 192 kHz
- Supports DD True-HD™, and DTS Master Audio™ Bitstream formats
- Each HDMI output can provide "stand-by" power to an external device of +5V at 200 mA total including the display and any devices that scavenge power from the HDMI output.

Miscellaneous

- IR and RS232 control inputs (See Tech Tip 11 and 12 on the Lumagen.com support page)
- Internal USB-to-serial adaptor for calibration or software updates
- Wired IR format command input
- Universal, 100-240V, ~50/60Hz external 12 VDC 5 Amp power supply
- Dimensions are 17" W x 9.5" D x 1.75" H (1U case, except Radiance Pro 424X-C
- For Radiance Pro 424X-C dimensions are 11.25" x 1.8" x 5.3"
- Optional rack mounting ears, except 424X-C is not rack mountable

P E R C O R S I
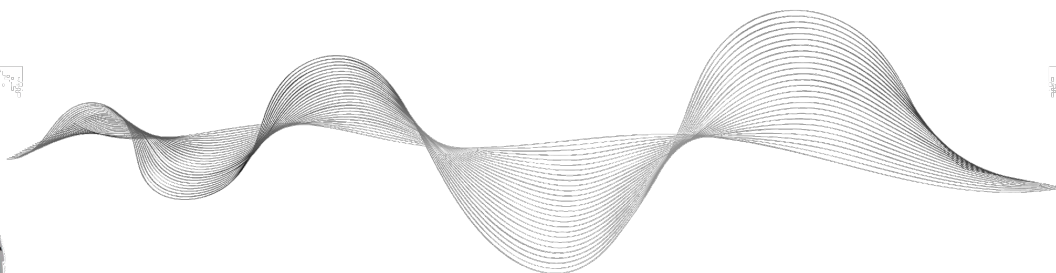
S T E R E O

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Chiamare per dimostrazioni del RADIANCE PRO 4K

ROHS

CE

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