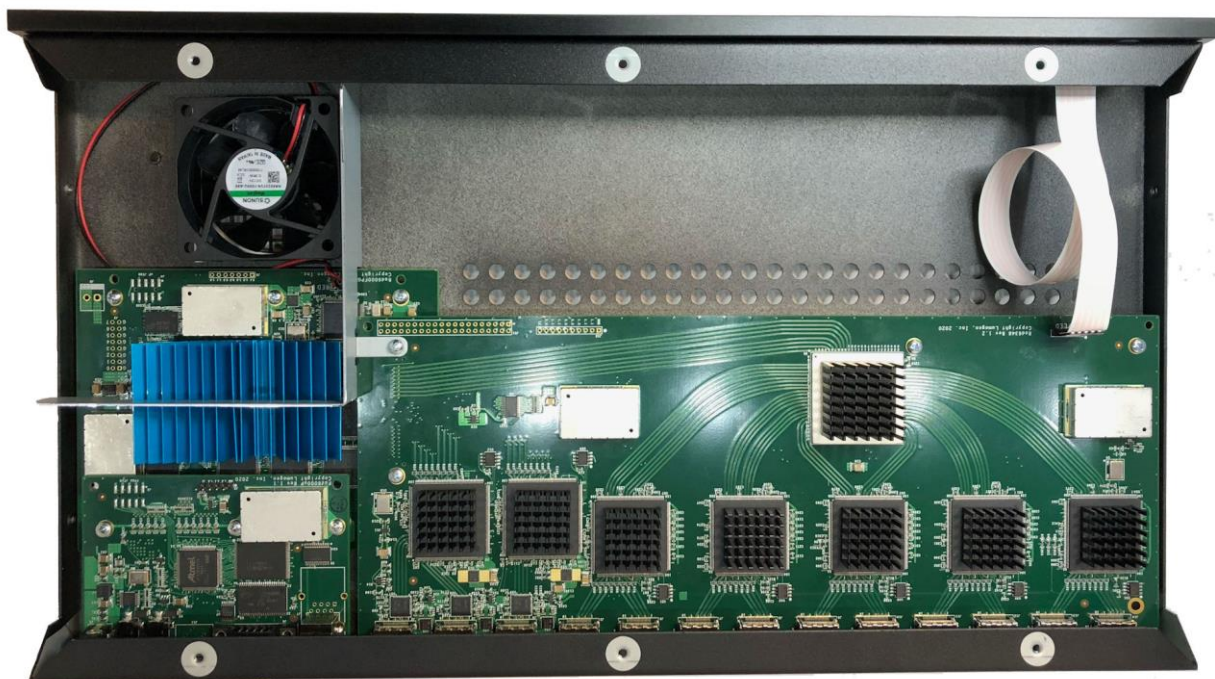
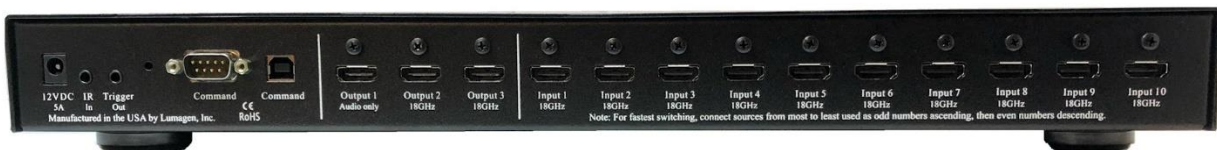


Lumagen, Inc. is excited to announce the latest addition to the Radiance Pro family of 4k video processors, the Radiance Pro 5348. The Radiance Pro 5348 takes the ultimate video processor to the next level by minimizing output-jitter and electrical noise.



The Radiance Pro 5348 has ten 18 GHz inputs, two 18 GHz outputs, and one audio-only output, in a 1U case. This is a fixed configuration.



The Radiance Pro 5348 uses the same software as the 4XXX models. So, video processing operations are currently identical. What sets the Radiance Pro 5348 apart is the electrical improvements in the design. While using the same HDMI chips, and FPGA, the use of linear regulators for 28 critical power supplies, and the addition of an HDMI dejitter output buffer, has dramatically reduced output jitter and noise. The use of Faraday cages for all nine DC-to-DC switching-regulators dramatically reduces EMI.

As an example, the current 18 GHz Rev 1.4 output card in a 4446 has a HDMI data jitter of about 80 pS (HDMI specification requires 102 pS or less for 18 GHz). In comparison the measured HDMI output data jitter on the Radiance Pro 5348 is 45 pS, or just about half. More importantly for audio, the HDMI output clock jitter has been measured at about 10 pS. This is a nearly ideal clock to send to the audio processor.

People have asked me if reduced jitter and electrical noise matters. Yes, it does. I have been discussing HDMI jitter on the forums for many years. What I can say based on my A-to-B testing is that, with the Lumagen Demo Theater's Trinnov Altitude 16, the Radiance Pro 5348 does make a significant improvement for appropriate content (e.g. Greatest Showman "Never Enough"). For the current 444X products I get calls on a fairly regular basis asking "the Radiance Pro does not process audio. So how come audio sounds better when it is running through the Radiance Pro?" The difference is lower jitter and reduced electrical noise. The Radiance Pro 4XXX output jitter and electrical noise are already dramatically better than other products we know about, but 5348 takes jitter and noise reduction to what we consider is the ultimate audiophile level.

Some have said that a high-end audio processor's dejitter circuit can handle higher jitter levels. In my experience, audio processor dejitter circuits can improve the jitter as the signal works toward the DAC's, but there is a limit to the improvement. The advantage the Radiance Pro has compared to traditional dejitter circuits is it completely regenerates the HDMI audio output using a very low jitter crystal clock chip for the HDMI audio clock, and then passes the HDMI signal through two stages of PLL dejitter circuits. Using linear power supplies also helps keep the jitter low by isolating the noise from the digital circuits away from the HDMI integrated circuits.

I am also being asked if the lower jitter of the 5348 will improve video. Since the 4XXX series already has output jitter well below specification, the 5348 going from 80 pS down to 45 pS for the data is not likely going to improve the Bit-Error-Rate (BER) on the HDMI connection. The data reaching the projector/TV should be identical and so there should not be any visible difference.

But, what about the reduced electrical noise on the Radiance Pro 5348 output? This gets into the question of can electrical noise injected into a projector through the HDMI cable affect the image's background "analog" noise. For a digital display technology such as DLP, the answer in my opinion is no. For a projector with an underlying analog display chip technology (LCOS, DiLA) the answer is that there is a chance it might make a visible improvement. Each system needs to be evaluated individually to determine if there is any visible change. As with any image quality analysis, the final assessment must be done at

viewing distance (typically 1X screen width for 4k). If you cannot see a noise reduction at viewing distance, any improvement is moot.

We have customers who say they can see a visible improvement due to lower noise using an external linear power supply and I believe I saw a slight image improvement (lower background noise) using the 5348 versus the 4446 in the Lumagen Demo Theater RS4500 with the supplied Radiance Pro external digital power supply. These difference are small, and unlike the audio where I am convinced I could tell the difference in a blind test, for video the difference would be difficult to tell which technology is in play in a blind test (IMO). So, we are not claiming you will see a visible improvement on an analog projector chip such as used by Sony and JVC. However, I believe I did see an improvement, and you can test this for yourself, assuming you have both a 4XXX and a 5348. I admit this may be hard to accomplish for most people.

The Radiance Pro 5348 uses a HDMI PLL re-clocking chip on each of the three outputs. We believe this HDMI buffer integrated circuit has slightly slower output edge rates that will be more forgiving when used with projectors with marginal HDMI input designs. These chips reduce jitter, and edge rate, but they also give the 5348 control of the output signal for level and EQ. Note that the default for the 5348 is to not have output EQ. The 4XXX series always have output EQ.

In the Lumagen demo theater all supported combinations of 5348 level and EQ work well. Not having EQ is intended to assist active fiber cables which do not have the appropriate amount of attenuation in their input buffers to account for the fact that normal HDMI outputs have cable EQ. This EQ typically in HDMI outputs, and the output edge rate, must be attenuated by a cable, or a well-designed input buffer in the case of the active fiber cable. With the default “no EQ” setting a passive cable should be in the 2-meter to 3-meter length range.

For a projector with a marginal HDMI input design we believe this programmability may help the projector lock on to an 18 GHz HDMI video signal. This assertion remains to be proven, or disproven. Note that we are looking for test cases for this. So, if you have a projector with a marginal HDMI input design that has issues locking on after a signal change, please contact me and we can discuss if it may be possible to test with the Radiance Pro 5348 in your problem system.

## **FAQ:**

### **It was mentioned the 5348 uses the 4XXX software. Might this situation change?**

We are evaluating whether it makes sense to have a different FPGA load with better precision but dropping one or more feature(s) to make room. Two possibilities are eliminating the reserved gates for PiP/PoP, and eliminating Vertical Keystone correction.

We will not make any decision on this until after the pipeline enhancements currently being worked on are completed. If we do a special FPGA release it would be a for-a-fee upgrade enabled by a software key.

So, at least for now, assume the software is identical to the 4XXX series for your purchase decision.

### **Does the Radiance Pro 5348 have any video features not in the Radiance Pro 4XXX?**

There is one section of hardware added that at some point in the future may improve Genlock. However, we are not discussing details, or committing we will add it. Until we have added, tested, and have committed to release this new feature, do not expect it in any 5348 releases. In other words, consider the video feature set of the 5348 to be the same as the 4XXX models when making your purchase decision.

### **Why have so many inputs?**

I think of the Radiance Pro 5348 as having five faster switching inputs. That means if you have five commonly used sources, switching between them can be faster. For reference, the 4446-18G can switch faster between four sources. This is because each pair of inputs go to one input chip, and switching inter-chip is faster than switching intra-chip.

We do have customers who have asked for 10 inputs. So, if you have 9 or 10 sources, the Radiance Pro 5348 is a good option.

### **Does the 5348 have a LAN interface?**

The initial version of the Radiance Pro 5348 will have the same RS232 plus USB (USB to RS232 internally) connections. This is the same as the Radiance Pro 4XXX models. This is nomenclated as the Radiance Pro 5348-USB.

One of the 5348 design changes is that the 5348 can support a Lantronix XPort Ethernet-to-RS232 interface on the small 5348 microprocessor daughter card. Note that the XPort LAN connection would replace the USB port.

We have yet to get this implemented, other than basic RS232 commands from a PC using a hyper terminal. We are new to having a LAN interface, so we do not yet know what is practical to accomplish using the XPort. Our goal is to at a minimum allow the same virtual COM port function for PC interface, and software updates, that the USB interface currently provides. We also believe we can set it up to receive IP commands to the Radiance Pro 5348 through the XPort. Not sure what additional features we will support.

Please be patient as we further explore options using the XPort LAN interface.

### **If I buy the 5348-USB version can I later upgrade to the 5348-LAN version when, and if, it comes out?**

If you buy the 5348-USB and tell us in your order you want the option to upgrade to the LAN interface, we will use the case bottom sized for the LAN port connection. You could later purchase the LAN version of the microprocessor board, and then swap out the microprocessor board in the field for one with the XPort option. This is a straight-forward task and almost identical to swapping an I/O card in the 4XXX units.

If you do not order the 5348-USB with the LAN case, you can still upgrade. You would send the unit in for us to do the change. In addition to the charge for the new microprocessor board, we would charge for the LAN case bottom and the labor to do the swap.

**Will the Radiance Pro 5348 support PiP/PoP?**

The 5348 does not support PiP/PoP.

**Will the Radiance Pro 5348 support 8k?**

I believe 8k does not provide any visible image improvement for home theater, since at 1X screen width viewing distance for 4k resolution, pixels are already below human visual acuity. Some people still want to have 8k. I can say we have no plans for the 5348 to process 8k. This is due to the FPGA and HDMI chips used. However, we are considering an I/O card upgrade to pass through 8k, if 8K HDMI chips become available to us. This is possible since we changed the design so that input and output HDMI chips are on the same circuit board.

Please keep in mind this is just a possibility and we are *\*not\** committing to adding 8k pass-through as a future upgrade. Consider the Radiance Pro 5348 a 4k product in your purchase decision.

**Will the Radiance Pro 5348 support “non-8K” HDMI 2.1 features?**

The Radiance Pro 4XXX already has one HDMI 2.1 feature (HDMI info-frame low-latency mode). So, while we do not refer to the Radiance Pro as a HDMI 2.1 device, according to the HDMI specification it could be considered a HDMI 2.1 device.

We will be evaluating other “non-8K” HDMI 2.1 features to see if we should add them.

**Does the Radiance Pro 5348 have a 12 VDC trigger output?**

There is one standard 12 VDC trigger output for the Radiance Pro 5348. There is no option for more than one 12 VDC trigger output.

**Are rack ears included?**

Rack-ears are included.

**What power supply is included with the Radiance Pro 5348?**

The Radiance Pro 5348 comes with the standard Radiance Pro 12 VDC power supply.

As a consumer product manufacturer, Lumagen cannot include a linear power supply.

I do recommend Radiance Pro 5348 owners consider a high quality external linear power supply. An external linear power supply has been known to improve audio by isolating the Radiance Pro digital electronics from wall power (reducing wall power noise to the amps), and because it provides the cleanest possible power source to the Radiance Pro. You may or may not notice the difference. So, weigh if it is worth the additional cost for a potential audio improvement.

We are currently recommending the Keces P8 single output linear power supply (12 VDC at 8 Amps) if you want to test with an external linear power supply. There are other good linear power supplier vendors.

### **Will there be more models in the Radiance Pro 5000 series?**

We are considering adding an additional 5XXX version to the 5000 series product line. We are not ready to discuss details.

### **Are the Radiance Pro 4XXX and 5XXX configuration files interchangeable?**

Yes, the configuration data can be transferred between the 4XXX and 5XXX units. So, you can download the configuration from a 4XXX you are trading in and upload it to a 5XXX unit. The 4XXX setup and calibration would then be available in the 5XXX model without additional effort.

### **I don't own a video processor, why should I consider the Radiance Pro 5348?**

The Radiance Pro family of video processor has the best feature set, the best scaling, the best HDR Dynamic Tone Mapping (DTM), the best image enhancement, the best image-based auto aspect selection, and the lowest electrical noise and jitter on its output. We have had many people describe the Radiance Pro as the Swiss army knife of video processors. Just about whatever setup feature your theater needs the Radiance Pro can help. Often the Radiance Pro is the only way to solve a special system requirement.

Common comments include "my only regret is that I did not buy the Radiance Pro sooner," and "the Radiance Pro is the most important piece of equipment in my home theater." One producer who does post-production for a large movie studio said "the competition is not even in the same league as the Radiance Pro." We have had many of our dealers and customers say that every projector needs a Radiance Pro to achieve the best user experience and video quality. If you want to "See what the director intended™" then you need a Radiance Pro video processor.

The Radiance Pro 5348 has all the features of the Radiance Pro 4XXX models and improves on the electrical characteristics.

Please check the Radiance Pro brochure for more information.

### **Should I trade-in my Radiance Pro 4XXX for a Radiance Pro 5348?**

For video quality my recommendation is that there is no immediate need to upgrade from a Radiance Pro 4XXX model to the Radiance Pro 5348. The 5348 may have a slight edge in lower background noise in a DiLA or LCOS projector, but the difference would be small and potentially not visible at viewing distance.

If you have lock-on issues due to marginal cabling, or a marginal projector input design, (both are common in our experience), then the addition of the output buffers in the 5348, and the slightly slower output edge rate, may help. So, for this case it is worth considering an upgrade. I plan to have a small number of units that can be sent out to test this. We would require a deposit, and assurance the unit would be purchased or returned.

If you have a high-end audio system and the cost is worth it to you to for the potential audio improvement, then consider upgrading. I plan on having a small number of units that can be sent out for customers to test my assertion that audio will be improved. We would require a deposit, and assurance the unit would be purchased or returned.

If you need 9 or 10 inputs, then consider upgrading to support all your sources directly into the Radiance Pro. As always, we *\*strongly\** recommend the Radiance Pro does switching.

If you are interested in LAN control, after (and if) we release the “-LAN” version you might consider the upgrade for the LAN interface.

**What is the cost for the Radiance Pro 5348?**

The Radiance Pro 5348 is meant as the premier Radiance Pro product and as such commands a premium price. The retail for the Radiance Pro 5348-USB is \$9495 USD. If, and when, we introduce the Radiance Pro 5348-LAN, it will retail for \$9995.

**Does Lumagen offer a trade-in credit for my current Lumagen video processor?**

We offer a trade in credit for any Lumagen video processor toward a Radiance Pro purchase, working or not. How much depends on the unit coming back in trade, and on the original purchase date. Please contact me if you have a trade-up situation you would like to discuss.

**When will the Radiance Pro 5348 be available for purchase?**

Currently, we have stock of Radiance Pro 5348 components from our pilot build. So, the Radiance Pro 5348 is available now in limited quantity. We build to order. Allow one week for us to build and ship your unit.

We plan to build more Radiance Pro 5348 units in February after which time the Radiance Pro 5348 should be available in volume.

Please contact me if you have any questions.

Thanks.

Jim Peterson  
President  
Lumagen, Inc.