Altman Lighting AP-150 RGBW PAR Luminaire

By: Mike Wood

Figure 1: Fixture as tested.

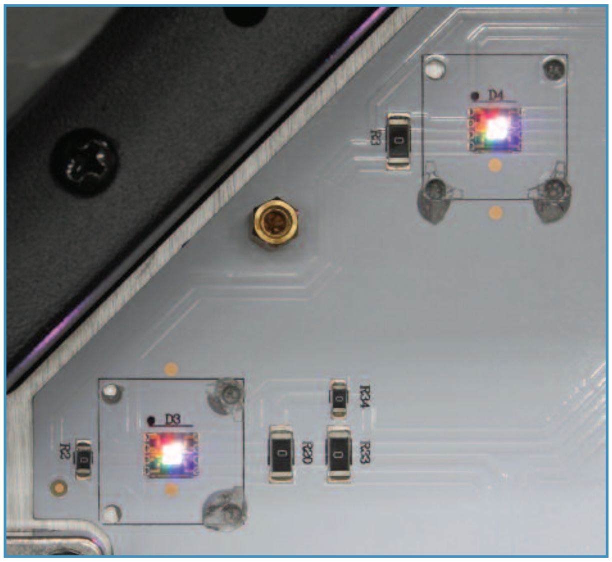

Figure 2: LEDs.

I've been writing these reviews for 15 years now, very nearly 100 of them so far, and in all that tiome I've never reviewed a product from Altman Lighting. Altman is one of the oldest manufacturers of entertainment lighting equipment in the US, but I typically stick to automated luminaires, and the company hasn't been in that arena since the days of the Altstar, back in the early 1990s. However, Altman very definitely does make products in an area that is an interest of mine: LED-based luminaires. Add in an automated zoom and it's not unreasonable to call it an automated luminaire. It also gives me the opportunity to go into more detail on some of the structure and science than I normally have the space for.

This month, we are investigating the Altman AP-150 RGBW PAR luminaire (I'll abbreviate that to AP-150 for the remainder of the review). As usual, my tests were based on a single sample of the unit supplied to me by the manufacturer. When Altman submitted the AP-150 for review, I was told that the company wants the unit to be considered as a workhorse that is very simple to operate. I was also told that it has no superfluous bells and whistles; instead, its merit comes from being versatile and straightforward. I'll try to bear that request in mind as we go through the unit.

For the tests, the AP-150 was operated from a nominal 115V 60Hz supply; however, the unit is fitted with an autosensing universal power supply input that is rated from 100V to 240V AC, 50/60Hz (Figure 1).

Light source and optics

The AP-150 uses nine RGBW emitters, each of which is 15W. Two of these can be seen in Figure 2. They are mounted directly on to a single circuit board with a thick aluminum backing plate, which, in turn, is thermally connected to the aluminum casing of the unit, forming a large heat sink. An internal fan keeps air circulating inside and through the enclosure to provide additional heat transfer.

Each RGBW LED is capped with a light pipe that serves to integrate the four colors into a single beam. You can see details of both ends of these light pipes in Figure 3. The light itself is a clear, solid PMMA rod inside the black supporting enclosure. Each light pipe is square at the bottom end, as shown on the left in Figure 2, where it contacts the LED so as to maximize light transfer. The opposite, exit, end is circular (right side of Figure 2), so you end up with a round beam, not a square one. You can also see that there is a micro lens pattern molded in the exit end of the pipe. This aids in further homogenization of the colors. You'll see similar light pipes in many entertainment lighting units.

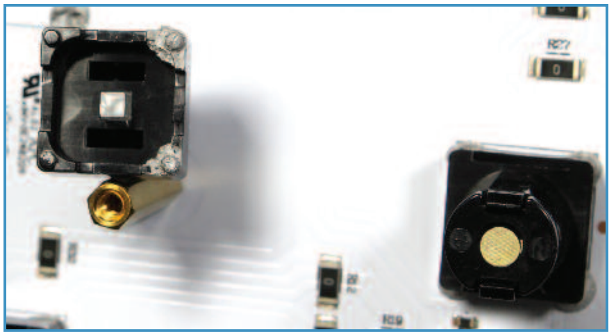

Figure 3: Light pipes.

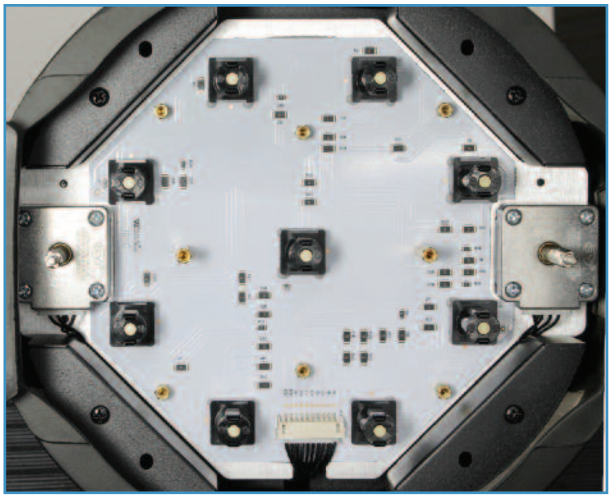

Figure 4: LEDs and zoom motors.

Some have one square end and one circular end, like this one, others are square and hexagonal and have differing types and amounts of micro lenses or diffusion. The goal is always the same: making the multiple LED colors appear as a single beam, with no color unevenness across the field. The light pipe doesn't do much, if anything, for collimation; it's primarily there for light capture and homogenization.

Note: You will sometimes also see tapered light pipes where the exit end is larger than the input end. This reduces the cone angle of light emitting from the pipe. The surface that light is emitted from is larger, but the angle is narrower. Conversely, a pipe with a smaller exit than the input will reduce the size of the light source but increase the angle. In a perfect world, it would be great to have both a small surface and a narrow angle at the same time, but physics gets in the way and the laws of etendue just don't allow it. You may as well try to design a perpetual motion machine!

Getting back to the AP-150: The nine LEDs and light pipe assemblies can be seen in Figure 4, mounted on the board. Each light pipe has an associated output lens, as shown in Figure 5. These are fine patterned PMMA Fresnel lenses; you can just see the concentric rings stepping out from the center on each lens. A Fresnel lens behaves optically like a

Figure 5: Fresnel lenses.

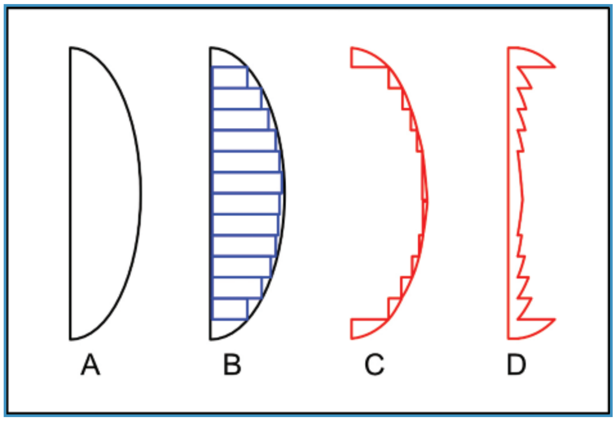

Figure 6: Fresnel lens construction.

much thicker regular lens. Figure 6 shows how they might be constructed. Lens A is our original lens; Lens B shows the same lens but with a set of rectangular blocks, shown in blue, superimposed. A rectangular block does nothing, optically, so these portions can be safely removed without changing the overall optical characteristics of the lens. This leaves us with the set of curved prisms shown in red in C. As a final step, slide all those prisms to the left so they line up and you end up with the familiar Fresnel lens (D). Lens D behaves almost the same as Lens A but is much thinner and lighter. It doesn't behave quite the same, because of the steps we've introduced. Those steps introduce stray spill light and loss. The smaller we can make each of those steps, the better, and this is how you end up with a very fine Fresnel lens, such as the one in the AP-150.

The nine Fresnel lenses are mounted on a single plate, which, in turn, is connected via lead screws to two stepper motors, visible one on each side in Figure 4. As the two motors turn, the lens plate moves toward and away from the light pipes, thus changing the beam angle of the emitted

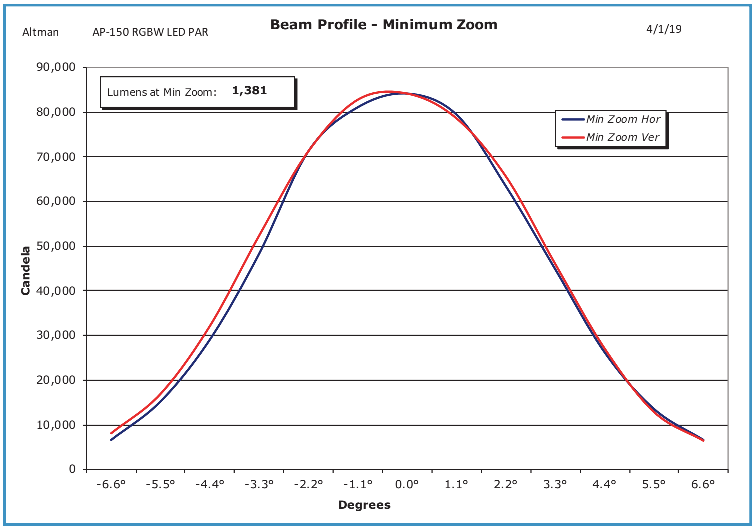

Figure 7: Minimum zoom.

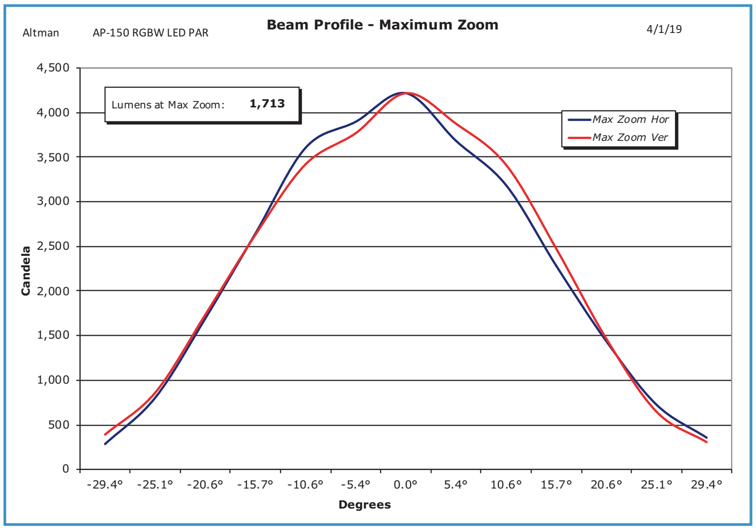

Figure 8: Maximum zoom.

beam. Close to the pipe, the beam is wide; far away and close to the focal length of the lenses, we get a narrow beam.

Output

Figure 7 shows the output of the AP-150 with all emitters at full, and the lens array in the fully narrow position after letting the unit run for 30 minutes to reach thermal equilibrium. In this mode, I measured just under 1,400 lumens with a field angle of 13°. The output was smooth and well-homogenized and, as you can see from the profile curve, should blend well from one fixture to an adjacent unit when creating a stage wash. Similarly, Figure 8 shows the AP-150 in the fully wide position. Here, as you would expect, the output is higher, at just over 1,700 lumens, with a field angle of 59°.

The output was, again, smooth; Figure 8 makes it look like there were bumps in the distribution, but these are not visible to the eye and likely come from the difficulty of measuring a wide angle like this. Unless you have a very large test room, it's difficult to get far enough away from a light when in wide angle to get a true image of the beam. The time for the AP-150 to move the lenses from one of the zoom range to the other was five seconds.

Note: Why are lights very often brighter in wide angle? Often, as is the case with the AP-150, this is because when the lenses are close to the light sources, as they are when producing a wide-angle beam, there is very good capture by the lenses of the light emitted. However, when the lenses are further away, for example in the narrow position, some of the light will miss the lenses and be wasted. There will, inevitably, be light that falls outside the diameter of the lens. Incidentally, this also helps explain why narrow angles means large lenses: the larger the lens, the more chance of capturing all the light.

Color

Altman offers a number of ways to adjust the color from the AP-150. You can control the four channels, RGBW, independently and mix your own colors; you can use RGB or HSIC (hue, saturation, intensity, CCT) control where the white channel is automatically adjusted, or you can use a macro channel where a range of premixed colors, matching popular gel colors, are provided. There is also a range of whites on that same channel, ranging from 2,700K to 10,000K. You can also choose between running these preset colors in calibrated or uncalibrated mode. Fixtures will likely vary unit-to-unit, but I measured approximately a 10% to 15% drop in output when switching to calibrated mode. This is to be expected, as any calibration can only reduce outputs from maximum, not increase them. I measured each of the provided whites as follows:

Color Temp.	Uncalibrated Mode	Calibrated Mode	TM-30 Rf	TM-30 Rg	CRI Ra
2,700K	2,880K	2,454K	51	110	29
3,000K	3,238K	2,743K	57	112	36
3,200K	3,462K	2,940K	61	113	40
4,000K	4,392K	3,830K	75	115	46
4,500K	4,685K	4,031K	80	113	70
5,000K	5,048K	4,526K	85	110	83
5,600K	5,664K	5,172K	85	109	85
6,500K	7,034K	6,210K	79	105	90
8,000K	15,974K	7,788K	78	95	79
10,000K	n/a	10,164K	78	95	82

In calibrated mode, the color rendering is pretty good at 4,500K and above but drops off at the warmer color temperatures. As examples, Figures 9 and 10 show the spectra at

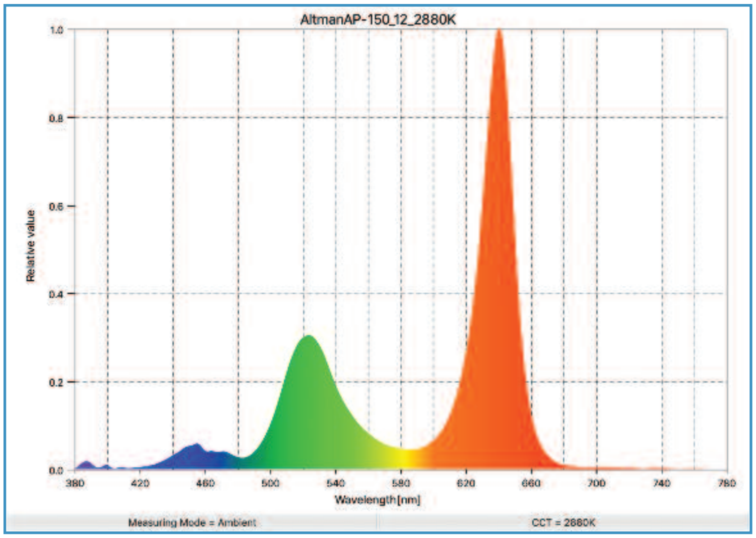

Figure 9: Spectrum 2,700K.

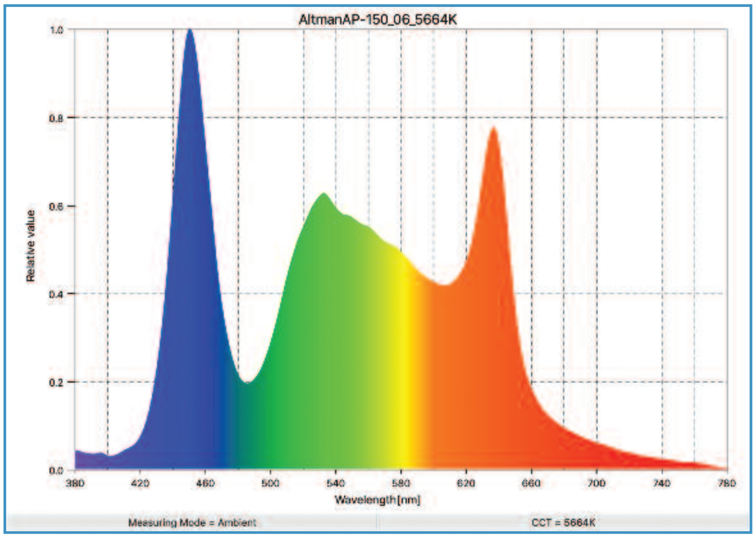

Figure 10: Spectrum 6,500K.

the 2,700K (2,880K actual) and 6,500K (5,664K actual) uncalibrated white points, respectively; Figures 11 and 12 show the corresponding TM-30 color rendering graphics. Note: These charts come from the new Sekonic C800 meter, which now reports TM-30 as well as CRI.

Of the four colors, red represents 13.5% of the lumen output, green 42%, blue 5%, and white 47.5%. This adds up to a little more than 100%, which shows some thermal budgeting is going on.

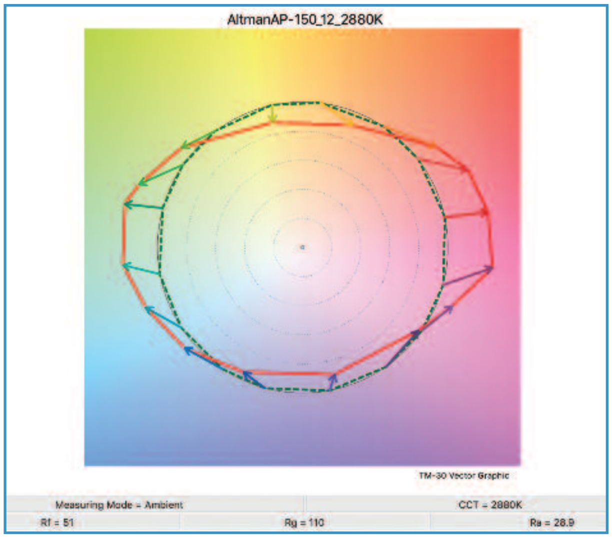

Figure 11: TM30 2,700K.

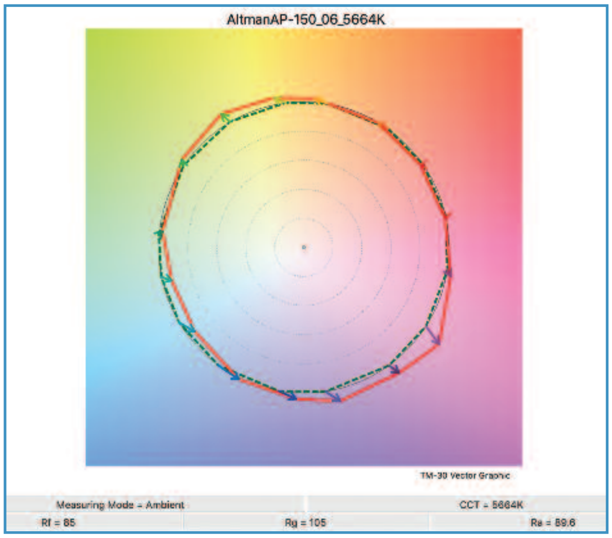

Figure 12: TM30 6,500K

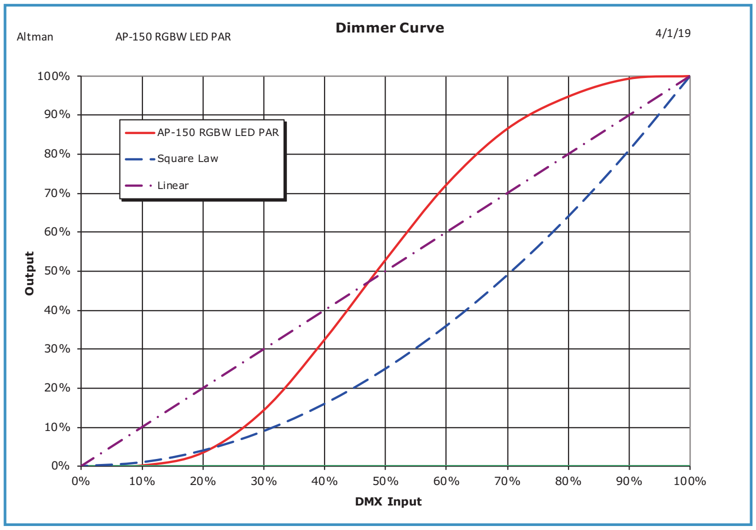

Figure 13: Dimmer curve.

Dimming and strobe

Figure 13 shows one of the available dimmer curves of the AP-150. This is the one Altman calls "incandescent." It's reminiscent of the old S curves you used to see on some dimmer racks. There are also linear and square laws available through menu selection. Dimming performance was very good, smooth with no visible stepping or inconsistencies. This is partly due, I'm sure, to the incandescent emulation modes available in the AP-150, which allow you to simulate the thermal lag of incandescent filaments and smooth out any fades.

I measured the thermal droop of the AP-150 by running it at full power from a cold start and measuring light output over a period of 30 minutes. Over the first five minutes, output dropped to 88% and finally settled out at 83% of the original level after 20 minutes. PWM rate is approximately 8kHz, which shouldn't have any problems with any cameras. Strobe rates through a dedicated strobe channel were measured ranging all the way up to 30Hz.

Noise

The AP-150 has an internal fan, which, when the unit was running at full power with the fans set to auto mode, measured at 41.8dBA at 1m. Running zoom, the only other noise producing motors, increased this to 43.7bBA at 1m. There are many options for the fans, including direct DMX512 control. I tested this by putting the fans in manual mode and turning them down to their lowest setting; the unit effectively became silent. However, this silence comes with a price: At full power, the unit ran at full output for about 100 seconds, then the light level dropped rapidly over about five seconds to about a third of the full output as the unit ramped down to keep the LED temperatures under safe limits. Recovery from this situation took a long time. After turning the fans back to auto, it took over 10 minutes for the unit to recover to its original output. Altman recommends that you use the option to set a reduced power level if you know you are going to want to run with very low or no fan noise. That way, you avoid any of these surprises with throttling.

Electrical parameters

POWER CONSUMPTION AS TESTED AT 120V

	Current, Power	Power Factor
Quiescent Load	0.058A, 5.8W	1.0
All LEDs illuminated	1.09A, 132W	1.0

Initialization time from power up or reset command to finishing homing of the zoom was around 12 seconds. The unit is badly behaved in reset, as the LEDs power up almost immediately as the zoom slowly travels to maximum and back over the full 12 seconds.

Figure 14: Rear panel.

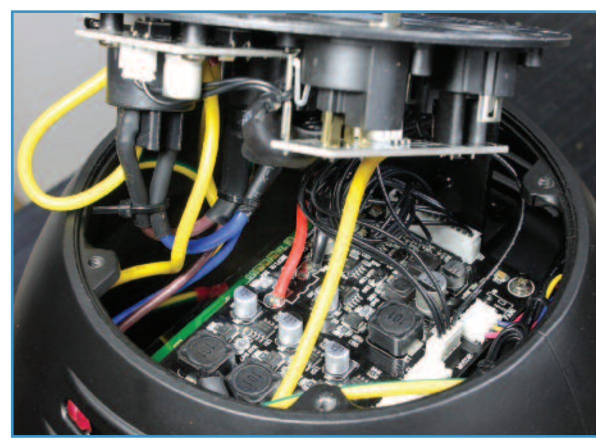

Figure 15: Electronics.

Electronics and control

Power in and out is through daisy-chained Neutrik PowerCon connectors. Control is through DMX512 on standard five-pin XLRs. The unit offers a control menu through a color LCD display and button array. This allows the setup of control parameters and stand-alone mode. Altman tells me they have tried to minimize the button pushes to get to any function. All these are visible in Figure 14.

Behind this panel is the main control board containing the LED and motor drivers, and the power supply, partly visible in Figure 15.

I also tested the RDM capabilities of the AP-150 using City Theatrical DMXCat. Figures 16 and 17 give you some idea of the data that's available through RDM. This is in addition, of course, to the ability to set menu parameters and control the unit. It can be a very powerful tool.

Figure 16: RDM1.

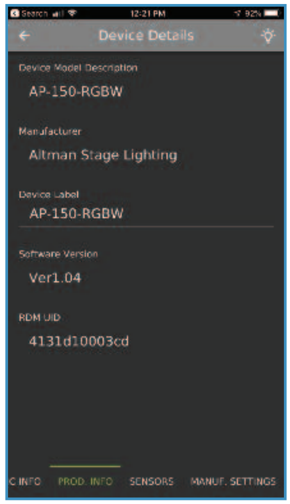

Figure 17: RDM2.

Construction

Not a lot to say about construction: It's a simple aluminum die-cast clamshell design with all components stacked inside. Removal of the lenses to access the LEDs was simple, but I didn't disassemble it much more than that. I don't anticipate it being a difficult unit to work on.

Conclusions

That's about it for my first review of an Altman luminaire. The Altman AP-150 RGBW is a straightforward RGBW LED color mixing PAR unit with motorized zoom. Would it work for you in your venue? I hope I've provided enough data to help you make that decision—but, as always, it's up to you to make the final decision.

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UPCOMING INDUSTRY EVENTS

Lightfair
May 21-23, 2019
Philadelphia, PA
https://www.lightfair.com/

Summer NAMM
July 18-20, 2019
Nashville, TN
https://www.namm.org/exhibit/ss19

Stagecraft Institute of Las Vegas
June 2-July 28, 2019
Las Vegas, NV
https://stagecraftinstitute.com/classes/

CITT Rendez-Vous
August 14-16, 2019
St. Catharines, Ontario
https://www.citt.org/trade_show.html

InfoComm
June 12-14, 2019
Orlando, FL
https://www.infocommshow.org/

PLASA Show
September 15-17, 2019
London, UK
www.plasashow.com