Robe ROBIN 600 LED Wash

By: Mike Wood

Figure 1: Fixture as tested

Although perhaps not quite as well known in the USA as in Europe and the rest of the world, Robe in recent years, has become one of the major players in automated lighting, with many new products appearing every year. The company is not shy about diving into new technology; perhaps inevitably, some products have performed better than others. It is no surprise, therefore, that, with the inexorable move of our industry toward solid-state lighting and LED-powered products, Robe has also jumped into that sector with both feet.

I don't envy lighting manufacturers at the moment. LED sources are on such a steep curve, with products becoming obsolete at such a breathtaking rate that an automated lighting manufacturer has to reevaluate every product at least once or twice a year—with that reevaluation perhaps requiring a significant redesign to take advantage of the latest and greatest improvements. We are suddenly on the commodity-product, new-model-every-year, train, whether we like it or not.

The product we are talking about this month is a case in point. The Robe ROBIN 600 LED Wash enters an incredibly busy sector of the market, namely LED wash lights with beam angle control. There is a lot of competition in this sector, which has quickly become one of the most successful areas for automated LED luminaires. I suspect that sales of automated zoom LED wash lights have already outstripped those of conventional automated wash units. How does the Robin 600 LED Wash stack up to that competition? Will it survive in the marketplace? As always in these reviews, I've taken as comprehensive series of measurements as I can from a single unit supplied to me by Robe for testing, and will present the results to help you decide if the Robin 600 LED Wash (Figure 1) is the unit for you.

Light source

Let's start at the light source and work our way through the system. The Robin 600 LED Wash uses 37 Cree XLamp MC-E LED packages. Each package is fitted with four dies, one each in red, green, blue, and white, and has a total power loading of around 10W (Figure 2). Each LED is fitted with an integral wide-angle optic, producing a native beam angle of around 120°. The 37 packages are mounted on three concentric circuit boards, which are, in turn, attached to a large die-cast aluminum heat sink to dissipate that 370W of heat. Figure 3 shows the arrangement, with one central circular board fitted with seven packages, surrounded by two ring-shaped boards with 12 and 18 packages respectively. Each ring (or zone, as Robe calls them) can be controlled separately, but we'll get to that later.

The LED heat sink, which also cools the LED driver board, has a single large temperature-controlled fan mounted on its rear to keep everything within the temperature band that LEDs require.

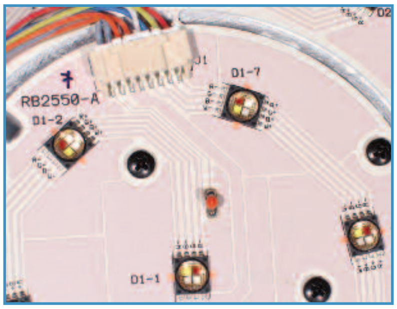

Figure 2: LED detail

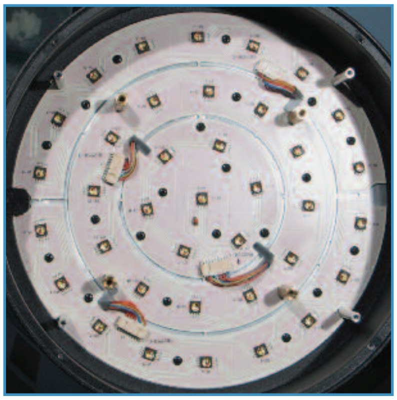

Figure 3: LED array

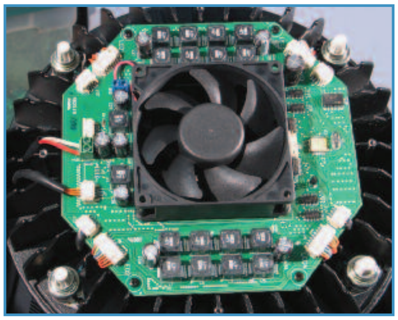

Figure 4: LED drivers

Figure 5: TIR lens array

Figure 4 shows the back of the unit; once you have removed the protective cover, with the large central fan surrounded by the driver circuitry. In operation, this fan will speed up and slow down as needed. I found that it rarely came on when using one or two colors, and gradually increased as I added more channels. With all four LED channels in use, it quickly got up to full speed. I ran the fixture for many hours in my workshop, and the light output varied very little with temperature.

Optics

Mounted above the LED board is a complex sandwich of plates and optical devices that together form the homogenization, beam angle control, and spill-limitation systems. I'll work up through the layers. Immediately above the LED packages is a fixed plate fitted with large plastic TIR (total internal reflection) lenses that bring the beam angle down from that native 120°. Figure 5 shows the rear of the lenses, which look like large solid cones. The cup in the pointed end of each of those cones fits over an LED package. Each TIR lens, as shown in Figure 6, is fitted with an output micro lens array of its own. This, I assume, serves two purposes: Firstly, it helps homogenize those four LED emitters into a single beam; secondly, it forms the first, fixed, group in the two-group zoom system.

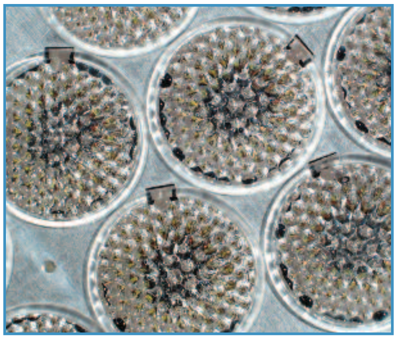

Figure 6: Micro lenses on TIR

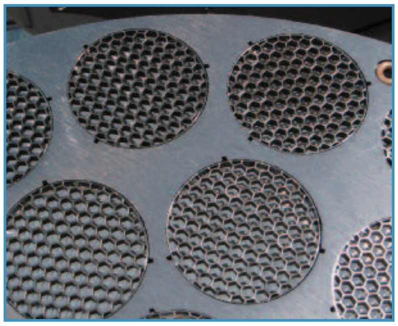

Figure: Micro egg crates

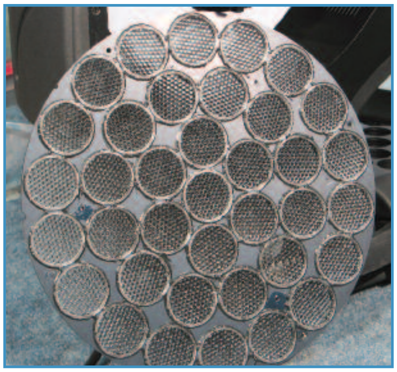

Figure 7: Zoom lens array

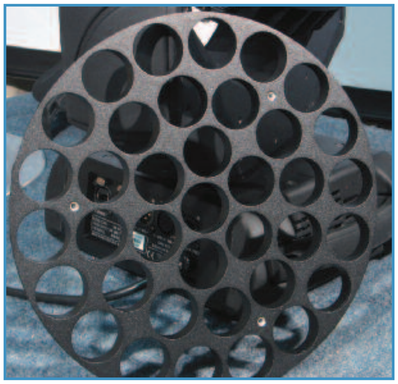

Figure 9: Output egg crate

The next element in the stack is a moving plate, which contains another set of micro lens arrays, as shown in Figure 7. These lenses line up with those in Figure 6, forming a myriad of small zoom lens systems with nearly 100 micro lenses for each emitter. The other side of this plate has tiny egg-crates (Figure 8) with one hexagonal compartment around each of the micro lenses. Presumably, these egg-crate louvers serve to confine the beam and reduce spill and extraneous light. This entire plate, with the micro lenses on one side and the egg-crates on the other, is moved axially by four stepper-motor linear actuators to change the beam angle of the system. You can see the actuators as the four white objects in the corners of Figure 4.

On top of all this, there is a larger egg-crate plate with 37 cavities, one

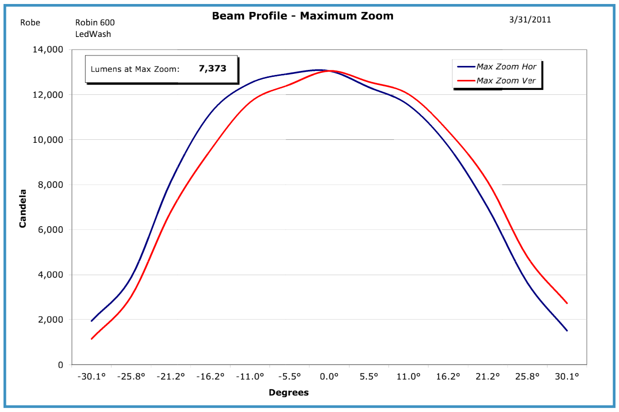

Figure 10: Maximum zoom

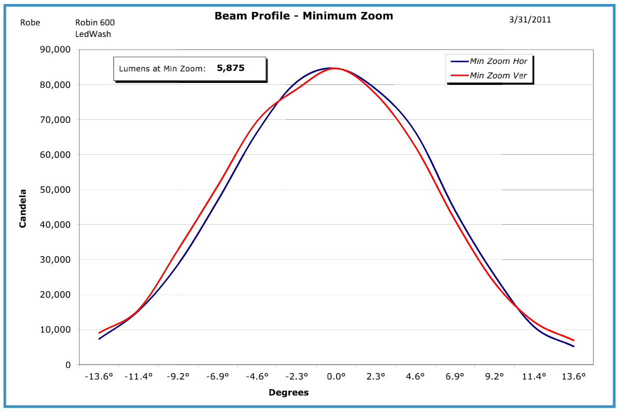

Figure 11: Minimum zoom

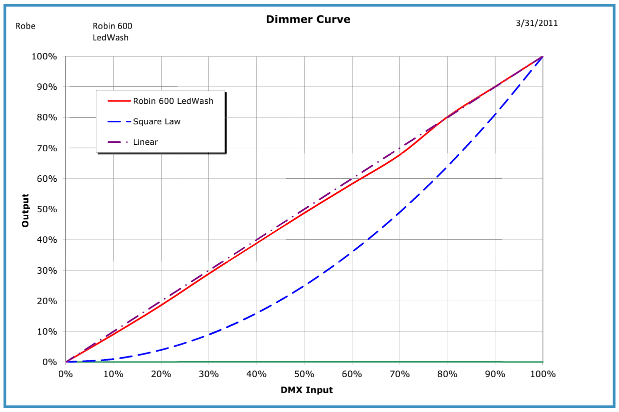

Figure 12: Dimmer curve

for each emitter (Figure 10), followed by a final protective transparent plastic cover plate. All these micro lenses and egg-crates seem to perform well; the output is extremely well-homogenized, with no color fringing or banding and no multi-colored shadows at normal throws. It also seems to avoid the red or blue halo I've seen on other fixtures of this type and gives a clean beam in just about all colors. I assume that's the result of the egg-crates. Robe must lose some light output with those tiny egg-crates, but the benefit of clean beams may well outweigh that.

Note: In the dim, distant past—two or three years ago—when LED luminaires had just emerged from the primeval ooze, manufacturers needed every last lumen out of the devices to make them useful, and quantity trumped quality every time. However, as time has gone on, and efficacies have exponentially improved, manufacturers can now afford to make a value judgment and sacrifice a few of those precious lumens in order to improve the light quality. This is a good thing and I'm delighted to see it, not just from Robe, but from many of the quality providers!

Output

Now we've described the complex optics of the Robin 600 LED Wash, how does it actually perform? I measured a maximum output, with all emitters at full, of 7,373 field lumens in the 60°-wide angle position ramping down to 5,875 field lumens at the 27° narrow angle. Beam distribution is shown in Figures 10 and 11. As you can see from the curves, the distribution was very smooth and should blend well between adjacent units. As I mentioned, these outputs were measured with all emitters at full, which perhaps isn't completely realistic, as the output color is not white but instead a very pale magenta. If we mix a 5,600K white that is close to the black body line, you get an output about 80% of that. The zoom is smooth (albeit noisy in standard mode—more on that later) and provides a clean transition between beam angles with no colored hotspots or rings at any point in the range. It took 0.5 seconds to adjust zoom over the full range at maximum speed. Overall, it provides a very pleasing and smooth light output that should make the Robin 600 LED Wash a good lighting tool.

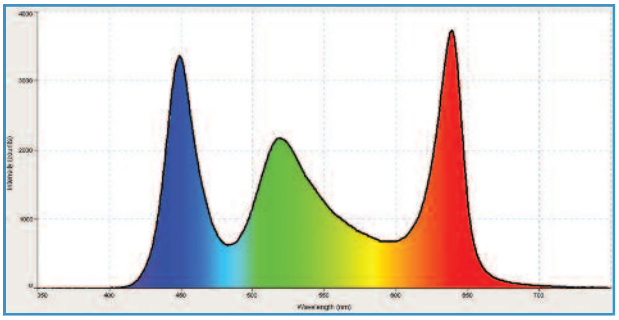

Figure 13: Spectrum - all channels

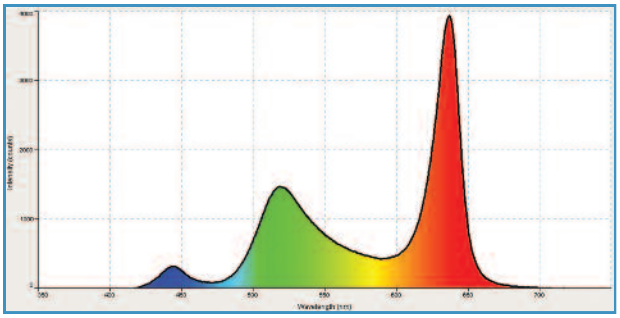

Figure 14: Spectrum - 3,200K

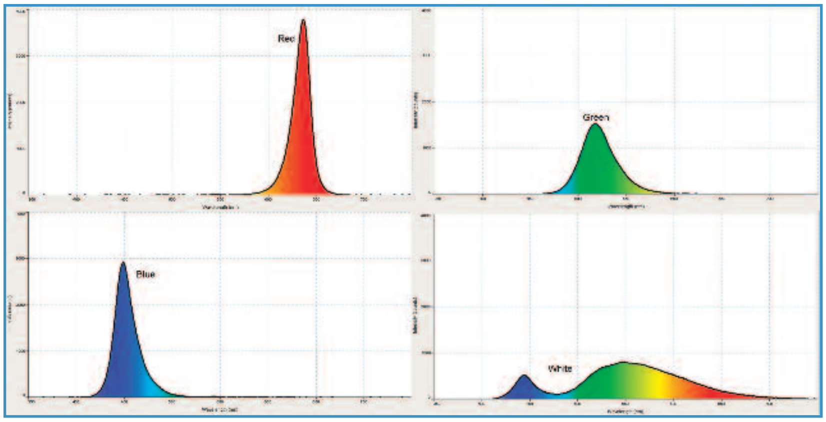

Figure 15: Spectrum - RGBW

Dimming

Figure 12 shows the dimming curve from the Robin 600 LED Wash. As you can see, it's extremely close to a linear response. Dimming, even from a single eight-bit DMX512 channel, was very smooth for over 90% of the travel, with stepping only appearing in the bottom 5 – 10%. Robe must be interpolating and smoothing the DMX512 data. The color consistency was also pretty good when the unit was dimmed, with just the very bottom end of the range showing some variation. I measured strobe speeds from 0.29Hz (one flash every 3.4 seconds) up to 19.2Hz at maximum. The unit offers a wide range of strobes, including independent control of strobes on the three concentric zones, if you want.

One further point on dimming: If you set the unit (using the Virtual Color Wheel channel) to either 2,700K halogen or 3,200K halogen white, then the software will red-shift that white as the unit is dimmed. This should allow it to track the shift in incandescent lamped units on the same rig. Robe also added some artificial thermal delay when in this mode, so that the dimming happens in the same time as a filament would take to cool down. Finally, I measured the PWM frequency at 300Hz, which is pretty slow these days and may cause issues in aliasing or flickering with HD video systems. It can also cause some strobing with fast-moving objects.

Color system

As far as color is concerned, this is essentially an RGB unit with the white channel improving brightness and color-rendering in some colors. Figure 13 shows the spectrum with all channels at full, while Figure 14 shows the unit set to produce 3,200K white light, and Figure 15 shows the individual RGBW emitters. As already mentioned, in addition to basic RGBW control, the Robin 600 LED Wash also offers a "virtual color wheel" channel offering a range of colors across the spectrum as well as rainbow and other special effects. Also on this channel are preprogrammed mixes for five different color temperature whites: 2,700K, 3,200K, 4,200K, 5,600K, and 8,000K. I measured the output and color temperature of these as follows using a spectrometer. (Note: I also tried measuring them with a color meter but got very different, generally lower, results. As I've often mentioned before, tri-stimulus color meters, such as Minolta or the one I used, a Gigahertz-Optik HCT-99, are of dubious accuracy when trying to measure the color temperature of LED sources. You should take any CT readings taken with a color meter with a large grain of salt and instead test with your camera or eyes. I know DPs and LDs use them extensively, but, if they knew how poorly they perform with LEDs, I think they'd change their minds.)

	lumens %	Color Temp, K
All LEDS at full	100%	n/a
2700K	43%	2,650
3200K	55%	3,125
4200K	75%	4,275
5600K	79%	5,900
8000K	79%	9,100
White LED alone	35%	6,500

The whites all looked very good; I can see them being useful for getting a quick result in white. Robe tells me that they calibrate the units using these whites as a reference so they should always look the same from unit to unit. The mix values are also published in the user manual, so you can use them yourself as a basis for mixing pale pastels and tints.

The outputs in the main primary colors as a percentage of full output were as follows.

Color Mixing

Color	Red	Green	Blue	White
Output	16%	22%	27%	35%

We should also mention the three zones; in some modes of operation, the three concentric rings of LEDs shown in Figure 3 can be controlled independently for

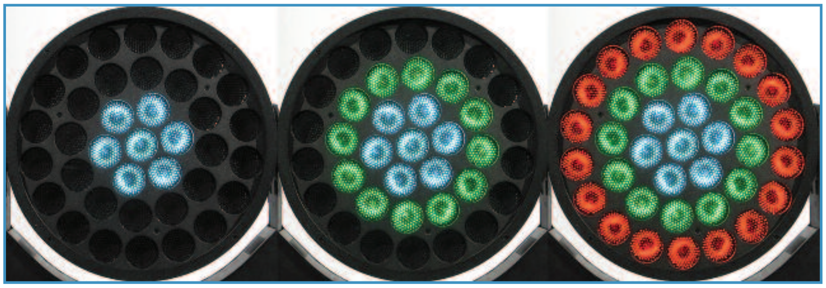

Figure 16: Zones

color and strobing. This allows effects such as those shown in Figure 16, in which each ring is a different color and brightness.

Pan and tilt

The Robin 600 LED Wash has a pan range of 450° and tilt of 300°. A full range pan move took 2.5 seconds, while a more typical 180° move finished in two seconds. Tilt took 1.5 seconds for a full move and 1.25 seconds for 180°. Positional repeatability on both pan and tilt was excellent, with an error of only 0.08° — which is around 0.3" of error at a 20' throw. Movement was also very good, with smooth moves at all tested speeds. Both pan and tilt use tried-and-tested mechanisms using familiar three phase motors, belt drives, and full positional feedback (Figure 17).

Noise

As mentioned earlier, the head fan is temperature controlled, so it speeds up and slows down as the LED power and temperature varies. The figures measured here are with all LEDs on at full and after waiting 30 minutes for the unit to reach equilibrium.

Sound Levels

	Normal Mode
Ambient	<35 dBA at 1m
Stationary	37 dBA at 1m
Homing/Initialization	50 dBA at 1m
Pan	46 dBA at 1m
Tilt	44 dBA at 1m
Zoom	46 dBA at 1m
Theatre Mode	43 dBA at 1m

Although pan was very slightly louder, zoom was the most noticeable in operation. It's quick to operate but quite loud. The Robin 600 LED Wash offers a theatre mode of operation, which you can set in the menu system. This slows down the pan, tilt, and zoom motors to reduce noise levels. With this mode enabled, noise on those functions came down about 3dB.

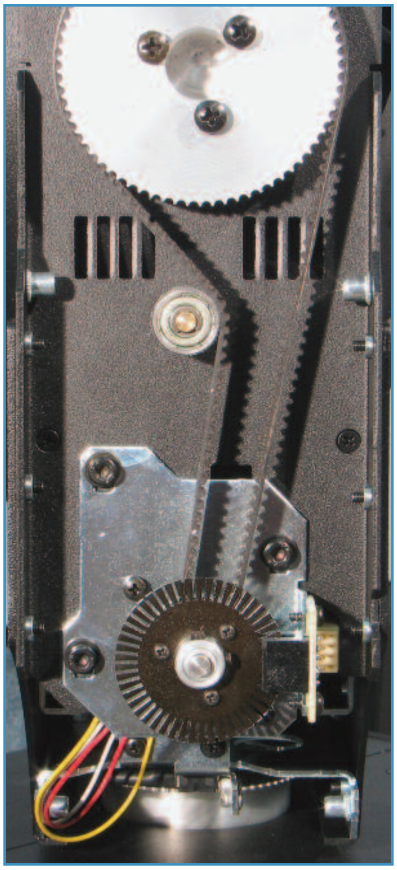

Figure 17: Tilt motor

Figure 18: Display

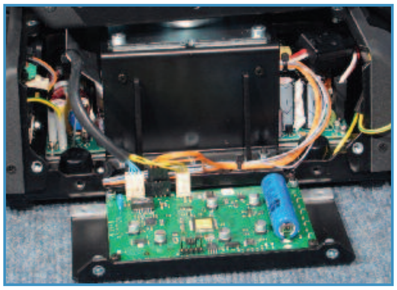

Figure 19: Control and power supplies

Electrical parameters

The Robin 600 LED Wash has a fully power-factor-corrected auto-ranging (100 – 240V 50/60Hz) power supply, and it consumed 3.5A, 420W with a unity power factor when running with all LED emitters at full power but no motors running. This equates to a maximum efficacy at the widest beam angle of 17.5lum/W. The quiescent load with no LEDs or motors running was 0.36A, 38W, with a power factor of 0.85.

Initialization time from power up or from sending a reset command through the DMX512 control channel was 30-35 seconds. The unit is well-behaved; it fades to black before starting to move in reset, and fades back up again when the reset is finished.

Electronics and control

The Robin 600 LED Wash uses Robe's standard color LCD display fitted with a touch screen as well as four push buttons (Figure 18). You can use either to operate the system, and it is battery-operated to allow setting parameters before the unit is powered. The system offers a comprehensive range of DMX512 options as well as a good range of diagnostic, stand-alone operation and service-related entries. The unit also stores all failure events, so there is a full service log available for the shop to look at. The electronics are distributed throughout the unit, with control and power supplies in the base (Figure 19) and motor drivers in one yoke arm (Figure 20) as well as the LED drivers in the head, which we've already looked at. Finally, there is a comprehensive range of connectors and data formats available, with the Robin supporting Art-Net and MANet over Ethernet, as well as DMX512 and RDM over both standard five-pin and non-standard three-pin XLR connectors (Figure 21).

Construction

The Robin 600 LED Wash is of standard current construction, using plastic covers over a die-cast and sheet-aluminum chassis. Access to the electronics in the yoke arms, head, and top box is simple and should present no problems. Access to the LEDs is a bit more time-consuming—there are a

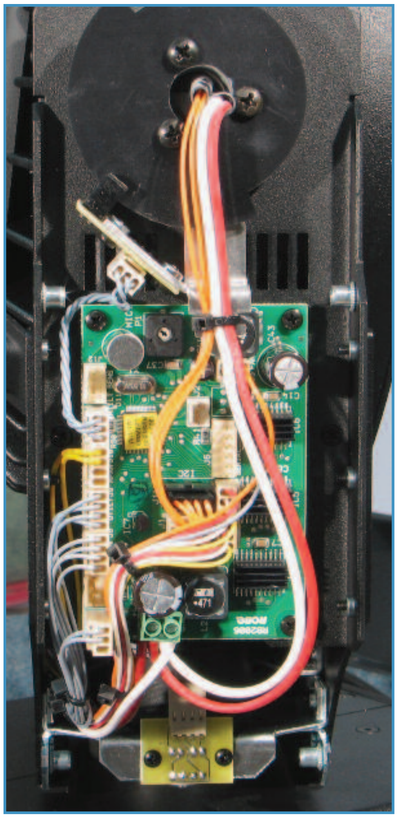

Figure 20: Motor drivers

Figure 21: Connections

lot of screws to remove — but still very straightforward.

Conclusions

There you have it, the Robe Robin 600 LED Wash. It's an interesting product that joins many others in a very competitive area of the market. The color homogenization and smooth zoom are definitely its strong points, but is it the right unit for you? I've given you the data, now you get to decide.

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