Robe ROBIN DLS Profile

By: Mike Wood

Robe has had a very successful couple of years with its ROBIN LED wash light units. We reviewed the Robin 600 LEDWash in these pages about 18 months ago, and its good color homogenization and smooth zoom were cited as strong features. That LED wash market has been getting busier and busier and is already starting to become commoditized. The days of the pixelated RGB LED PAR can are long gone, and every manufacturer is making sophisticated luminaires that do a great job. The same is not yet true for LED-based spot units, however. We have seen a number of introductions this past year of static LED spot units, designed to compete with standard theatrical ellipsoidal units epitomized by the ubiquitous ETC Source Four, with entries from ETC, Philips, Prism Projection, and many others jockeying for a position on your lighting rig. When we turn to automated LED spot units, the available number is even smaller, with only a handful as yet on the market. The difficulty has to do with collimating a large array of LEDs down into the small aperture of a spot unit. This is bad enough with the large gate of a theatrical ellipsoidal but is an order of magnitude more difficult for an automated unit with a gate that's only about 1" in diameter. There is no commoditization yet and still lots of room for innovation in design.

Robe enters this market with the ROBIN DLS Profile. The DLS is part of a product range that includes the DLX Spot and DLF Wash fixtures, all of which are fitted with the same RGBW LED light engine. The Robin DLS Profile offers the standard features of an automated spotlight with the addition of fully automated four-blade framing shutters, something I have not seen before on an LED unit. (More about that later.) How does the Robe Robin DLS Profile stack up? Is it a good replacement for a more conventional automated unit? As usual in these reviews, I'll try and answer as many questions as I can by working through the unit from lamp to output, describing and measuring everything as I go, my goal being to give you enough objective information to help you make up your own mind. As I understand it, I was sent one of the first production units for testing after its introduction at the fall trade shows. The results presented here are based on my tests of that unit.

All tests were run with the fixture operating on a nominal 115V 60Hz supply. However, the Robin DLS Profile can be run on supplies rated anywhere from 100–240 VAC, 50/60Hz with automatic voltage selection through switched mode power supply.

Figure 1: Fixture as tested

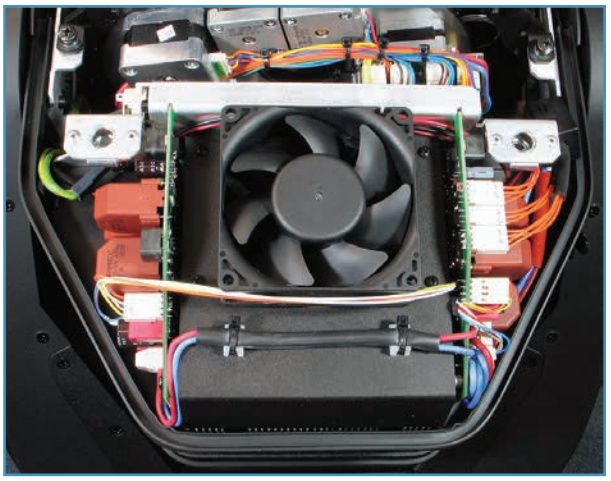

Figure 2: LED module

Light source

The Robin DLS Profile uses a 450W RGBW LED light engine. This employs proprietary technology to homogenize and collimate the four colors into a single light beam with almost no color errors or banding. We've seen a similar engine in another manufacturer's product earlier this year; however, that was RGB. Robe has chosen to add in white as a fourth channel. It doesn't increase the total power consumption, but it should help with color rendering and pastel colors. Robe rates the engine at 450W, with a minimum of

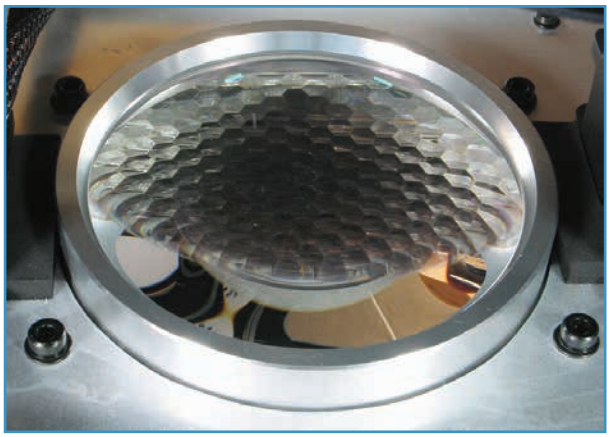

Figure 3: LED module lens

20,000 hours life and better than 75% beam uniformity. This light engine is a black box, and it is up to the luminaire manufacturer to provide cooling and LED drivers to control it. Robe has surrounded three sides of the light engine with a fine-finned heat sink, and has two fans, on top and bottom, to force air around and through those fins. The unit ran cool, with the two fans speeding up and slowing down as necessary to accommodate changing load conditions. The light engine is sealed, with no user-serviceable parts.

Figure 3 shows a view into the output lens of the light engine, and you can glimpse the hexagonal facets of the internal fly-eye lens that forms part of the homogenization system along with crossed dichroic filters, which superimpose the light beams. There are no further light engine optics; the collimated light comes out of this module and straight into the optical chain.

Strobe and dimmer

Dimming and strobing are, of course, done electronically by controlling the power to the LEDs with PWM control of the current. I ran the unit in DMX 512 Mode 1, which provides 16-bit control of many functions, including intensity. Figure 4 shows the dimming curve, almost a perfect match for straight line linear dimming. Dimming was very smooth to the eye for the top 90 - 95% of the curve. Once below 10%, you can start to perceive some stepping; however, it remains constant all the way down to zero, with no large steps or loss of color mixing. I measured the PWM frequency at 300Hz, the same as on the Robin LEDWash. The unit has a dedicated strobe channel that provides varied strobe options, such as ramp and random. I measured a maximum strobe rate of 17Hz.

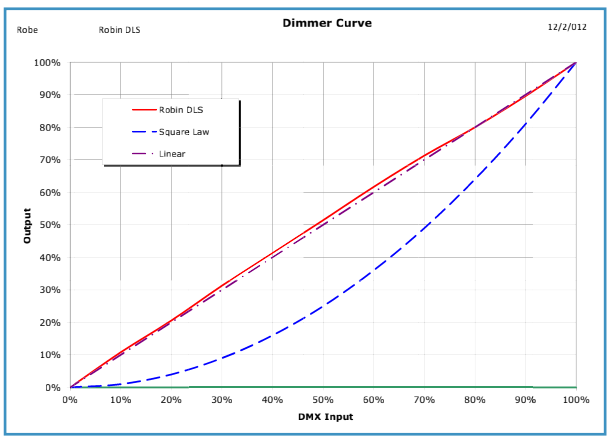

Figure 4: Dimmer curve

Color systems

As mentioned above, the Robin DLS Profile is a four-channel RGBW additive color mixing unit. As with the Robin 600 LEDWash tested last year, for color-mixing purposes Robe treats it as an RGB unit and adds white automatically to improve the color rendering and to add brightness. As soon as you mix a color that is not fully saturated, the electronics will add the white emitter into the mix to give a broader spectral response. I like this approach, as it gives the advantages of a fourth emitter without having to worry about how or when to best use it. By default, the unit is calibrated to produce white light rather than the usual pale pink when you take all the emitters to full, so full output is a useful color. It's clear that the unit does some internal power budgeting to keep the total heat load within specifications. This allows it to shift power between emitters as needed to optimize the mix. Again, to keep control similar to its Robin Wash siblings, the Robin DLS offers a virtual color wheel channel as well as RGBW additive mixing. This color wheel channel includes pre-programmed mixes for five different color temperature whites: 2,700K, 3,200K, 4,200K, 5,600K, and 8,000K. I measured the color temperature and Δuv of these as follows using a spectrometer.

	Color Temp, K	Δuv
2,700K	2,699	0.0001
3,200K	3,100	0.0004
4,200K	3,840	-0.0026
5,600K	4,940	-0.0023
8,000K	7,000	-0.0065

Note: Robe tells me that it calibrates these values using a Minolta CL-200A color meter to +/- 100K and +/- 0.001 for Δuv. I'm not surprised that those values differ from my results using a spectrometer, but this presents an interesting dilemma for the manufacturer. I believe that a tristimulus meter can never give correct values for RGB LEDs; however, most LDs will likely also be using such a meter. What does the manufacturer do? Use the same meter as his customers so they match, or use a spectrometer that, although arguably more accurate, won't match?

Figure 5 shows the spectrum when the output mix is set at the normal 8,000K white, and Figure 6 shows it set to 2,700K white. The warm colors, 2,700K and 3,200K, are good matches for incandescent light sources and show the advantage of adding the extra white emitter. The more colors the better, as far as color rendering is concerned.

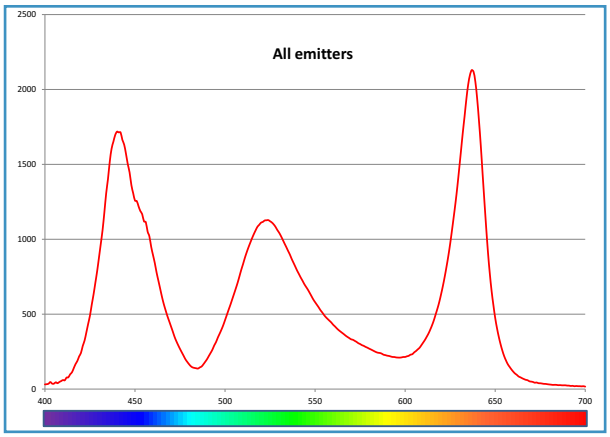

Figure 5: All emitters

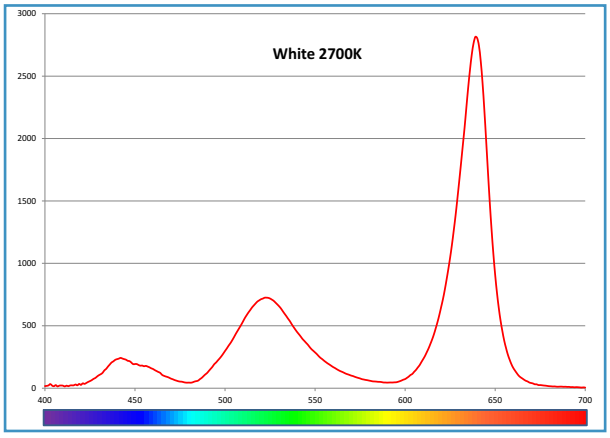

Figure 6: White 2700K

COLOR OUTPUT

Color	White	Red	Green	Blue	Cyan	Magenta	Yellow
Output	100%	18%	34%	6%	40%	23%	50%

All color changes are instantaneous, as you would expect with LEDs, so my usual timing tests wouldn't be relevant. For some reason, this always seems more surprising when you see it in a spot unit than a wash. I guess we have gotten used to those snap changes with LED washes, but not yet with gobos! Many colors can be achieved through the single color wheel channel, including rainbow chases, but you can always use the RGBW channels to mix the exact color you want. In addition, the Robin DLS Profile provides a CTO channel that modifies the color temperature of the standard white used in the color mixing. Using this, you can mix a color with the 8,000K standard white and then adjust it to what it would look like with a 3,200K source.

Iris

Finally, we get out of the light engine and start moving through the optical modules in the unit. The first optical module is the iris. The Robin DLS Profile has a conventional multi-leaf iris mounted on the front side of the framing module. The fully closed iris reduces the aperture size to 17% of

its full size, which gives equivalent field angles of 2.0° at minimum zoom and 7.8° at maximum zoom. I measured the opening and closing time at around 0.2 seconds.

Framing system

Next is the four-blade framing system. Framing modules have always been a tricky thing in moving lights. Many designers would like to use them, but they are difficult to make reliable and accurate, so they end up as an expensive specialty item. However, one of the biggest reasons they are so difficult to manufacture is because of the temperatures they normally have to deal with. It's not unusual for shutter blades to glow cherry red with the heat from an incandescent or HID lamp. The good news is that none of this is a problem with LEDs. No heat to worry about means that shutter materials can be thinner and more lightweight without fear of buckling, and bearings and moving parts will stay free-running when they don't have their lubricants boiled away. Friction is reduced, power is less, and the whole assembly can be small and lightweight. The framing module in the Robin DLS embodies all of this (Figure 8). Each of the four blades is directly connected to two stepper motors through simple two-bar linkages. As everything is so small and lightweight, it can move extremely quickly. I measured the blades at less than 0.1 seconds to move from out of the beam to their fully inserted position. That snappy movement means you can use these blades as a fully shape-configurable iris or as a special effect, as well as the normal framing use. The blades run between the cross-shaped separator plates that you can see in the photograph, with the outer two blades in their own slots and the center two sharing a slot. Each blade can pivot +/- 45° and can cover more than half of the beam when fully inserted (75% when flat, 57% when fully angled). Figure 9 shows the top blade in two different positions, so you can see how the motors move to position and angle the blade. In addition, the entire mechanism can be rotated 90° through a separate, ninth, motor. Full travel on this motor took two seconds. I was concerned about the accuracy of such a simple system; however, I measured the hysteresis at a very respectable 0.05°, which is 0.2" at 20'. The optics at wide angle cause some pin cushion distortion, which means that the straight edges of the shutters get curved at wide beam angles. The weakest point on the shutters is slightly jerky movement when running at very slow speeds, but their strength is they are very, very quick. The simple construction and lack of heat should mean good reliability.

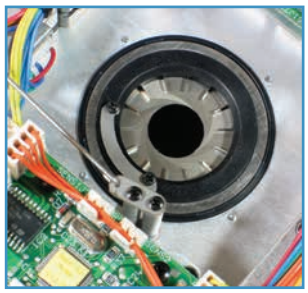

Figure 7: Iris

Figure 8: Framing module

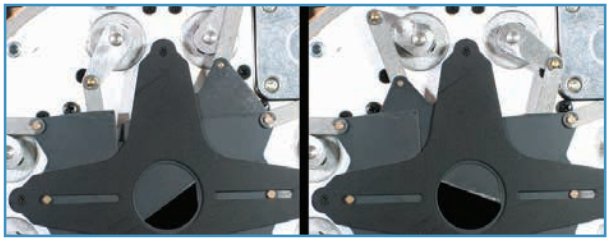

Figure 9: Shutters

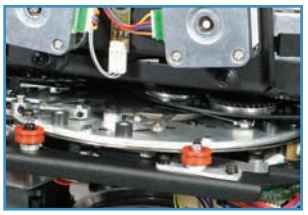

Figure 10: Framing and gobo

Figure 11: Gobo

Gobo wheel

Face to face with the framing module is a conventional rotating/indexing gobo wheel with seven patterns plus open hole. The gobos are changed through a snap-in cartridge system. The range of both pattern and wheel rotation was good, with smooth movements at slow speeds. The wheel uses a quick-path algorithm to minimize change times.

ROTATING GOBO SPEEDS

Gobo change speed – adjacent	0.2 sec
Gobo change speed – worst case	0.5 sec
Maximum gobo spin speed	0.45 sec/rev = 133 rpm
Minimum gobo spin speed	612 sec/rev = 0.1 rpm
Maximum wheel spin speed	6 sec/rev = 10 rpm
Minimum wheel spin speed	240 sec/rev = 0.3 rpm

Hysteresis accuracy on rotation positioning was 0.1°, equivalent to 0.4" at 20'. Focus quality was generally good; the large-range zoom optical system tends to cause pin-cushion distortion at wide zoom angles, which affects edge to center a little and gives some mild distortion, but nothing too unusual. As usual with these fast optical systems, it isn't possible to focus on the gobos and iris or framing shutters at the same time.

Effects wheel

The Robin DLS Profile has an effects, or overlay, wheel. This is a large breakup pattern that can be moved across the gobo aperture at an angle. Both the amount of insertion and

rotation can then be altered, giving some effective shimmering/water type effects to the gobo pattern. Figure 12 shows the effects wheel in its fully open and fully inserted positions. The control channel offers some interesting preprogrammed macros, which combine gobo and effects wheel movement to interesting effect.

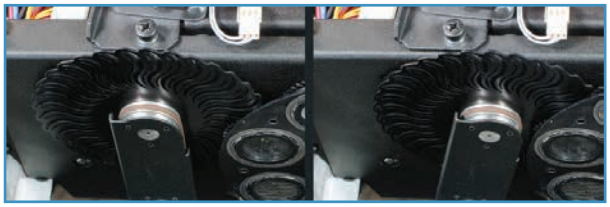

Figure 12: Effects wheel

Lenses and output

The final optics in the Robin DLS are the familiar three-group system seen on many spot units. Two groups move, providing zoom and focus, while the final group is stationary and forms the final output lens of the luminaire. I measured the output in open white 8,000K at 3,936 lumens at a wide angle of 46.4°, ramping down to 3,049 lumens at 11.7° over a 4:1 zoom range. The beam distribution is very smooth,

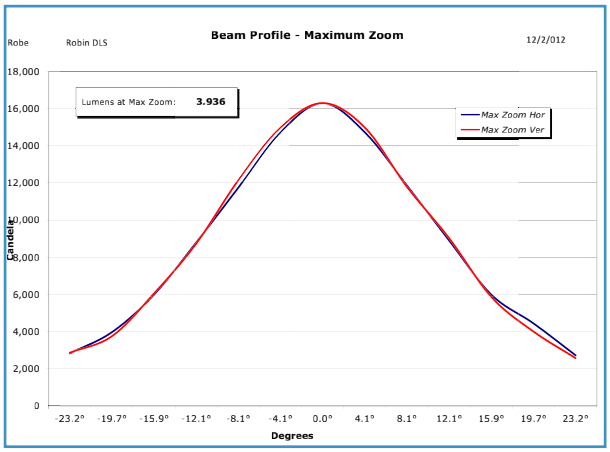

Figure 13: Maximum zoom

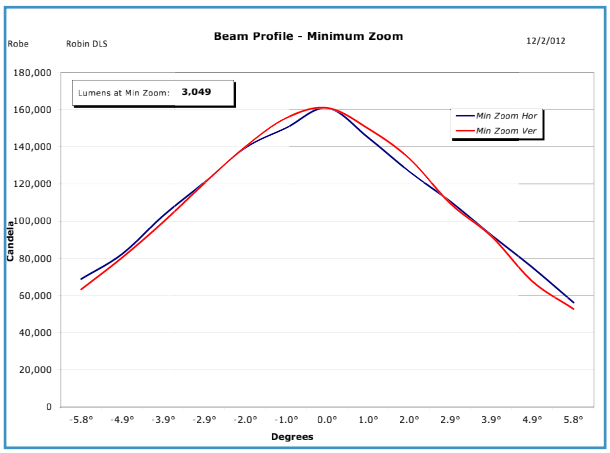

Figure 14: Minimum zoom

blending distribution with good beam homogeneity. As mentioned earlier, there is some noticeable barrel distortion at the wide angle end of the range. The time for the zoom to move from narrow to wide was 0.6 seconds, while a full range focus change took one second.

Prism and frost

The prism and frost are mounted between the zoom and focus lenses. Each is placed on an arm that swings in. The three-facet prism takes 0.5 seconds to insert and can be rotated at speeds ranging from 0.3 sec/rev (200 rpm) down to 162 sec/rev (0.37 rpm). Image separation is good and alters with zoom. The frost is a simple flag that can be dropped across the beam in 0.2 seconds. It's the kind I call a "wash" frost in that it washes out the entire beam, and it isn't possible to use the frost to soften the edges of gobos. (I call the one that softens gobo edges a "diffusion" frost. Both types have their uses, but they look very different in operation, and it's important to know which kind you have.)

Figure 15: Frost and prism

Pan and tilt

The Robe Robin DLS Profile has a pan range of 540° and a tilt range of 280°. It took four seconds for a full range pan and 2.4 seconds for a more typical 180° move. A full 280° tilt move took 2.6, while a 180° tilt took 2.2 seconds.

Movement was smooth with excellent repeatability and no stepping; I measured hysteresis at 0.07° on pan and 0.03° on tilt. That's equivalent to 0.3" at 20' for pan and 0.1" for tilt.

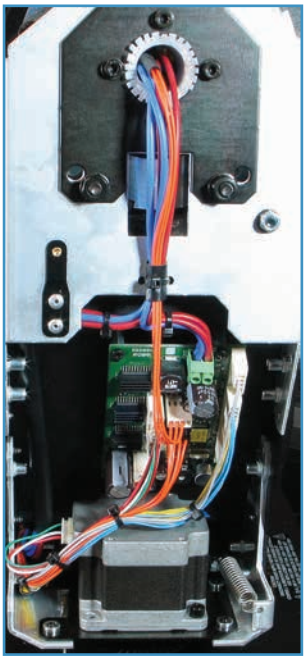

Figure 16: Yoke arm

As we've seen with other stiff systems, good repeatability often leads to some bounce on final positioning, and that's the case here. Both pan and tilt systems are fitted with encoders and will correct position errors if blocked or knocked. Figure 16 shows one of the yoke arms with the pan motor, tilt is in the other yoke arm.

Noise

SOUND LEVELS

	Normal Mode
Ambient	<35 dBA at 1m
Stationary	44.8 dBA at 1m
Homing/Initialization	46.1 dBA at 1m
Pan	46.5 dBA at 1m
Tilt	48.2 dBA at 1m
Effect	45.5 dBA at 1m
Gobo	46.5 dBA at 1m
Gobo rotate	46.5 dBA at 1m
Zoom	47.1 dBA at 1m
Focus	46.8 dBA at 1m
Frost/Prism	45.0 dBA at 1m

The unit is very consistent with its noise level, which is primarily driven by the LED cooling fans. These figures are all with the unit at full white output after running for 30 minutes. I ran the fans in auto mode, but it is possible to override that and set them to theatrical mode, where you can adjust the fan speed to whatever you wish. The system will automatically reduce light output and movement speeds as required. Sometimes it's better to have a fixed fan speed than one that ramps up and down; a constant noise is often subjectively less noticeable than one that keeps changing. I tested theatrical mode and set the fans to minimum speed; this dropped the stationary noise level by a significant 8dBA down to 37dBA while the light output reduced to 66%.

Electrical parameters and homing/initialization time

POWER CONSUMPTION AT 115V, 60HZ

	Current, RMS	Power, W	VAR, VA	Power Factor
Quiescent (LEDs off)	0.88A	103W	108VA	0.95
LEDs at full	3.85A	459W	461VA	0.99

Initialization took around 36 seconds either from a cold start or 30 seconds from a DMX512 reset command. Homing is well-behaved, and the fixture doesn't fade up until pan and tilt have finished moving to their final position.

Electronics and control

The Robin DLS Profile uses Robe's standard comprehensive touch-screen color LCD display, which also has four adjacent push buttons (Figure 17). You can use either the touch

Figure 17: Display

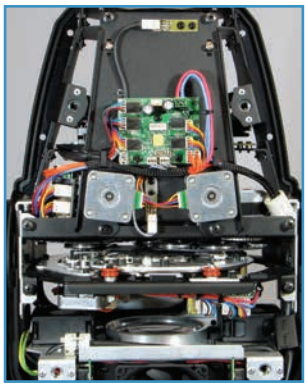

Figure 18: Optical modules

screen or the buttons to operate the system, which 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 tracks all failure events, so there is a full service log available for the shop to examine, as well as full RDM capability for remote configuration and diagnosis. Integral wireless DMX is also optional, using the LumenRadio CRMX module.

Electronics is distributed on various small circuit boards throughout the unit, control and power supplies are in the base, and motor drivers are adjacent to their own modules such as the one shown in Figure 18.

The Robin DLS offers five-pin XLR DMX512 and three-pin XLR connections as well as an Ethercon for Ethernet that provides Art-Net, MANet 1, and MANet 2 support with Streaming ACN support planned. You can also use a unit as an Ethernet-to-DMX512 gateway, where it receives one of these protocols and retransmits a universe as DMX512 through the XLR connectors.

Figure 19: Connections

Construction

The Robin DLS Profile is a simple unit to disassemble and work on. With the exception of the sealed LED engine, everything else should be easily serviced. The appearance is very similar to other Robe spot units and, unlike wash units, you would be hard-pressed to recognize it as an LED-based unit from a distance.

So that's it, the Robe Robin DLS Profile. The first LED spot unit I've tested to have automated framing shutters. The effective removal of heat-related problems through the use of LED sources opens up the engineering possibilities in units like this, so I'm sure it's not the last. Could the Robin DLS fill a slot in your lighting rig? As always, you get to decide.

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