Philips Vari-Lite VL2600 Spot

By: Mike Wood

Figure 1: Fixture as tested.

White-light LED engines keep getting better and better. Regular readers of this column will know that I'm still somewhat skeptical of the mixed technology of using white LEDs with dichroic color-mixing, but I can't argue with reality or the market, and the combination undoubtedly represents the majority of new spot fixtures these days.

This month, we are looking at a new fixture from the company that started it all, Vari-Lite: the VL2600 Spot. This is a small unit with a high-power LED white engine, gobo wheels, and CMY dichroic color-mixing. This is a sector of the market that is very busy right now, so how does the unit stack up against the competition? I've tried to help you with that decision by measuring all that I can and reporting it in a standard format.

The results presented here are based on the testing of a single unit supplied to me by Vari-Lite, with the fixture operating on a nominal 120V 60Hz supply (Figure 1).

Light source and cooling

The VL2600 Spot uses a new (or, at least, new to me) light engine from a company called Unionlux. The AMF520 is a prepackaged engine containing an array of white LEDs, each with associated optics. It is capped with a fly-eye lens array and final collimating lens. This engine is rated at a nominal 30,000lm output when run at 526W. Figure 2 shows a view of the package with the fly eye lens visible through the output lens. To give you an idea of scale, this output lens is about 50mm in diameter.

Figure 2: LED engine lens.

The heat generated by the LED array is directed back through six heat pipes into a large finned heat sink with two sets of fans, one set on the bottom, drawing air in, and the other on the top, exhausting it, forcing cooling air through

Figure 3: Cooling.

the heat sink and out the top of the luminaire. Figure 3 shows the heat sink along with the heat pipes and fans.

Color systems

The primary optical components of the VL2600 Spot are mounted in two removable optical modules. The first contains color-mixing, color wheel, and two of three gobo wheels, while the second has the final gobo wheel and iris. Figure 4 shows the light input side of this module. The color-mixing uses four pairs of linear flags, (cyan, magenta, yellow, and CTO), with etched gradient patterns. A closer

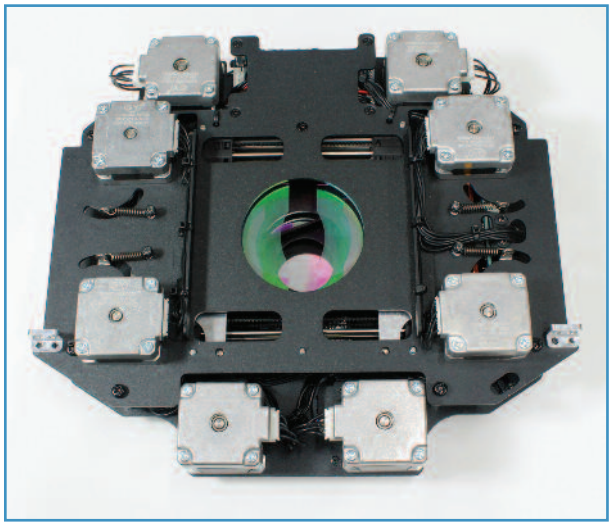

Figure 4: Module 1, input side.

view of one of these flag pairs is in shown Figure 5. The etched dot pattern is clearly visible, along with the semicircular cutout on the leading edge of the glass flags. Color-mixing from this system was very smooth and even. There was a small amount of color difference between the center and the edge when mixing my torture-test colors, lavender and aqua, but nothing objectionable. As I always seem to discover with units based around LED arrays with dichroics, you start to see some color-fringing when there is an unfocused gobo edge in the beam.

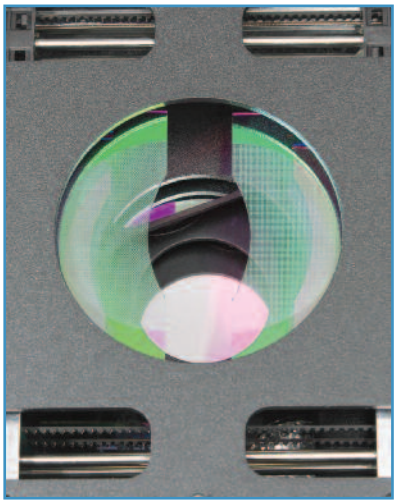

Figure 5: Color-mixing flags.

COLOR MIXING

Color	Cyan	Magenta	Yellow	Red	Green	Blue
Transmission	25%	8.8%	77%	7.4%	13%	0.9%
Color change speed – worst case				0.6 sec		

Inserting the CTO flags fully across the beam dropped the color temperature from the native 7,422K down to 2,682K, with a corresponding drop in output to 29% of the original (Figures 6 and 7). The corresponding TM-30 and CRI colorrendering metrics varied from the mid-60s to mid-80s as the color temperature was adjusted.

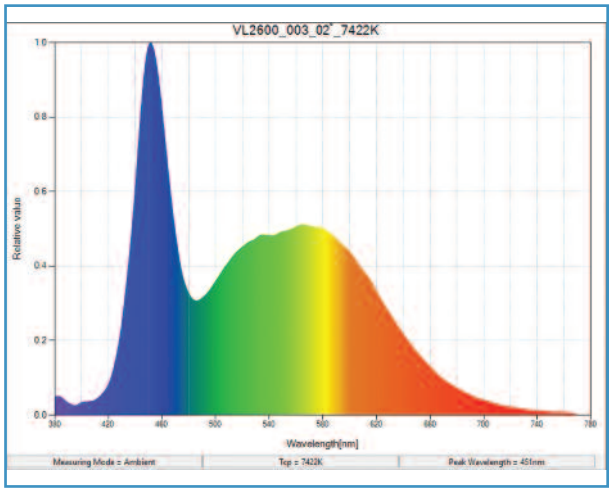

Figure 6: Native spectrum.

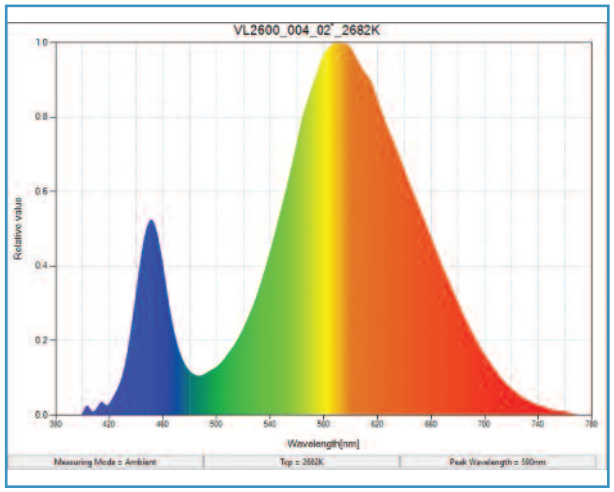

Figure 7: Full CTO spectrum.

Next in line is the color wheel. This has seven fixed colors plus an open hole.

COLOR WHEEL

Color	Red	Blue	Yellow	Kelly Green	Congo	Amber	CTB
Transmission	1.5%	0.8%	87%	17%	0.1%	23%	70%

COLOR WHEEL SPEED	
Color change speed – adjacent	0.2 sec
Color change speed – worst case	0.7 sec
Maximum wheel spin speed	0.79 sec/rev = 76 rpm
Minimum wheel spin speed	1760 sec/rev = 0.03 rpm

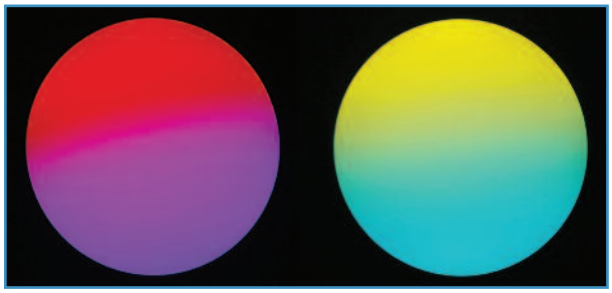

Figure 8: Half colors.

Color change speed was good; I'd say 0.2 seconds was the average for fixtures in this sector of the industry. The transitions between the colors is also good, with almost no border, so that half-colors are possible. Figure 8 shows two transitions, the first from red to blue and the second from yellow to Kelly green.

Gobo wheels

The VL2600 Spot has three gobo wheels: two rotating and one fixed. The first two are on module 1 and are visible in Figure 9, which shows the rear of that module. First in the optical path is the fixed gobo wheel, on the right side of Figure 9; it has eight removable patterns plus an open hole.

FIXED GOBO SPEEDS	
Gobo change speed – adjacent	0.3 sec
Gobo change speed – worst case	0.75 sec
Maximum wheel spin speed	1.4 sec/rev = 43 rpm

The two rotating gobo wheels look to be identical; one is on the rear of module 1 while the other is facing it on the front of module 2 (Figure 10). Each has seven removable gobos plus an open hole. Figure 11 shows a gobo in its nap-in carrier removed from one of the rotating gobo wheels.

ROTATING GOBO SPEEDS	
Gobo change speed – adjacent	0.3 sec
Gobo change speed – worst case	0.8 sec
Maximum gobo spin speed	0.55 sec/rev = 109 rpm
Minimum gobo spin speed	520 sec/rev = 0.12 rpm
Maximum wheel spin speed	1.4 sec/rev = 439 rpm
Minimum wheel spin speed	2640 sec/rev = 0.02 rpm

Both wheel and gobo rotation were smooth, with a very wide range of rotation speeds. An interesting feature that the gobo wheels share with the color wheel is that you can choose, through a DMX channel, whether each has quick path enabled or not. With quick path enabled, the wheel will always take the shortest route to a newly selected pattern or color; with it disabled, the wheel always takes the longest route. The positional accuracy of the gobo rotators is excellent, with a measured hysteresis of 0.10° that equates to 0.4" at a throw of 20'.

The two rotating gobo wheels are close enough that you can get a good morphing effect between them. Figure 12 shows an example of this. I particularly liked the two gobos that are honeycomb-shaped (bottom center in Figure 9 and top center in Figure 10). There are two gobos with this pattern, one being the negative of the other and one on each of the two gobo wheels. Overlaying them, rotating one against the other, and mixing between them gave some interesting looks. One final point: When rotating the whole gobo wheel, the system controls the light output to avoid damaging the gobo wheel as it passes through the beam.

Iris

The last item on module 2—just visible beneath the gobo wheel in Figure 10—is the iris. It moved from fully open to fully closed in 0.4 seconds and, when fully closed, reduced the aperture to 41% of its full size. This gives equivalent field angles of 2.3° at minimum zoom and 16.7° at maximum zoom.

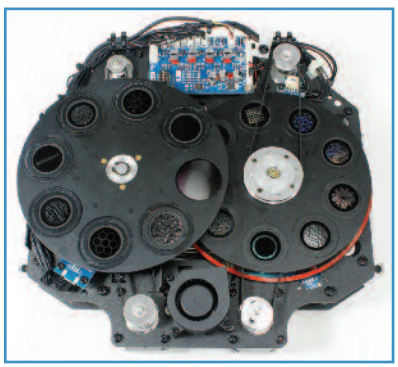

Figure 9: Module 1, output side.

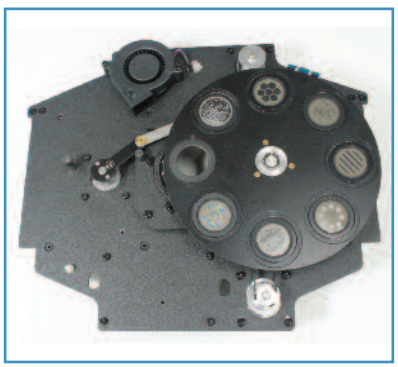

Figure 10: Module 2.

Figure 11: Rotating gobo.

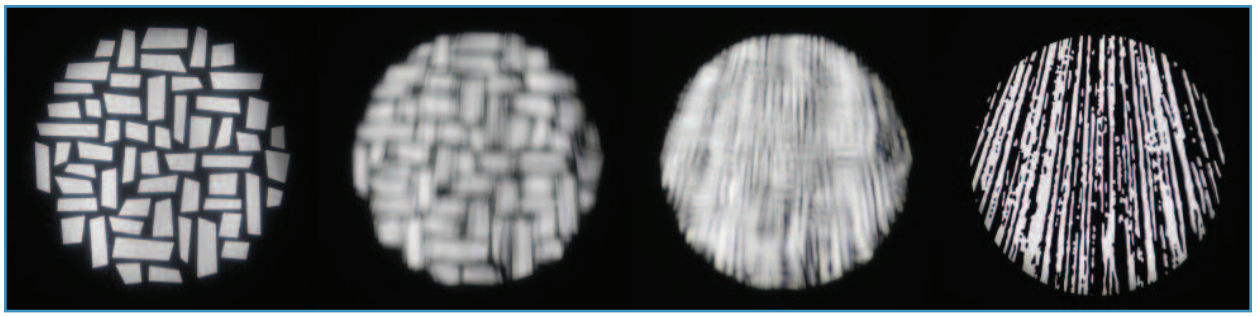

Figure 12: Gobo morph.

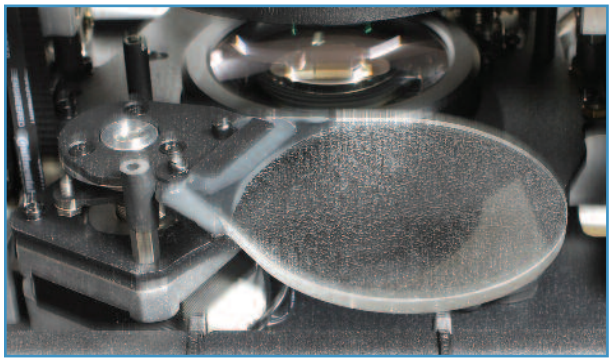

Figure 13: Frost.

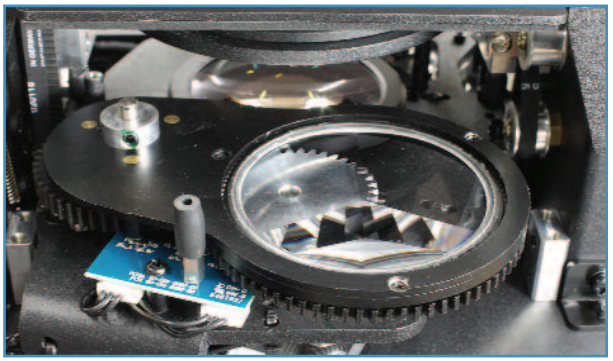

Figure 14: Prism.

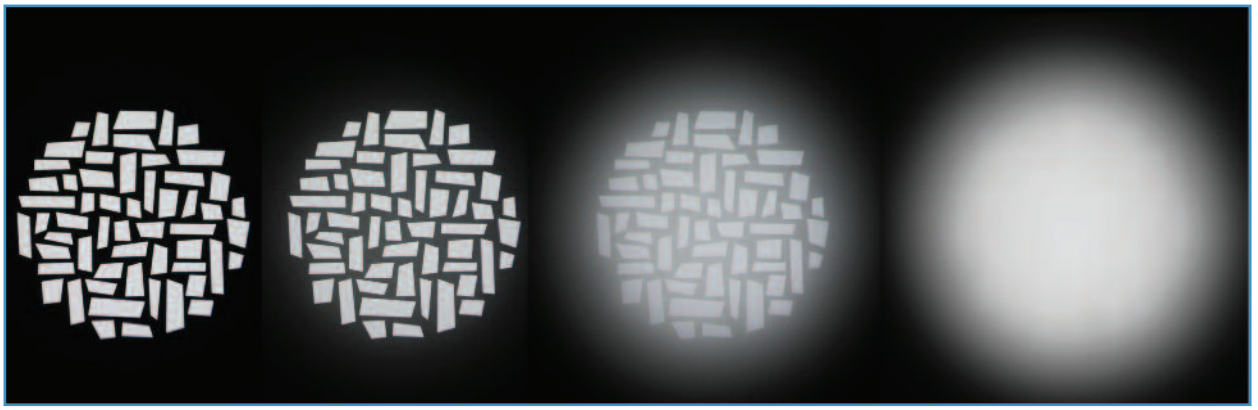

Figure 15: Frost effect.

Frost and prism

The VL2600 Spot contains the usual three-group zoom system with the frost and prism mechanisms mounted on the rear of lens group 1 and traveling with it. Frost and prism both need the same position in the optical train, so only one at a time can be used, as they share the slot.

The frost flag can be inserted or removed in 0.5 seconds. The flag has intermediate positions but, like many frost systems, doesn't actually soften the projected edges of gobos until fully inserted. Instead, it reduces overall image contrast and increases spread. You can also see the edge of the flag coming across the beam. Figure 15 shows the effect as frost is brought in.

The prism is a three-facet, which can be inserted in 0.4 seconds. Once in place, it can be rotated at speeds varying from 0.6 sec/rev (100rpm) down to 804 sec/rev (0.07rpm).

Lenses and output

The VL2600 Spot has a wide zoom range. I measured field angle as varying from 5.8° to 41°, or 7:1. The output at wide angle was 17,300lm, ramping down to 11,450lm at narrow angle. The beam profile was clean and very flat at all angles (Figures 16 and 17). The focus (or "edge," as Vari-Lite calls it) was excellent, with almost no visible chromatic or spherical aberrations. Moving these heavy lenses over the large range is difficult to do quietly and quickly, but the VL2600

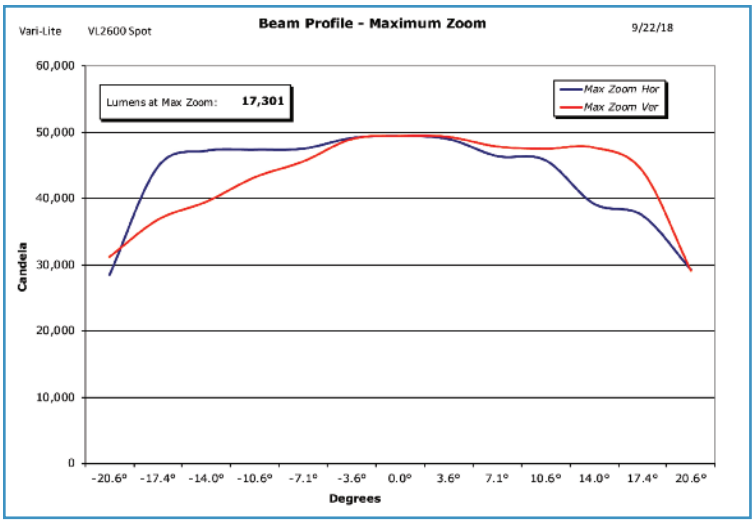

Figure 16: Maximum zoom.

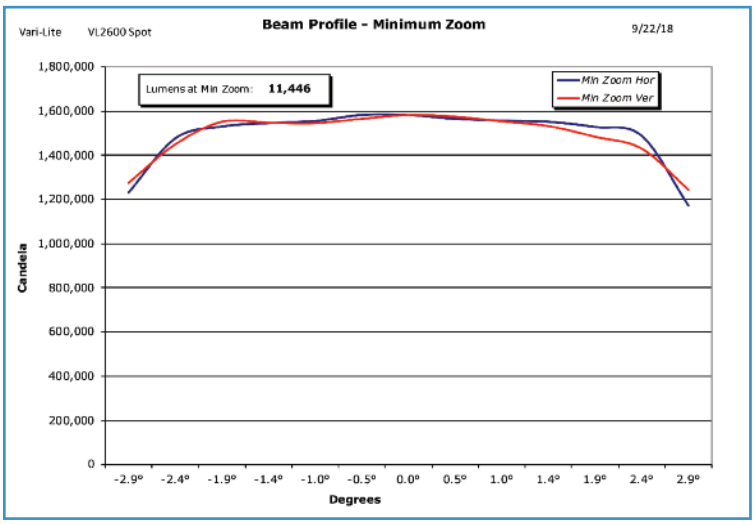

Figure 17: Minimum zoom.

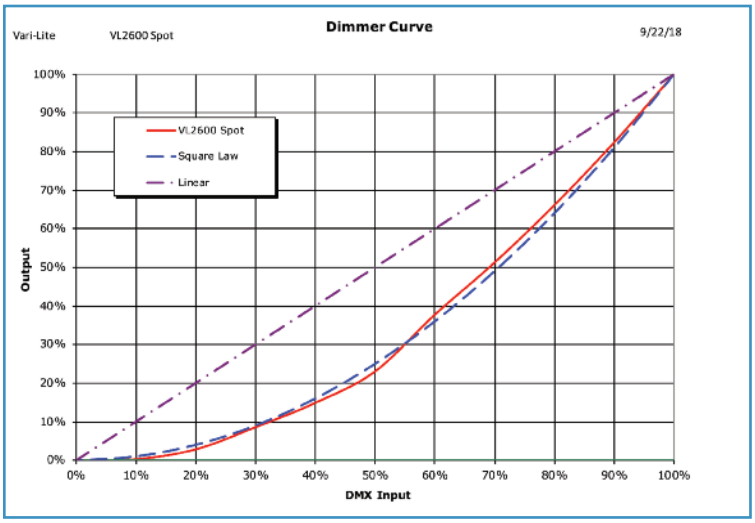

Figure 18: Dimmer curve.

does a good job. The zoom lens took one second to travel end-to-end, while the focus lens took 1.6 seconds. There is, as always, a lot of interaction between the two lens functions, particularly at the narrow angle end, and the system seems to give priority to the last lens you move when it comes to collision control. It can, therefore, take a bit of juggling of both controls to get the exact result you want.

Dimming was extremely smooth and followed the standard square law very well. I didn't see any jumps or steps in slow fades to black (Figure 18). I measured the PWM rate at 3.9kHz. Strobing of the LEDs is adjustable up to 30Hz. *(Note: I've always reported strobe speeds as, in the past, this was a mechanical function that varied widely from unit to unit, and manufacturer to manufacturer. As nearly everything these days is LED-based, and the strobe is, therefore, fully electronic, I'm not sure of the usefulness of this metric any longer. Anyone should be able to make a LED fixture strobe just as fast as they need!)*

Pan and tilt

The Vari-Lite VL2600 Spot has a pan and tilt range of 536° and 270°, respectively. A full-range 536° pan move took 4.8 seconds to complete, while a more typical 180° move finished in 2.5 seconds. Tilt took 3.1 seconds for a full 270° move and the same 2.5 seconds for 180°. All movements were very smooth, with very little bounce and no visible steppiness. I measured hysteresis on pan at 0.12°, equivalent to 0.5" at 20', and on tilt at 0.05°, equivalent to 0.2" at 20'.

Noise

For once, it wasn't zoom and focus that were the loudest functions. That dubious honor goes to the iris. Overall, the VL2600 Spot was consistent in its noise levels, with the constant noise floor from the fans providing the bulk of the noticeable sound.

SOUND LEVELS

	Normal Mode
Ambient	<35 dBA at 1m
Stationary	46.4 dBA at 1m
Homing/Initialization	49.9 dBA at 1m
Pan	47.3 dBA at 1m
Tilt	47.5 dBA at 1m
Color	46.4 dBA at 1m
Gobo	46.4 dBA at 1m
Gobo rotate	46.4 dBA at 1m
Zoom	48.6 dBA at 1m
Focus	46.4 dBA at 1m
Prism	47.2 dBA at 1m
Iris	54.1 dBA at 1m
Frost	46.4 dBA at 1m

Homing/initialization time

Full initialization took 55 seconds from either a cold start or a DMX512 reset command. The VL2600 Spot homing is well-behaved in that the fixture fades out smoothly, resets, and keeps the LEDs off before fading up again after all movement is finished.

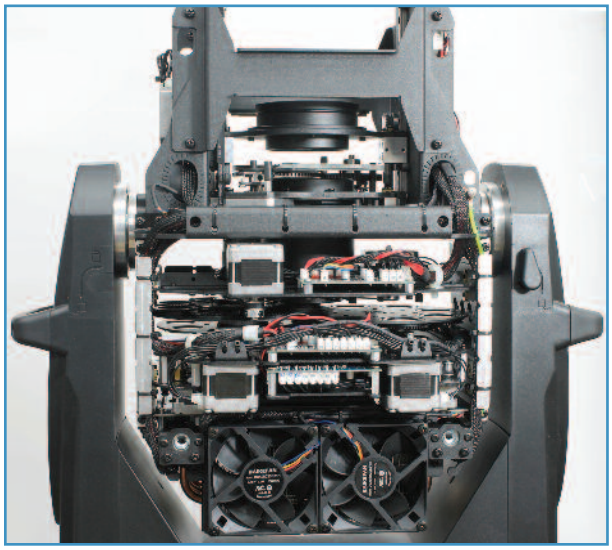

Figure 19: Head.

Power, electronics, control, and construction

The head, with its main modules, can be seen in Figure 19. The two main modules were very easy to remove after the wiring harness was unplugged. Overall construction is very neat and tidy, with thought clearly being given to ease of maintenance. Figure 20 shows both yoke arms with the covers removed; again, disassembly was very easy.

Finally, the top box. The setup menu uses a color LCD display that is clear and easy to read, along with control through six membrane switches. It has all the usual options

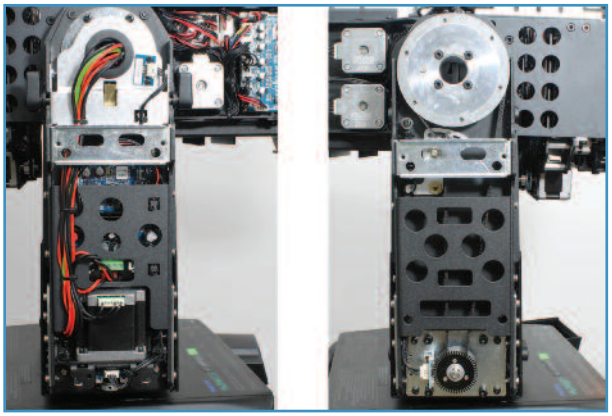

Figure 20: Yoke arms.

Figure 21: Display.

Figure 22: Connectors.

for fixture configuration and shows some useful diagnostic information (Figure 21). The power and connectors are on the other side: powerCON TRUE1 for power in and through, five-pin DMX512/RDM, and an RJ45 network connection supporting only Art-Net (Figure 22).

In my testing at 120V, 60Hz the power consumption of the VL2600 Spot was 5.8A with the LEDs at full power, fans running, and no motor movement. That equates to 683W, 685VA with a power factor of 1. Quiescent load with LEDs extinguished was 0.8A, 102W, 102VA, power factor of 1.

That's it from end-to-end for the Vari-Lite VL2600 Spot. It's clearly an elegant unit, but does it have what it takes to compete? There's a lot to choose from out there in this market sector. As always, I hope that my measurements are of some help to you in that decision and encourage you to try these units out in your own venues. Your own eyes are the true judges.

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