As seen in Lighting&Sound America October 2004, www.lightingandsoundamerica.com

The VL1000 ERS

Getting inside one of the lighting industry's most talked-about products

by Mike Wood

Before we start, let me explain the goal of this review. It isn't intended to be a subjective assessment of the unit tested; rather, it's an attempt to provide objective measurements of the unit's performance and operational parameters in a way that allows readers to decide for themselves whether it is or isn't suitable for their applications. The uses of entertainment lighting equipment are so diverse and varied that, inevitably, a feature that works marvelously for one application will be less useful in another. We hope, by presenting the raw data, that you can draw your own conclusions for your own needs.

This is a pilot review for what may become a regular series. Therefore, we've chosen a fixture that is relatively new but still sufficiently well-known that readers are able to compare the findings here with their own experience and judge the merits accordingly—thus, the Vari-Lite VL1000 ERS. The VL1000 has been around for a while now, and is a stable and well-known product, but is still new enough not to be commonplace; it seemed to us an appropriate unit with which to start. Please let us know if you find this approach to be useful.

The VL1000 is an automated ellipsoidal spotlight, sold and marketed as combining the functionality of the ubiquitous conventional ellipsoidal spotlight with the versatility of an automated luminaire. For this review, we looked at the tungsten version with integral framing shutters and an external dimmer: the VL1000TS model. Alternative versions are also available with features that include an integral dimmer and with a discharge lamp. These versions were not tested.

In all tests, the fixture lamp was run at a controlled 115V. (See Fig 01).

Fig 01: Test setup.

Lamp

Let's start from the lamp and work forward. The lamp (designated VL1K) is a custom Ushio 1,000W, 3,200°K, 115V compact biplanar grid filament lamp mounted on a robust G22 base. Vari-Lite uses a standard lampholder, with the addition of large aluminum blocks which clamp around the base. Presumably, these serve to act as heatsinks as well as securing the lamp. The system seems to work well and I had no problems with the lamp shifting during movement. (See Fig 02)

The lamp is positioned in a large cool-mirror coated-glass ellipsoidal reflector immediately followed by a planar hot mirror; this layout is common these days and does a good job of keeping the heat in the rear of the unit and away from the optics and motors downstream. I measured temperatures up to 200°C on the outside of the rear heat sink but not more than 80°C in the optical compartment.

Gobo

Next in the path is the rotating gobo mechanism; this is a fairly standard belt-and-gear-driven planetary motion system with six apertures, five changeable gobos, and an open position. (See Fig 03). Changing gobos is straightforward; by releasing two spring clips, the front cover of the fixture slides forward a few inches before being stopped by the safety bond. This gives you enough room to access the gobos without having to completely remove the cover—which means no large, loose parts when you are up on a ladder. The gobos, unusually, are square and slide into the wheel behind a large spring clip. (See Fig 04). It's not difficult to do but it would be easy to accidentally scratch a glass gobo. (See Fig 05).

Rotating Gobo

Gobo change time, adjacent apertures	1.2 sec
Gobo change time, max (Gobo 0 to 3)	2.7 sec
Maximum gobo rotate speed	1.65 sec/rev = 36 rpm
Minimum gobo rotate speed	2150 sec/rev = 0.028 rpm

Gobo indexing when rotating in one direction is very accurate; however, there is a significant amount of hysteresis in the system when switching from one direction of rotation to the other. The result of this is a potential gobo position error of 0.4° (2" at 24') when direction is reversed.

Framing module

The framing module is mounted as close as possible to the gobo wheel to minimize focus difference between the optical planes. (See Fig 06). This is a critical component of this type of fixture; if the unit is to replace a conventional ellipsoidal the framing has to perform well.

Framing Module

	Adjustment angle	Time for full travel	Speed
Shutter Blades	60° (+/- 30°)	6 sec	10 deg/sec
Total Rotation	90° (+/- 45°)	12 sec	7.5 deg/sec

The combination of each blade having +/- 30° of rotation and the whole assembly +/- 45° means that most shutter cuts can be made. Each blade is driven by two motors and two DMX channels, each channel controlling the movement of one end of the blade. Each channel controls both blade insertion and rotation, with consequent interaction between the two channels; this interaction means that operation is not completely intuitive. However, it is relatively easy to get the shapes required once you figure out what's going on.

Each blade can cover up to 80% of the aperture; this has both good and bad consequences. On the plus side, this independence means that you can make almost any shape with the shutters, including narrow slits and triangular shapes. On the minus side, the necessity for blades to pass each other means that they run in separate slots and are in different focal planes; as a consequence, the fixture cannot provide a sharp focus on all the blades simultaneously and some compromise is needed. (See Figs 7 and 8).

Similarly, you cannot hard-focus on the gobo and shutters at the same time. This isn't unusual in ellipsoidals.

Focus lens

Unusually, the focus lens is next, and is mounted before the color-mixing; this arrangement has a couple of advantages in the VL1000's optical system. Firstly, the color-mixing ends up between the lenses, which ensures that it is well out of focus and, secondly, it positions the focusing lens close to the center of gravity of the fixture so its balance remains relatively constant. (See Fig 09).

Focus quality is generally good and on a par with other incandescent ellipsoidal fixtures. With the large filament size of an incandescent lamp, the focus is never going to be quite as good as with a small arc source. There is some focus difference between center and edge, but it is acceptable. (See Fig 10). This is mainly noticeable when in minimum zoom and reduces as beam size increases. Focus lens movement is relatively slow, which makes finding accurate focus tricky.

Fig 02: Lamp holder showing retaining clips and heatsinks.

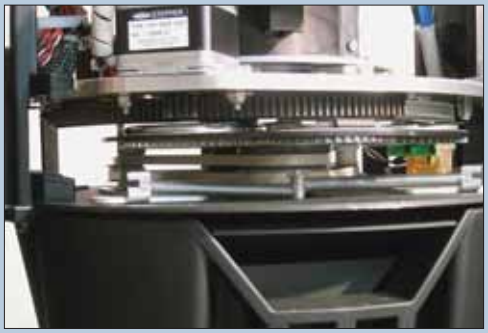

Fig 03: Gobo mechanism and driving belts.

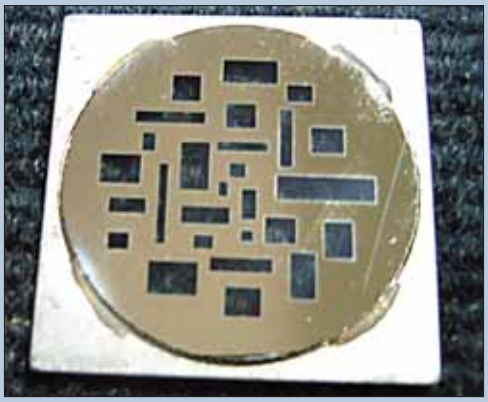

Fig 04: Gobo as supplied on square mounting plate.

Fig 05: Gobo change, care needs to be taken to avoid scratching glass gobos on the retaining clip.

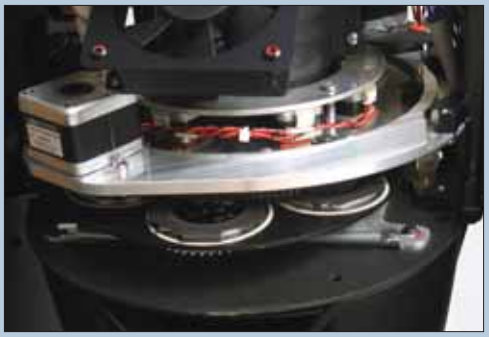

Fig 06: Caption: Gobo and framing shutter mechanism, note the thin framing module.

Figs 07 & 08: Two shots of the same framing setup with different focus positions, the first is hard focused on the bottom blade, the second on the left blade.

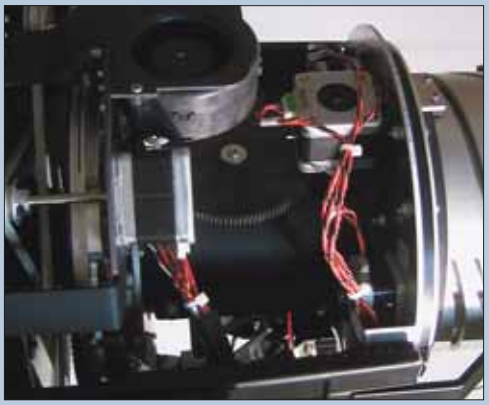

Fig 09: Caption: Focus lens assembly.

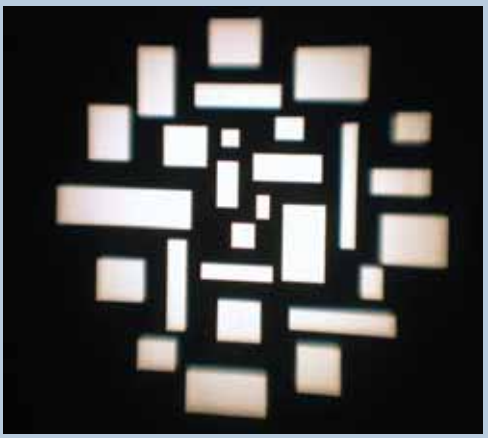

Fig 10: Center-to-edge focus in normal use at a 20ft throw, minimum zoom.

Focus lens

Focus speed - end to end	7 sec

The focus lens assembly has a small, blacked-out section in the center of the beam; this presumably reduces any center hotspot and improves the overall beam profile.

Color-mixing

The VL1000 utilizes a very slim dichroic CMY color-mixing system between the focus and zoom lenses. Each color uses two blades, which move into the beam from opposite sides. It appears that the dichroic flags do not need to be etched to ensure a flat, smooth color mix, a positive consequence of the positioning of the color system in the optical train. (See Fig 11).

Color-mixing is smooth, with little visible aberration in the beam. It is possible to mix acceptable pastel colors such as Lee 103 (straw) and Lee 117 (steel tint), as well as the more usual dichroic saturates. The warm (3,200°K) color temperature of the incandescent lamp really helps with mixing a good red. There is some difference between the beam center and edge when mixing pastels, but, once into the mid-tones, these differences disappear.

The only area where there is visible aberration is when trying to mix pale lavenders; there is some interaction between the cyan and magenta filters in this range which causes zebra stripes in the output. This was the only time I saw this problem, most of the time the color mixing was very smooth. (See Fig 12-14).

Color mixing

Color	Cyan	Magenta	Yellow	Red	Green	Blue
Transmission	33%	30%	76%	20%	13%	10%

Color change speed - end to end	0.8 sec

Zoom lens

The VL1000 has a very interesting zoom objective lens; it's a four-element lens where the front and back elements remain fixed and the middle two elements move on separate cam slots. The front element mainly provides the regular zoom range while the rear element provides the "super" zoom. (See Fig 15).

What this means is that you have a 19-36° regular range, where you can fully focus the gobos and framing shutter and a "super-zoom" range, from 36-70°, where focus is less well-defined, but you can get some good wide full-stage color washes.

The fixture software attempts to hold focus as you zoom in the 19-36° regular range by applying automatic compensating movement to the focus lens. This kept focus close, but it still requires tweaking once the final zoom position is reached.

Measured light output at 115V is 8,423 field lumens at minimum field angle of 19° and 8,607 field lumens at the maximum field angle of 70° (See Fig 16-18, on page 72).

Diffusion

The variable diffusion filter works very well in the regular zoom range and provides a smooth, even diffusion over the whole beam. It does not, however, have much effect in the "super-zoom" range and I was not able to get quite as soft an edge as I would want for a wash when in full 70° zoom.

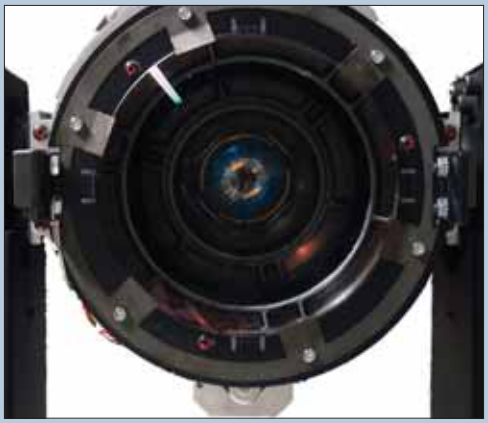

Fig 11: View of Cyan flags half closed through the front lens.

Fig 12 (top): Good mixed pastel blue; Fig 13 (middle): Good Peach mixed color, this is often a tough color to mix well; Fig 14 (bottom): Slight zebra stripes when trying to mix a lavender.

Pan and tilt

Pan range was measured at 540° and tilt at 270°, and the positioning accuracy and repeatability, including the auto-correct if the fixture was knocked out of position, was exceptional. Hysteresis error was very small, 0.14° in pan and 0.07° in tilt—some of the smallest I've seen in a moving light. This means that the system is mechanically very tight with no dampening, which is good for accuracy but does mean that you can see some slight steppiness at the slowest speeds.

Pan and tilt

	Range	Min time, full range	Min time, 180°	Hysteresis error
Pan	540°	8.4 sec	4.5 sec	0.14°
Tilt	270°	5.5 sec	4.5 sec	0.07°

Noise

Noise levels are critical for a fixture of this type and its intended market. When stationary, this unit was effectively silent, although there are thermostatically controlled fans for the shutter module these never turned on during many hours of running in 30C ambient. Vari-Lite tells me they will turn on if the unit is run pointing straight up for a period of time, but not otherwise.

When running the motors at full speed, the noise level was relatively high; you'd probably want to make any fast moves in noisy parts of the show or allow enough time to make slower, quieter, moves.

Homing/Initialization	65 dBA at 1m
Pan	63 dBA at 1m
Tilt	53 dBA at 1m
Color	47 dBA at 1m
Gobo change	53 dBA at 1m
Gobo rotate	52 dBA at 1m

Fig 15: Zoom lens showing two cam slots for moving elements.

Fig 16: Open white field as measured.

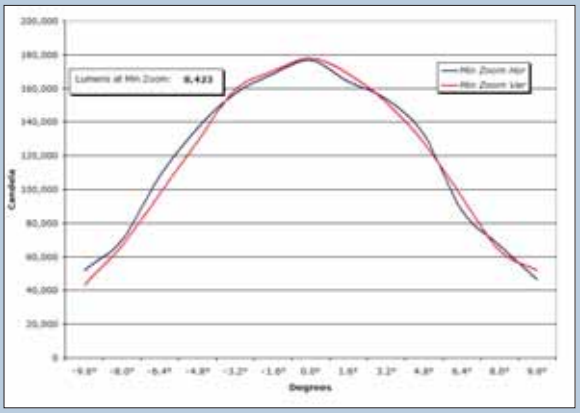

Fig 17: Beam profile and output with zoom adjusted to minimum, 19° field angle.

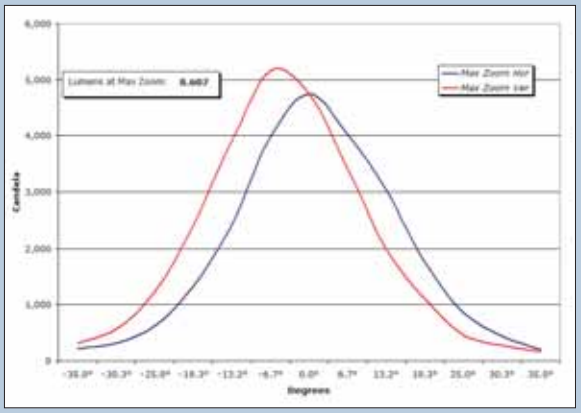

Fig 18: Beam profile and output with zoom adjusted to maximum, 70° field angle.

Fig 19: Side view of fixture showing electronics and tilt motor.

Fig 20: Heat sink behind motor control board, the tilt belt runs between the pins on the heat sink.

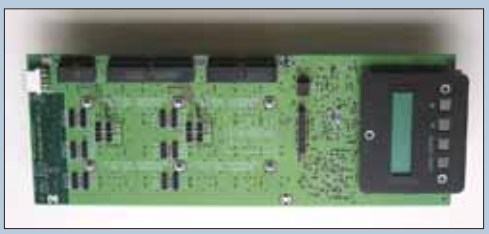

Fig 21: LCD display and control panel.

Electrical parameters

Power consumption

	Max current	Power Factor
Electronics, initializing	1.18A	0.56
Electronics, stationary	0.8A	0.66
Electronics, all motors	1.33A	0.64

Homing/Initialization Time	65 sec

Electronics and control

As with many previous Vari-Lite fixtures the VL1000 has no large top box or electronics enclosure. All of the fixture electronics are on one board, which is mounted in one of the yoke arms. (See Fig 19). This necessitates a clever heat-sink design where the belt running from the tilt motor to the main drive gear runs in between the heat-dissipating pins on the heat sink. (See Fig 20). This same board also has the LCD display and control panel (See Fig 21).

Conclusions

Well, I'm not going to draw any conclusions! As stated at the start of the article, the intent was to present the measured data and let the fixture speak for itself. I hope that this helps you decide if the fixture meets your needs for your specific application.

Thanks to Vari-Lite for agreeing to participate in this review.

(After an early career as a lighting designer Mike Wood has been responsible for technology strategy, R&D, standards and Intellectual Property in many companies within the entertainment industry. He is the current President of the Entertainment Services & Technology Association (ESTA). Mike can be contacted through his company Mike Wood Consulting LLC at mike@mikewoodconsulting.com.
Lighting&Sound America *would like to add its thanks to Vari-Lite for agreeing to be the pilot subject for this series of product reviews. To learn more about this product and others, to go www.vari-lite.com.)*