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# The Vari*Lite VL500 80V Wash

by Mike Wood

In this issue, we are examining one of the newest automated wash lights around—which is also, in many respects, one of the oldest automated wash lights around. The Vari*Lite VL500 was introduced at the PLASA Show in London last September and is a new and improved spin on a very well-known product, the VL5. (Or the "1994 Emmy Award-winning VL5," as Vari-Lite now always refers to it!)

Although other products may since have shipped in larger quantities, there probably isn't a more instantly recognizable moving light on the planet than the VL5. Those trademark "turbine blade" color-mixing vanes invented by Jim Bornhorst, in what must have been a moment of total inspiration, may not make for the absolute best color-mixing system in the world, but they surely make it the coolest looking! I've never asked Jim if the VL5 vanes inspired the * in the Vari-Lite logo or the other way round. Either way, the VL5 became an iconic product of its time, despite, or perhaps because of, a few idiosyncrasies.

The stated intent of the VL500 is to retain those iconic features while painlessly removing the warts. This review seeks to see if Vari-Lite has succeeded in this goal.

When I first saw the VL500 at last year's PLASA, I was immediately drawn to the 80V tungsten version. The low-voltage lamp seemed ideally suited to an incandescent wash light and I was keen to test that specific unit. I had to wait a while until one became available, however. The issue with the PLASA demo unit was, the lamp power supply was mounted separately and it was clear to everyone that it would be much better if they could somehow squeeze it into the fixture yoke arm or top box. It took a while, but they did it, and the unit I tested has indeed got everything integrated, with no separate modules or supplies.

The VL500 80V (Fig. 1) is a 1,200W automated incandescent wash light with basic functionality. It is intended to be a workhorse wash product with very few bells and whistles—it's a wash light and that's it.

Following our usual format, this review will work through the fixture and attempt to lay out measurements and details in as complete and objective a manner as possible, with the intent of leaving the reader in a position to judge the conclusions for him or herself.

In all tests, the fixture was run at 115V, 60Hz. However, the VL500 80V is fitted with auto-sensing universal lamp and motor power supplies and is rated for 90V-264V 50/60Hz.

## Lamp and dimmer

The VL500 80V uses a Philips 80V, 1,200W, 3,200K compact biplane incandescent lamp (Fig. 2), which is powered through an internal low-voltage dimmer controlled by a DMX channel in the usual way. Because of the low-voltage lamp, you don't use an external dimmer, as you can optionally do with the regular 120V or 230V versions of the VL500. The curve on this dimmer is a good match for a regular theatrical square law curve and thus should closely track other incandescent fixtures in the rig as you dim (Fig. 3).

Note the P3 symbol on the lamp ceramic base, indicating that the lamp uses P3 pinch protection with plated molybdenum foils leading through the pinch. Although you also see this in the Philips' discharge lamps, the process was originally developed for incandescent lamps by engineers in the Philips France facility and was used on those lamps first. This improved seal protection allows running the lamp at higher temperatures without damaging the pinch, a very useful attribute. Other major lamp manufacturers, such as Osram, have their own versions of this

Fig 1. Fixture as tested.

Fig 2. Lamp.

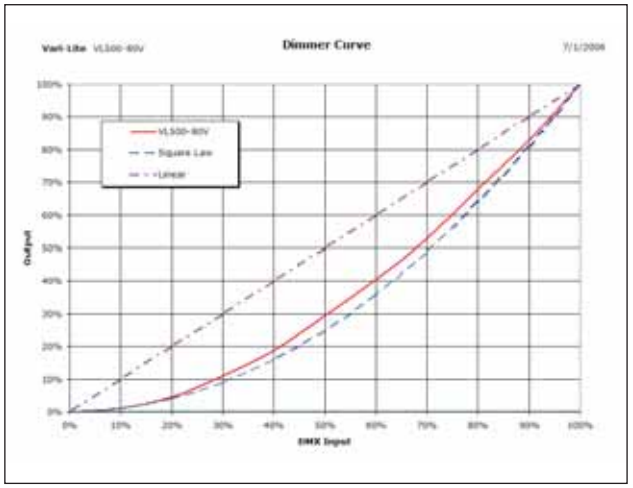


Fig 3. Dimmer curve.

Fig 4. Reflector and lamp.

Fig 5. Lamp cap and heatsink.

Fig 6. Color motors.

Fig 7. Color vanes.

Fig 8. Color module.

process.

A piece of somewhat off-topic but perhaps useful background information: this photo also shows the lamp date code K5. Philips uses a simple date code system; letter A to L for the month, followed by the last digit of the year, so this lamp was most likely manufactured in November 2005.

Low-voltage lamps have some advantages over their higher-voltage cousins. In general, the lower the voltage, the more efficient the lamp is (which is why it's used here, of course). For a given power level, they also tend to have thicker, and thus more robust, filaments. (In lamps, the 115V versions are well known to be more robust than their 230V cousins, and 80V is even better). The slight downside, though, is the filament thickness, which gives the lamp its strength, but also means it has a lot of thermal mass to heat up and cool down when you turn the lamp on and off. The visible effect of this is a blackout or strobe that's fairly slow. I measured over five seconds for the lamp to go completely black from a DBO. Although it probably wouldn't be visible onstage after two or three seconds, this is something to be aware of. If you treat it like a regular 2,000W lamp for expected dim times, then you'll be about right.

The lamp is changed by unclipping the latch on the rear door of the fixture and swinging out the heatsink and reflector assembly (Fig. 4). All parts remain captive during this operation and the lamp, with its large G22 base, can be easily removed through the hole in the reflector. This reflector is cold mirror-coated and allows the majority of the heat energy—with an incandescent lamp, that's a lot of the total—


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Fig 9. Turbines.


Fig 10. Replacing color module.


Fig 11. Spill rings.


Fig 12. Lens change and diffuser.

to pass through and into the large finned rear heatsink. (Fig. 5). Be warned that the heatsink gets very hot in operation and great care should be taken if you have to relamp this fixture while it's hot.

## Optics

That large parabolic reflector is the heart of the optical system and has always differentiated the VL5/500 from other fixtures. The optics we are more familiar with—which are used in most automated fixtures—are elliptical. An elliptical reflector focuses the light down to a small focal point and through a small aperture; that aperture is usually where you mount optical components, such as color mixing and gobos. Parabolic optics, on the other hand, direct the light into a roughly parallel beam the same size as the reflector (think searchlight). Thus the beam diameter in a VL500 is the same size as the reflector diameter and the same size as the output aperture—it's a cylindrical beam going right through the unit. A natural consequence of this is that the color-mixing system can't be a small system mounted over an aperture; it has to be capable of coloring the entire beam from edge to edge and therefore has to be the same size as the reflector. Thus we have Jim Bornhorst's twisting vanes. It also means that there is nowhere inside the fixture to hide motors and mechanics; the beam fills the entire space. This forced the mechanical designers to create the "power bulge" on the exterior of the fixture, where the color-change motors are mounted, outside of the beam.

## The color system

Figure 6 shows those color-change motors clearly; each one is a small stepper motor driving an internal nut with a threaded rod run through it. As the motor rotates the nut, the rod is driven backwards and forwards in a linear manner. The result is a push-pull action from a standard rotary motor in a compact package. This motion drives an external cam ring, which encircles the light, which, in turn, drives spring-loaded tabs on each of the 16 dichroic vanes used for each color (Fig. 7). The rear three motors in the photograph are the three colors, while the front one is used to drive the diffusion vanes in exactly the same manner.

Here we come to a real difference between the VL500 subtractive color system and the CMY systems used in other fixtures. In most units on the market today, the CMY color filters always remain perpendicular to the light beam; this means that moving the filter in and out of the beam can change the saturation of the particular color but not the hue. The vane twisting of the VL500, on the other hand, causes changes in both hue and saturation simultaneously. The net result is color-mixing best described as funky—not bad, just funky! Instead of the cyan, magenta, and yellow you usually see with automated fixtures, Vari-Lite call the vanes blue, magenta, and amber. That's an important distinction, this isn't plain vanilla secondary color subtractive mixing; instead, it's a combination of subtractive mixing and hue changes. Those blue vanes actually go through various shades of magenta as you rotate them in, before ending up in the blues, and never really go through cyan, while the amber goes through yellows on its way to amber. The bottom line with all this physics is that the VL500 color-mixing is exactly the same as the VL5 you already know. If you love it in the VL5, then you'll love it in the VL500; conversely if you hated the VL5, then you'll hate this too! All the tricks and effects you used with the VL5 will work here. It isn't exactly the same as the VL5, though; Vari-Lite has made noticeable improvements in the accuracy and repeatability of the color system, so you shouldn't have to individually adjust color palettes for every fixture in the rig, as I remember doing with the original VL5. The move to tighter mechanics and improved specification dichroics is apparent.

The mixed colors are generally smooth, with the familiar VL5 aberrations at low saturations. The standard stippled lens homogenizes the beam well.

**Color mixing**

| Color | Blue | Magenta | Amber | Red | Green | Dark Blue |
|---|---|---|---|---|---|---|
| Transmission | 33% | 28% | 59% | 17% | 18% | 9% |

| | |
|---|---|
| Color change speed - worst case | 0.7 sec |

The transmission readings show the expected high efficiency in the warmer colors, with less in the blues, which is inevitable with an incandescent lamp.

The speed of color change, from open to full color, was relatively slow, at 0.7 seconds—however, I think this is slightly quicker than a VL5.

Vari-Lite, as it did with the VL5, recognizes the gamut of limitations in the regular color-mix system, particularly in trying to mix paler shades of blue and pink, and thus offers an alternate pair of the blue and magenta vanes better suited for pastel colors (Fig. 8). With this module installed, I was indeed able to get much better pastels and even an aqua—something you can't get close to with the standard vanes.

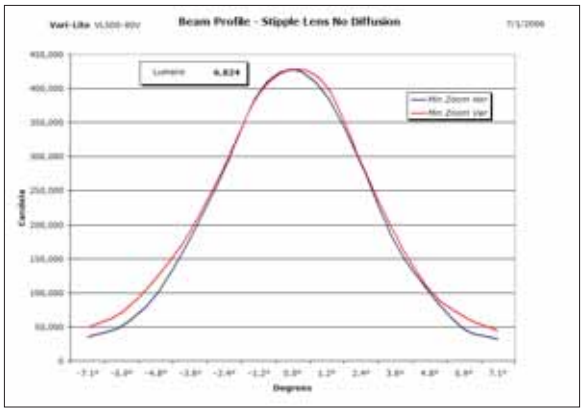


Fig 13. Output with no diffusion.

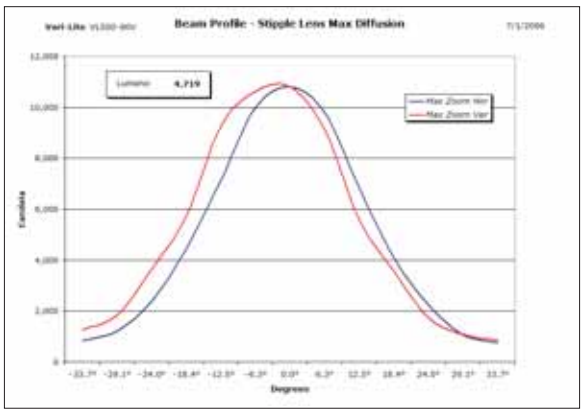


Fig 14. Output with full diffusion.

Fig 15. Motor control fan.

Criticism here is perhaps irrelevant, as what the VL500 color-mixing is really about, as we all know, is that "look" into the audience and the camera; and there is no question that the appearance at the business end is just as it's always been (Fig. 9).

In my selfless dedication to you, my loyal readers, I switched out a color module on my test unit to see how tough it was to do. I recall this wasn't that easy on the VL5 but, I'm pleased to say, it turned out to be simple with the VL500. The top cover comes off with a few screws exposing the modules (Fig. 10). Unplug two motor wires and remove four screws and the whole rear module pulls out. Reassembly is equally straightforward; the whole process took me about 10 minutes and I'd never seen one before (much less read a manual). One tip: make sure you have a cross-head screwdriver with a magnetized tip and the task is easy. Without a magnetic screwdriver to guide the screws into place, it would be much more tricky. I wouldn't want to do this up on a rig, as the modules are pretty delicate, with their thin exposed dichroics, but it shouldn't be a problem on a bench.

## Spill rings

It's not a controllable feature but is worthy of mention: the VL500 has internal concentric spill rings to control light reflected off an axis by the optical system. They serve to keep the beam tight and controlled (Fig. 11).

## Diffusion

As mentioned previously, the diffusion system uses exactly the same mechanism as the color mixing, with 16 twisting vanes so, not surprisingly, the performance was identical too: 0.7 seconds to open or close the vanes. The diffusion system works well, giving a pretty smooth transition from the narrow beam to a broad wash (Fig. 12).

## Lenses and output

For all my tests, I used the stipple lens. This is the standard shipping lens and is by far the most common lens used in the units. It has just enough surface texture to homogenize the color-mixing without reducing light output or broadening the beam too much. With this lens in place, the output, with no diffusion, was 6,824 lumens at a field angle of 14° (Fig. 13). When the diffusion was increased to its maximum level, the field angle increased to 67° while the output reduced to 4,719 lumens. (Fig. 14). The same range of optional lenses as the VL5 is available—all the way up to the intriguingly named "buxom."

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## Pan and tilt

To my mind, motor control is where we can see some of the biggest improvements in the VL500 over the VL5. Pan and tilt movement is very smooth and accurate with very little judder and hysteresis. Both axes use standard three-phase stepper motors with optical feedback encoders

**Pan & Tilt**

| | Range | Min time, full range | Min time, 180° | Hysteresis error |
|---|---|---|---|---|
| Pan | 540° | 4.6 sec | 2.5 sec | 0.1° |
| Tilt | 270° | 2.7 sec | 2.0 sec | 0.1° |

Hysteresis and position repeatability was the lowest I've measured in a fixture to date and certainly should be no problem in a wash light. The only very minor criticisms I have are a slight wobble and overshoot when coming to a halt after a counter-clockwise pan—but even this was a tiny amount.

## Noise

Noise is one of Vari-Lite's major selling points for the VL500 and, indeed, the unit is very quiet. The only fans are tiny chip coolers (Fig. 15), which, Vari-Lite claims, will only come on when ambient is over 45°C and the unit is mounted sideways. I can confirm that they never came on in my testing, even with the AC turned off in my workshop for the noise tests when the ambient rose to nearly 37°C!

When stationary, the unit is essentially silent—I couldn't measure anything above my ambient floor level of 35dBA. Pan and tilt were both very quiet, at 41dBA at 1m, while the highest noise levels from the system were peak levels of 56dBA at 1m from the color system when all three colors were moving simultaneously. Snap changes are particularly noticeable and rattly (all those glass vanes) but it can be kept under control by using lower change speeds.

**Noise**

| | |
|---|---|
| Homing/Initialization | 56 dBA at 1m |
| Pan | 41 dBA at 1m |
| Tilt | 41 dBA at 1m |
| Color | 56 dBA at 1m |
| Diffusion | 46 dBA at 1m |
| Stationary | <35 dBA at 1m |

## Electrical parameters

**Power consumption as tested at 115V**

| | Max current | Power Factor |
|---|---|---|
| Electronics, initializing | 0.77A | n/a |
| Running with lamp at full | 11.9A | 0.99 |

Homing/initialization time was 25 seconds from a cold start, 20 seconds with a DMX "reset" command.

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**Fig 16. Yoke arm and control panel.**

**Fig 17. Motor control PCB and fan.**

**Fig 18. Lamp supply.**

## Electronics and control

The unit has a slightly unconventional layout, with the main electronics and control in the yoke's arms. The main stepper-motor control electronics are in one side of the yoke, along with the control menu system. This uses a large LCD display and was simple to navigate with a standard four-button system (Fig. 16; Fig. 17).

The other side of the yoke has the lamp power supply and pan motor (Fig. 18). It also has a large ferrite (visible in the bottom left of the yoke arm next to the motor). This caused me some aggravation, as I could hear it rattle from side to side every time the fixture rotated. It took me a while to find it, but it should be an easy matter for Vari-Lite to fix this down.

With everything in the yoke arms, the unit top box is left with not much in it other than the electronics power supply and the DMX and power connectors. Consequently, it's pretty small, a bit of a Vari-Lite trademark, as you can see in Figure 1, where the unit is mounted on the floor stand accessory.

## Conclusions

Is the Vari-Lite VL500 80V a worthy successor to the mantle of the VL5 or not? That's not for me to say, but hopefully I've provided you with some useful information to allow you to make up your own mind.

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