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# GLP impression X4 Bar 20

By Mike Wood



Fig. 1: Fixture as tested.

Once in a while, I like to look at luminaire types other than standard automated spots and washes. One category I've covered sporadically seems to have gained popularity, year on year, over the last five years or so. This is the batten, or light bar. One of the oldest types of theatrical luminaires, the batten traces its heritage back to the earliest candle-powered footlights and drop washes. Battens were the workhorse of lighting from the 1930s onwards. Overtaken by more controllable luminaires, they receded in popularity in the 1970s and '80s, but enjoyed a comeback when lighting designer David Hersey revived the style, adding automation for his *Light Curtains*, most memorably in his original lighting for *Miss Saigon*. However, it was the introduction of LEDs as sources that really gave this luminaire type its big break, resulting in small units that don't clutter the rig and integrate color-changing with the added ability to control each cell individually. Because the units are lighter and smaller, adding tilt is much simpler. Top it all off with a zoom system that the smaller optics allows and you have the present-day automated battens, or light bars.

This month, I take a detailed look at the GLP impression X4 Bar 20. This product has been gathering attention in 2016, winning at least two awards that I know of. It's been shipping for a year or so, but seems to have gained traction

in 2016. The impression X4 Bar 20 is a 20-cell RGBW LED batten with automated tilt and zoom. As usual, I tested a single unit supplied to me by GLP as representative, and measured everything I can think of, from power input to light output. This review tries to present those measurements in as objective a way as possible. For the tests, the impression X4 Bar 20 was operated from a nominal 115V 60Hz supply; however, the unit is fitted with an autosensing universal power supply input that is rated from 100V — 240V AC.

## Light source and optics

As can be seen from the main photo of the unit tested (Figure 1), the impression X4 Bar 20 has 20 individual LED modules arranged in a single tightly spaced row. Each module contains a single Osram Ostar RGBW 15W LED chip. Mounted directly on top of the LED is a solid light rod, which serves to homogenize the four colors together and collimate the light. Figure 2 shows two of the light rods mounted on the circuit board, one with, and one without, the moving secondary optic providing zoom. The light rod is a solid optic using total internal reflection (TIR) to bounce the light along the rod. This is the same mechanism used to guide light along in optical fibers. The light rod GLP is using is octagonal (at least at the end we can see). It is usual to use a non-circular cross section in this kind of system; the flat facets provide better randomization of the light beam bounces, and thus improved homogenization of the colors. Next comes a large molded plastic objective lens. All 20 of these lenses are mounted on a single long plate, side by side, which moves backwards and forwards to



Fig. 2: LED and board.



Fig 3: LED through lens.

provide the zoom function. With the lens close to the top of the light rod (as shown in Figure 3), you get a wide angle; pull it away and the angle decreases. The optics homogenize the four colors acceptably well. There's some very slight color banding visible on minimum zoom, where you can see an octagonal image of the end of the light rod, but that pretty much disappears at wider angles. Note that the lenses, and thus the light output, are symmetrical; this is a batten, not a cyc-light.

### Zoom control and cooling

Figure 4 shows a section of the impression X4 Bar 20. The unit contains four circuit boards, each of which has the drive electronics and control for five LED modules. There are two items of note on this circuit board. First, the board is cut short on one end, to allow the final LED to be as close as possible to the end of the unit. This facilitates stacking impression X4 Bar 20 units end to end while maintaining the same pixel-to-pixel spacing. Secondly, each board has a cut-out for the zoom stepper motor. In the case of the 20-cell unit, the two end boards have the zoom motors section populated. I imagine the 10-cell model has just two boards, both of which have zoom motors.



Fig 4: Multiple modules.



Fig 5: Zoom motor.

Figure 5 shows one of the two zoom motors in more detail. Many manufacturers have gone for a lead screw to provide this kind of movement; GLP, however, has adopted a different approach. The stepper motor directly drives a pulley, which has a thin metal band around it. As the pulley rotates, the band pulls the attached zoom plate up and down. The whole plate rides on two linear bearings, one of which can be seen in the top right of Figure 5. A direct-drive mechanism like this can provide quicker operation than a

lead screw, albeit with reduced power. In the case of the impression X4 Bar 20, I measured the zoom at 0.5 seconds from end to end, which is indeed very quick.

The four circuit boards are mounted on an extruded aluminum heat sink, which forms the rear of the unit. There are fans as well, but, in my testing of the unit, these never ran. I imagine these will only come on in high ambient temperatures.

### Output and color control

To make measurement easier/possible, I ran the unit in single-pixel mode and measured the output of a single LED module in the center of the unit. Figures 6 and 7 show the output of this single module in narrow and wide zoom. We need to multiply these by 20 to get the unit's total output. This equates to 3,075lm at the narrow end of zoom, measured at 7.5°, and 4,036lm at wide, measured at a field angle

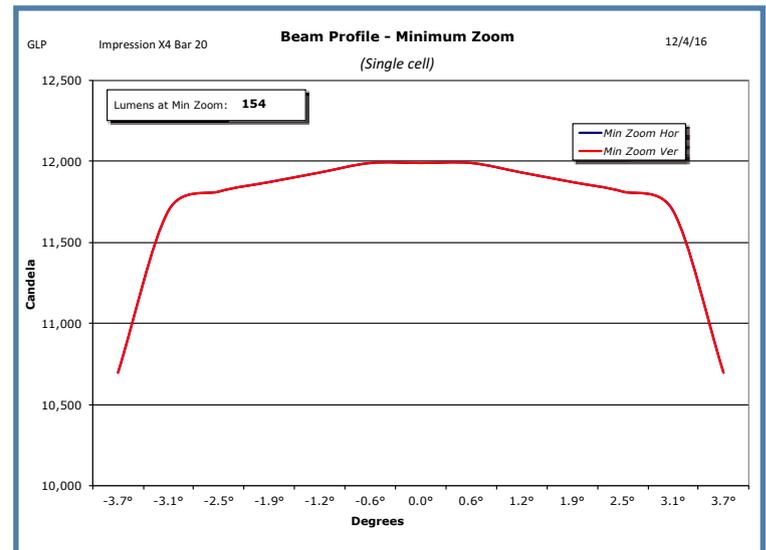


Fig. 6: Minimum zoom.

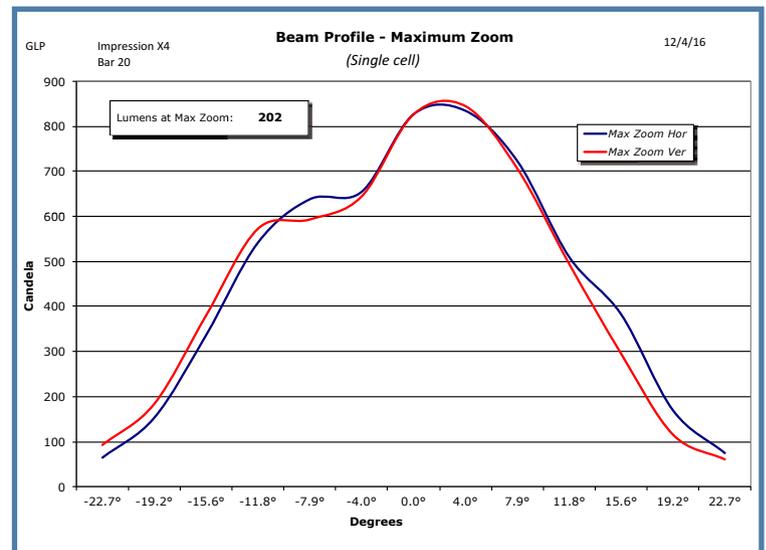


Fig. 7: Maximum zoom.



Fig. 8: Zoom range.

of 45.4°. The effect on the wall, with all the modules running, is shown in Figure 8; it's narrow on the left and wide on the right. The vertical spread of the whole unit at any throw can be calculated in the usual way from the measured field angle of a single module. However, to get the total horizontal spread at any distance, you first need to calculate the optical spread from the field angle of a single module and then add the physical length of the unit, 1m. (Don't make the mistake of multiplying the field angle by 20; it doesn't work that way!).

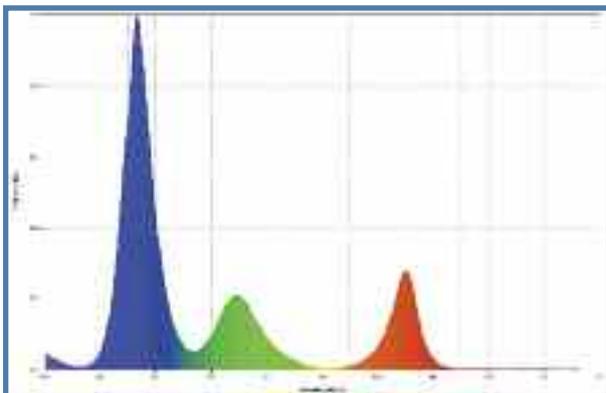


Fig. 9: RGB spectra.

Figure 9 shows the spectra of the RGB LEDs in the impression X4 Bar 20, with the white LED turned off, so you can see the colors available.

The color-mixing range was what you would expect from an RGBW unit: good in saturated colors while a little restricted in some of the subtle pastels. The white helps enormously in both boosting output and with those pastels. The chart below shows the share of output in the major colors from the system. It doesn't quite add up to 100%, so there is some load-sharing going on.

COLOR MIXING				
Color	Red	Green	Blue	White
Output	8.9%	52%	4%	40%

The impression X4 Bar 20 offers a number of control modes, from controlling all 20 LED modules as one combined unit all the way to allocating each one its own set of

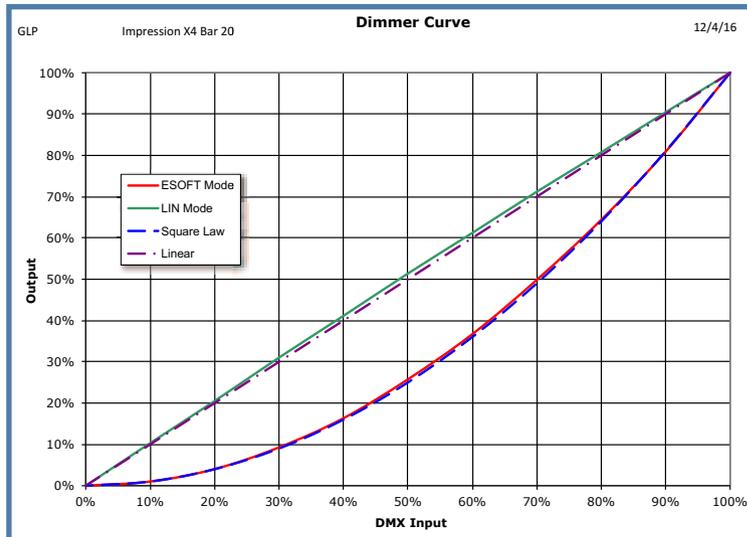


Fig. 10: Dimmer curves.



Fig. 11: Pixel control.

DMX addresses for individual pixel control. In this mode, the unit has a DMX footprint of 88 channels: four each for the RGBW of each of the 20 pixels, plus eight channels for the zoom, tilt, control, and intensity controls common to all pixels. Figure 11 shows an example of use in individual pixel control.

The impression X4 Bar 20 also has a filter slot at the front of the lenses. I was supplied an asymmetric filter plate, which affects the vertical spread very little, just 3°, but adds 30° to the horizontal. This allows a seamless transition between horizontally spaced units, even if they aren't installed butting up to each other.

### Dimming and strobe

The dimming behavior of the impression X4 Bar 20 has a couple of quirks. It's very smooth, but the available dimming curves are quite steep and behave slightly oddly at the bottom end. Figure 10 shows the impression X4 Bar 20 using both the ESOFT (as it arrived with me) and the LIN dimming curves, compared with standard square law and linear. Dimming was smooth with both curves, with excellent match to the standard linear and square law curves.

I measured the PWM frequency at 1.2kHz; there is also a menu item to reduce this to 600Hz, if required. Strobe rates, through a dedicated strobe channel, range from 0.1Hz to a measured 10Hz.

## Tilt

It's the tilt function that turns the impression X4 Bar 20 from a simple batten to a light curtain. I measured the tilt range to be 204°, with a minimum movement time from end to end of 1.2 seconds. Movement is very steppy, even with 16-bit control. It doesn't look like there's any internal motion smoothing.

## Noise

Although the unit has two head fans, in all my testing they never came on, even when running the unit with all emitters at full power. This means the only noise when the unit is stationary is from the power supply cooling in the base. This noise was very low, below my noise floor of 35dBA, so I was unable to measure it. I can only report that it's just audible, but very quiet! There is more noise when the unit is moving, of course; tilt movement peaked out at 52.5dBA at 1m when run at full speed.

## Electrical parameters

I measured the impression X4 Bar 20's power consumption as follows:

POWER CONSUMPTION AS TESTED AT 120V		
	Current, Power	Power Factor
Quiescent Load	0.47A, 40W	0.71
All LEDs illuminated	3.22A, 374W	0.98

Initialization time, from power up to output, was 16 seconds; from a DMX reset, it was slightly quicker at 14 seconds. Homing is badly behaved, and the unit dims up the LEDs before it has reached its final position.

## Electronics and control

Power in and out is through daisy-chained Neutrik powerCON connectors with DMX512 through standard five-pin XLRs. Figure 12 shows the connectors at the input end of the unit, next to one of the two swing-out safety cable connection points. Output connectors are at the other end.

The impression X4 Bar 20 offers a comprehensive control menu through a monochrome LCD display and the usual select buttons, as shown in Figure 13. This provides functionality for diagnostics as well as address and mode settings. If the head is tilted towards you, then, as soon as you touch any of the buttons on the panel, the head tilts to the vertical, straight-up position, and stays there until no button



Fig. 12: Connectors.

has been touched for about 10 seconds. I understand this is to get it out of the way, but I have to say I found it a little irritating that I always had to wait 10 seconds to see the effect of anything I changed. Perhaps there's a way to disable that in the setup, but I couldn't find it. It's a minor criticism, as it doesn't affect anything operational once the unit is up and running.

## Construction

The impression X4 Bar 20 is built around aluminum

extrusions that provide heat management as well as structure. The head is essentially one large heat sink, with the LEDs and electronics mounted to the front. The top box contains power supplies and the tilt mechanism. GLP has designed the unit to be stackable. The spacing of the LEDs remains constant if units are placed end to end, so you can make an unbroken line of regularly spaced pixels across the stage. There are retractable alignment pins on the end of the top box that mate with the adjacent unit to facilitate this. Figure 14 shows these pins deployed. Overall, the unit is very compact and elegantly constructed.

## Conclusions

I've always liked light curtains, I liked the way David Hersey used them way back when, and I like the striking effects that you can create with that bar of light. The individual pixel color control of LED based units has taken these units another step. The GLP impression X4 BAR 20 is an attractively designed example of the genre with a couple of odd quirks. Does it suit you and your show? I hope I've provided some hard facts to help you make that decision—but, as always, it's up to you to make the final call. 🎤

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Fig. 13: Menu.



Fig. 14: End alignment pins.