# JB-lighting A12

By: Mike Wood

Figure 1: Unit as tested

We first met the German manufacturer JB-lighting in these pages three years ago, with a review of its JBLED A7 lighting unit. The A7 was a landmark product in the irresistible rise of LED-based wash lights, as it was among the first (if not the first) to offer a workable and useful automated zoom. You may know that same product as the Martin Professional MAC 301 as, soon after the review was published, it was rebranded by the Danish company.

Three years on, JB-lighting has continued to develop automated LED wash luminaires; this month, we are looking at its latest model, the A12. This time around, the product is being marketed as a JB-lighting unit and is available in North America through the company's exclusive distributor, Creative Stage Lighting.

The A12 enters a market that is buzzing with automated LED wash lights, and just about all of them have beam angle control, so the A12 doesn't have the instant advantage that the A7 had. How does the A12 measure up to the competition? Does the extra power shine through, and how good is the color mixing?

As always with these reviews, I have measured the parameters of a sample unit supplied to me by the manufacturer. I try to measure everything I can think of that's measurable, from light source to output, presenting those results for you to use in your own decision-making. The A12 is fitted with a universal power supply rated from 100-250V 47/63Hz, and, for these tests, the luminaire was run from a nominal 115V 60Hz supply (Figure 1).

## Light source

Let's start with the light source. JB-lighting has added white LEDs to the mix used on the JBLED A7, and the A12 uses 61 LED packages, each containing red, green, blue, and white dies. JB-lighting rates these packages as being "in the 15W class," with a total rating of 830W maximum for the array. Each of the 61 packages has its own primary optic, which comprises a small TIR lens and a square reflector package. Figure 2 shows a view of the main circuit board and four of the LED packages with their primary optics.

The cooling system for all these LEDs is somewhat unusual. Right behind each LED, on the rear of the circuit board, each package has its own long cylindrical finned aluminum heat sink. Each of these is enclosed in its own tube, which forms a guide for forced air cooling. Figure 3 shows the black tubes behind each LED; Figure 4 shows the view from the other end of the tubes, where they all exit. You can just see the multiple fins of aluminum

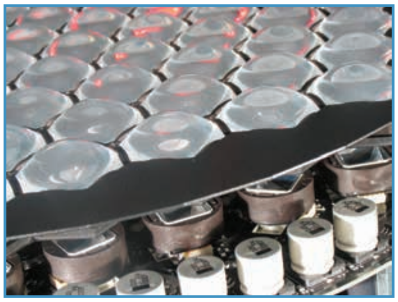

Figure 2: LEDs and lenses

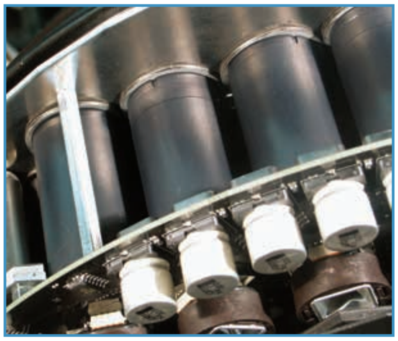

Figure 3: Cooling tubes

Figure 4: Cooling tube exits

Figure 5: Fans

Figure 6: Zoom lenses

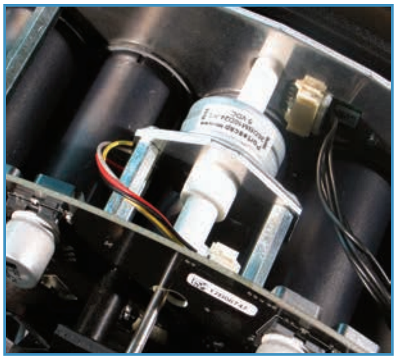

Figure 7: Linear actuator

Figure 8: Diffuser

inside each tube. Finally, mounted adjacent to the tube exits shown in Figure 4 are two temperature-controlled fans, which draw cooling air in through air filters on the back of the head and then force it down through all those tubes (Figure 5). The heated air finally exits around the rim near the front of the head. JB-lighting tells me that this system, where each LED has its own heat sink, has certain advantages in that it keeps every LED independent and equally cooled, whereas a single large heat sink tends to favor those LEDs closest to the cooling fan. It also keeps weight down, and allows each LED with its associated heat sink to be a separate component that can be changed out in service. To facilitate this, the LEDs on the A12 are mounted on small daughterboards that snap into connections on the main board.

The same fans also cool the LED driver electronics that are mounted on the periphery of that same large board. With 800W of LEDs to cool, these fans have a lot of work to do. In my testing, when running all four colors at full power, I found that the light output dropped by 20% over 30 minutes as everything heated up.

## Optics

Immediately above each LED package and its primary optics is a second, hexagonal, lens, which provides both color homogenization and beam angle control. The entire array of hexagonal lenses is cemented together into one honeycomb-shaped lens and mounted on a circular support plate. This plate is supported on sleeve bearings and can be moved backwards and forwards by three small linear actuators to provide the beam angle control. Figure 6 shows the zoom lens array; Figure 7 shows one of the three linear actuators. Note: Linear actuators are another form of stepper motor. The large cylinder is essentially a normal rotary stepper motor; however, it drives an internal threaded nut, which surrounds a lead screw connected to the output shaft. As the motor rotates, so does the threaded nut, which, because the nut is constrained from moving axially, causes the lead screw to move in linear fashion. It's just like screwing a nut on to a bolt, except the nut is fixed and the bolt is free to move.

The final element in the optical system is a large diffusing plate mounted in front of the entire array of lenses. Presumably, this diffuser improves the color homogeneity of the unit. Figure 8 shows a photo with the plate partially removed, so you can see the effect.

In operation, the zoom lens produced a range of field angles, from 12.4° at the narrow end up to 62° at the wide. This is a very respectable 5:1 zoom range.

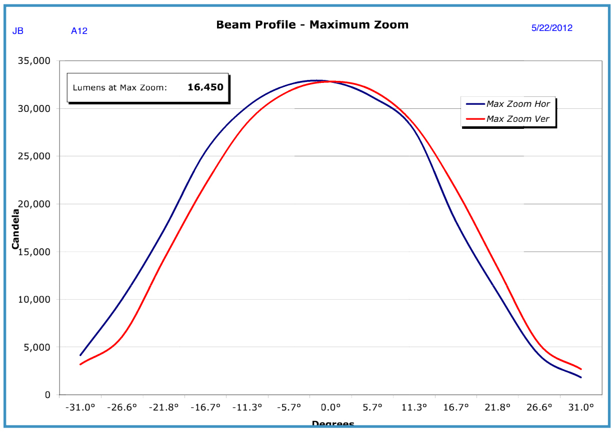


Figure 9: Maximum zoom

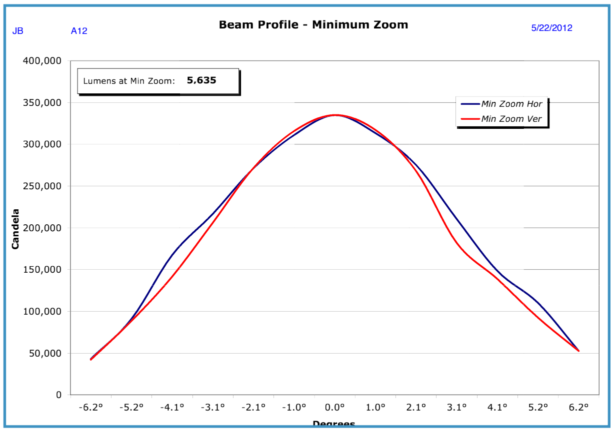


Figure 10: Minimum zoom

## Output

I measured the unit, with all four colors at full power, as giving 16,450 lumens in the wide angle 62° position, ramping down to 5,650 lumens at the narrow 12.4° position. As is often the case, the optics are much more efficient at wide angle than at narrow. The output was smooth, and should blend well to provide a stage wash. Figures 9 and 10 show the output and beam profile at maximum and minimum zoom, respectively. The wide angle gives a good flat top to the beam.

Homogenization was very good in the wider angles, with minimal colored shadows, and not quite so good in the extreme narrow position, where the beam exhibited colored edges. This was particularly noticeable when just mixing red and blue; the narrowest beam had a red center with blue edges. Note: Keeping red and blue on top of each other is very difficult in optical systems, as the different wavelengths are affected differently by lenses. In general, blue light is bent further by a simple lens than red light; this is the chromatic aberration effect you see with gobo projection from ellipsoidal units, where the gobo has a red or blue edge.

## Dimming

The dimming curve for the JB-lighting A12 is shown in Figure 11. You may have trouble seeing the curve in the figure, as it falls exactly on top of the theoretical square law line. A perfect fit!

Dimming performance is equally good, and all fades were very smooth and step-free. JB only offers an eight-bit mode for the intensity, but has done an excellent job of interpolating and smoothing the DMX512 signal to give very respectable dimming performance. In particular, the final transition to blackout is very, very smooth. This kind of smoothness at the bottom end is very difficult to achieve; JB-lighting has done an extremely impressive job with its LED control. The same is true of color control while dimming, there is very little color change when

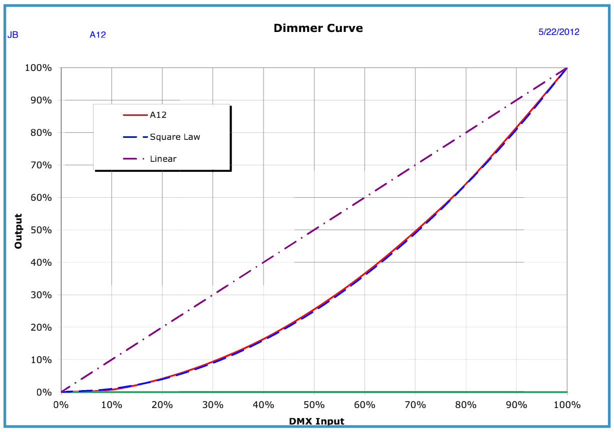


Figure 11: Dimmer curve

intensity is changed with the A12, and mixed colors stayed consistent throughout. The A12 has a separate strobe channel, which provides a range of different strobe types, including ramps and snaps. I measured a speed range with a regular strobe from 6Hz up to 20Hz.

JB-lighting offers a number of options with PWM speeds selectable through the menu system. There are two TV rates of 200Hz and 240Hz, designed for 50Hz and 60Hz systems, respectively. The company also offers a "Flex" mode, which seemed to run at 600Hz. However, this is only part of the story. From what I could tell, JB-lighting uses a modified form of PWM, which uses different phase angles for different colors, and also deliberately introduces varying time divisions to randomize the signal somewhat and minimize the chances of flickering or aliasing on a video camera. I wasn't able to test this system out with a high-quality TV camera, but it looks interesting.

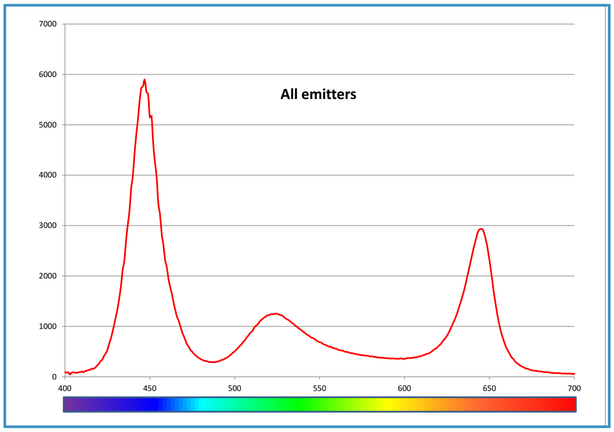


Figure 12: Spectrum: All emitters

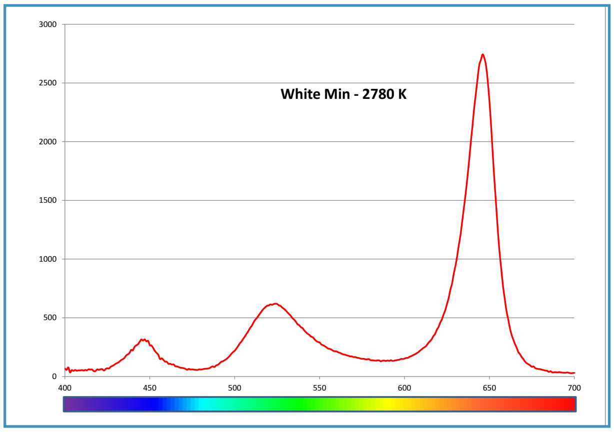


Figure 13: Spectrum: White 2780K

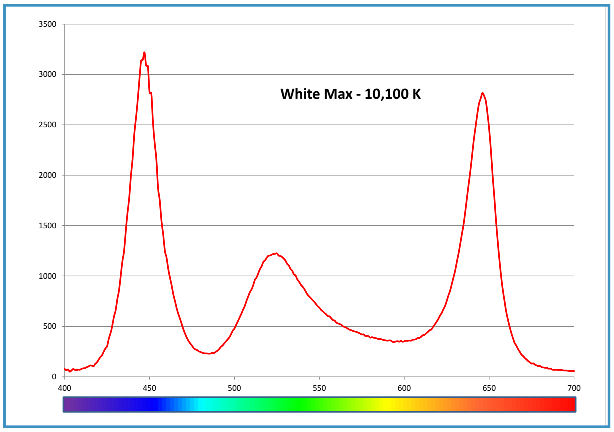


Figure 14: Spectrum: White 10,100K

## Color System

Color mixing from an RGBW LED-based additive system is becoming a standard, and the A12 behaved as expected. JB-lighting also provides a CTC, or color temperature control channel, which modifies the mix setup on the other four channels to emulate changing the color temperature of the light source. I measured a range of color temperature in white light, from 2,780K up to just over 10,000K as the CTC channel was adjusted. Figures 12, 13, and 14 show some sample spectra. Figure 12 shows the unit with all emitters at full. In this mode, the light is not a pure white, but you still have good adjustment of color above from the RGB emitters on top of the white LED base light. Figure 13 shows the unit with the CTC channel at full, producing its lowest white color temperature of 2,780K. You can clearly see the dominance of the red LED at around 640nm when in this mode. Conversely, Figure 14 shows the unit at 10,000K with the CTC channel at zero. The blue peak at 450nm is now the dominant color. (As it did with the JBLED A7, JB-lighting has also provided a simulated color wheel channel in the A12. This provides instant selection of pre-mixed colors, as well as rainbow and color chase effects of varying speeds.

The output in the main primary colors as a percentage of full output was as follows.

**COLOR MIXING**

| Color | Red | Green | Blue | Cyan | Magenta | Yellow | White |
|---|---|---|---|---|---|---|---|
| Output | 16% | 39% | 3.1% | 42% | 19% | 55% | 41% |

As has been mentioned before in this column, the blue level is much higher to the eye than these figures imply. JB-lighting uses quite a deep blue, and light meters underestimate how much of that the human eye can see.

The A12 can also be run in a direct-view pattern mode, where the array of 61 emitters is broken down into six groups, each of which can be controlled independently. The outer two rings of LEDs are each split into two groups, the next smaller ring is the fifth group, and, finally, the central six LEDs form the sixth group. Figure 15 shows some examples of the kind of pre-programmed effects that can be achieved through the pattern channel.

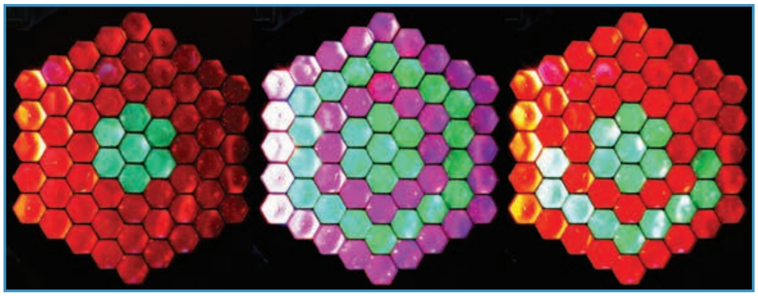

Figure 15: Pattern examples

## Pan and tilt

The A12 has a pan range of 430° and tilt range of 330°. A full-range pan move took three seconds, while a more typical 180° move finished in 2.6 seconds. Tilt took 1.9 seconds for a full move and 1.6 seconds for 180°. Positional repeatability on pan was 0.35°, which is approximately 1.4" of error at a 20' throw. Tilt was slightly better at 0.21°, 0.9" at a 20' throw. The mechanical system was nicely damped; moves end smoothly, with very little bounce or overshoot. The slow speeds were also good, with smooth, accurate moves. As with many recent units, the top box size is minimized by mounting the motors in the yoke. Figure 16 shows one of the yoke arms with the tilt motor and drive belt, along with the twin spring tensioners for the belt.

## Noise

The A12 is a reasonably quiet unit for an 850W unit. If you let the luminaire get hot enough in full power, then the thermostatically controlled fans come in and quickly become the noisiest component. The pan motor produced a little whine at some speeds, but nothing objectionable.

**SOUND LEVELS**

| | Normal Mode Ambient |
|---|---|
| | <35 dBA at 1m |
| Stationary | 44 dBA at 1m |
| Homing/Initialization | 46 dBA at 1m |
| Pan | 44 dBA at 1m |
| Tilt | 44 dBA at 1m |
| Zoom | 44 dBA at 1m |

## Electrical parameters

The JB-lighting A12 is rated for operation on a 100-250V AC 47/63Hz supply, auto switching. At the 115V I was using, I measured a static power consumption of 835W at full output with all four colors on. The power factor was around 0.99. Quiescent power consumption with all LEDs off was 43W at a power factor of 0.81. This power consumption equates to an efficacy in full output of 20lm/W at wide angle, and 6.7lm/W at narrow angle.

Figure 16: Yoke arm

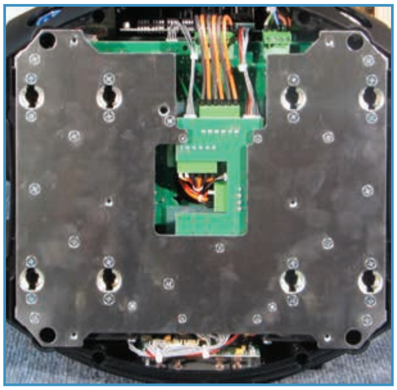

Figure 17: Inside base


Figure 18: Menu system

Figure 19: Connectors

Initialization time from power up, or from sending a reset command through the DMX512 control channel, was around 48 seconds. The unit is well-behaved when reset live, in that it fades out before moving, then fades back in again after the reset has ended.

## Electronics and control

The majority of the A12's electronics are in the head, on the single large circuit board containing the LED daughterboards and their drivers. DMX electronics and power supplies, along with the menu system and its display, are in the base unit. Figure 17 shows the view from under the base after removing the outer covers. The unit has an LCD display and menu buttons, which allow setting all the usual parameters and options, including a mode for programming stand-alone operation. Figure 18 shows the display; note that it has two sets of buttons, one set for each orientation. Depending on which set you use, the display will flip to match. It also comes fitted with the JB-lighting wireless DMX interface as standard. As with the company's previous units, the A12 provides both five-pin and three-pin XLR connectors on the top box; these are mounted centrally with the daisy-chained PowerCon connectors on either side (Figure 19).

## Construction

The A12 is a familiar-looking luminaire, very similar in style to its predecessors, with a curved yoke and a relatively small top box. The internal construction is very neat and tidy; however, as with many LED-based units, there's not much servicing that the regular user would be able to do himself. I didn't dig deep enough to try removing an LED module. Screws are a mixture of Torx and cross heads, and you have to remove quite a lot of them to get full access. As for mounting options, the base has four mounting points where quarter-turn omega clamps can be fitted for rigging.

## Conclusions

Three years ago, the JBLED A7 was the first LED wash light with beam angle control that I was able to review. Since that time, I've seen and tested many, as this class of unit has become a steady workhorse of many automated lighting rigs. The A12 follows in that line; it's a larger, more powerful unit than its older sibling, with a wider zoom range (5:1 as compared to the 3:1 of the A7) and with improved color range and color rendering with the addition of the white LEDs to the mix. Will the JB-lighting A12 fill a slot in your rig? That decision is yours and yours alone. However, I hope that some of the data I've provided will help you make the call.

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