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Martin by Harman ERA 800 Performance

By: Mike Wood

Figure 1: Fixture as tested.

LED-based lights aren't always small. LED-based lights aren't always lightweight. LED-based lights aren't always about additive color mixing. An LED light could be the Martin by Harman ERA 800 Performance.

The ERA 800 Performance is clearly very much a workhorse product and, in the much-wished-for post-COVID days to come, I believe such automated lighting products will recover first. When money is tight and rental companies are struggling to survive, special effects and one-trick-pony custom lights (you know the ones I mean) will be passed over in favor of spending what little cap-ex there is on lights with the potential for high usage and long rentals in a wide range of productions. This means a high-powered white LED engine spot with good color mixing and framing. It's as close to a ubiquitous product as you can get in 2020.

I'm sure Martin didn't design the ERA 800 Performance with a post-COVID economy in mind, but serendipity has perhaps taken the company on the right path here.

For the first time in quite a while, I needed help in getting a light onto my test bench. The ERA 800 Performance weighs 90lb. (I have to admit that's perhaps as much to do with me getting older and less willing to put my back out.) There's no shortage of competitive workhorse luminaires on the market, so how did the ERA 800 Performance get on in my testing? As always, I've tried to test and measure everything I can, from power input to light output, reporting the raw data so you have the information to make your own determination.

The results presented here are based on the testing of a single ERA 800 Performance supplied to me by Martin by Harman in the US. Although I ran my tests with the fixture operating on a nominal 120V 60Hz supply, the unit is rated to run on voltages from 100—240V 50/60Hz (Figure 1).

Light source and cooling

The ERA 800 Performance uses an 800W white light LED engine of a familiar design. I suspect that it's from Appotronics/YLX, but I didn't dismantle it to confirm. It certainly uses the familiar layout of an array of white LEDs with a tandem fly-eye lens array and condenser lens. Cooling is also familiar, with heat pipes leading out to a large heat sink cooled by four thermostatically controlled fans drawing air from bottom to top. All this performed well and, in fact, exhibited minimal droop.

The main optical and color components of the unit are mounted on three removable modules for color mixing, color wheel and gobo, and framing.

Color systems

The ERA 800 Performance has both CMY color mixing and color wheels. First in the optical train is the color-mixing module. This contains four sets of dichroic mixing flags (cyan, magenta, yellow, and CTO), each comprising two dichroic filters etched with a dot pattern. Each pair runs on its own linear rails and opens and closes across the beam like curtains. Color mixing is smooth and even, with only a small amount of color fringing around the beam edges when trying to mix some tricky pastels (Figures 2 and 3).

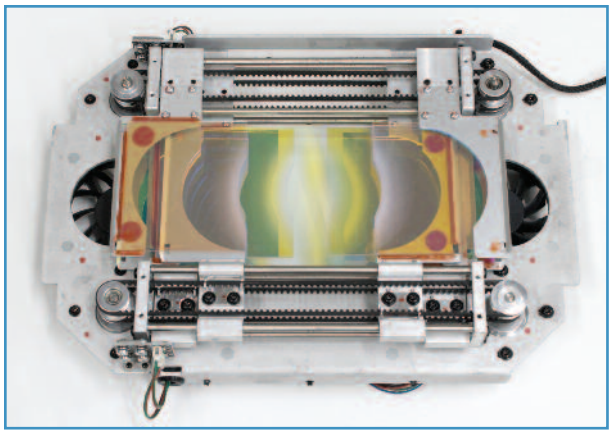

Figure 2: Color mixing module.

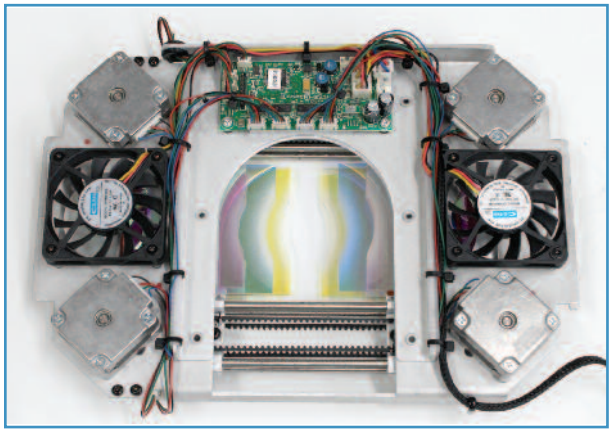

Figure 3: Color mixing module rear.

COLOR MIXING

Color	Cyan	Magenta	Yellow	Red	Green	Blue
Transmission	16%	5.8%	81%	4.9%	8.2%	0.3%
Color change speed – worst case			0.2 sec			

You can see from the figures that the color wheels allow for the mixing of very saturated colors. In addition, the CTO wheel allowed adjustment of the color temperature from a warm 3,318K up to the native 6,750K when fully out of the beam. As you can see from the spectral distribution charts, as is common with white LEDs, there is not much deep red in the source (Figures 4 and 5). These optical systems, using an Appotronics engine plus dichroic color mixing, all suffer from a common problem, and the ERA 800 Performance is no exception. If a gobo is slightly defocused when a pastel color is mixed, the colors separate, giving colored rings around the gobo pattern edges. Figure 6 shows the issue. As I said, this is not unique to Martin. Every fixture I've seen using the Appotronics-style LED engine shows this same aberration.

Immediately after the color-mix system, but included in the gobo module and visible in Figure 7, is the fixed color wheel. This contains six trapezoidal dichroic filters and an

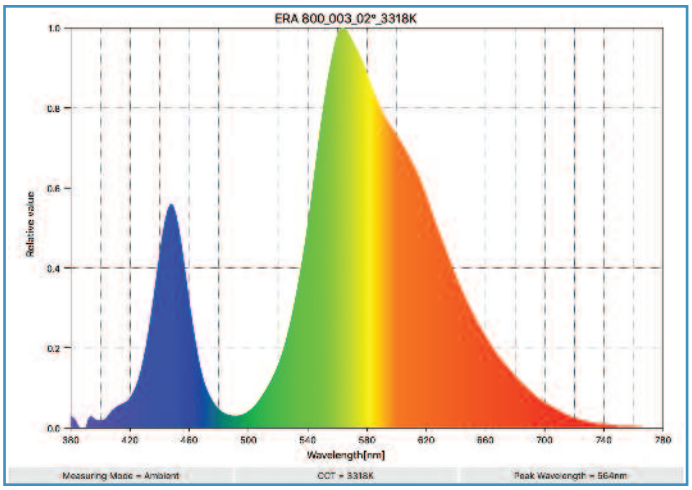

Figure 4: 3,318K spectral distribution.

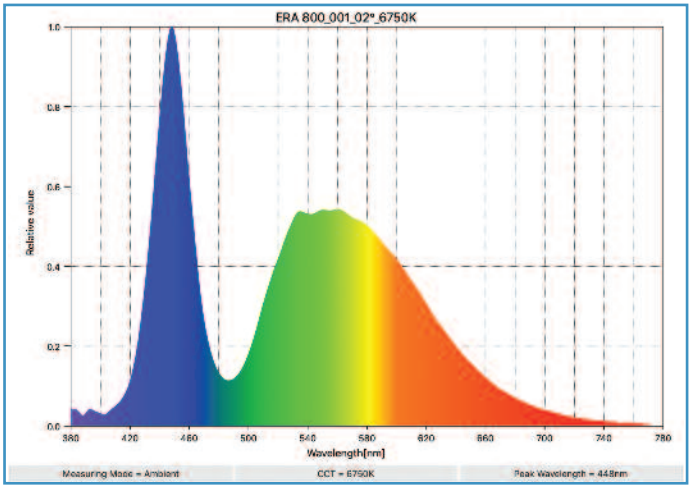

Figure 5: 6,750K spectral distribution.

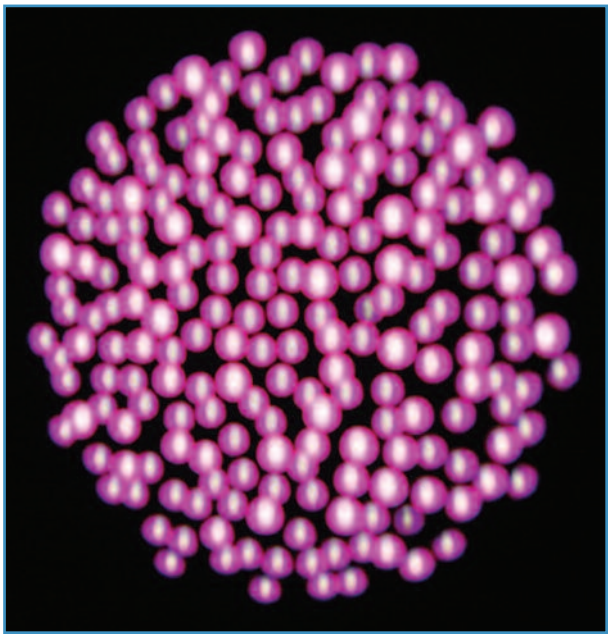

Figure 6: Color breakup when defocused.

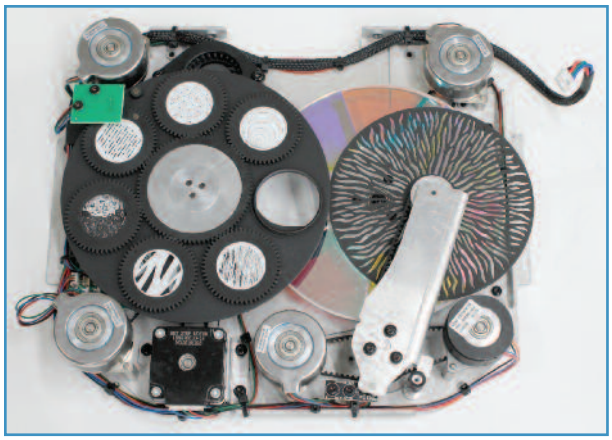

Figure 7: Gobo module.

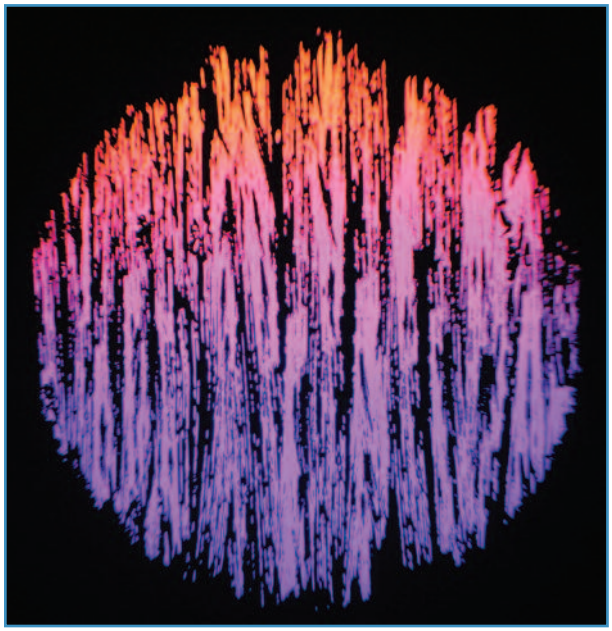

Figure 8: Half color.

open position. The gaps between the colors are narrow and don't interfere with half colors, as shown in Figure 8.

COLOR WHEEL

Color	Red	Medium Blue	Dark Green	Lavender	Deep Orange	Deep Blue
Transmission	5.1%	9.8%	28%	27%	32%	2.3%

COLOR WHEEL SPEED

Color change speed – adjacent	0.2 sec
Color change speed – worst case	0.3 sec
Maximum wheel spin speed	0.75 sec/rev = 80 rpm
Minimum wheel spin speed	263 sec/rev = 0.23 rpm
Color wheel movement was smooth and accurate.	

Animation wheel

Apart from the fixed color wheel already discussed, the gobo module contains three systems: an animation wheel and fixed and rotating gobo wheels. The unit has a single animation wheel that can be moved in and out of the beam and then rotated or indexed. It took approximately 0.4 second to insert or remove the wheel. Once in place, it can be rotated at speeds up to 1 sec/rev (60rpm).

Gobo wheels

Next in the optical train is the fixed gobo wheel. This has seven patterns plus an open hole.

FIXED GOBO SPEEDS

Gobo change speed – adjacent	0.3 sec
Gobo change speed – worst case	0.6 sec
Maximum wheel spin speed	0.99 sec/rev = 61 rpm
Minimum wheel spin speed	353 sec/rev = 0.2 rpm

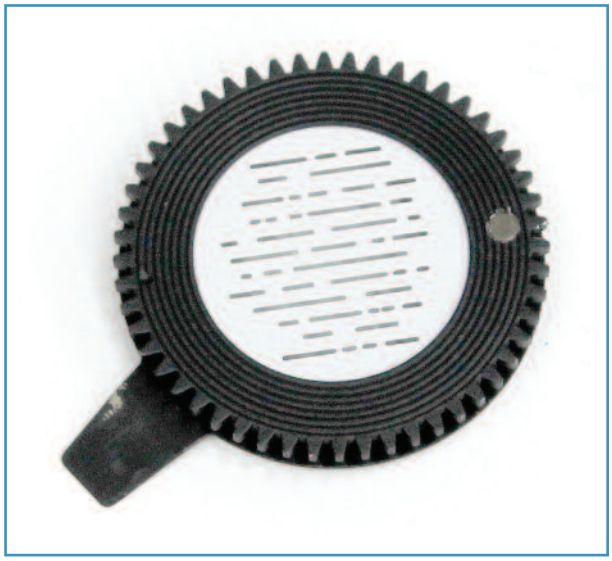

Figure 9: Gobo.

Next to it is the rotating gobo wheel, which has six replaceable glass gobos and an open slot. Figure 9 shows a gobo in its carrier. Gobo removal and replacement while the unit is in the rig is possible, although a little tricky. It requires very small fingers or some delicate maneuvering with long-nosed pliers.

ROTATING GOBO SPEEDS

Gobo change speed – adjacent	0.5 sec
Gobo change speed – worst case	0.7 sec
Maximum gobo spin speed	0.4 sec/rev = 160 rpm
Minimum gobo spin speed	480 sec/rev = 0.125 rpm
Maximum wheel spin speed	12.3 sec/rev = 4.9 rpm
Minimum wheel spin speed	352 sec/rev = 0.2 rpm

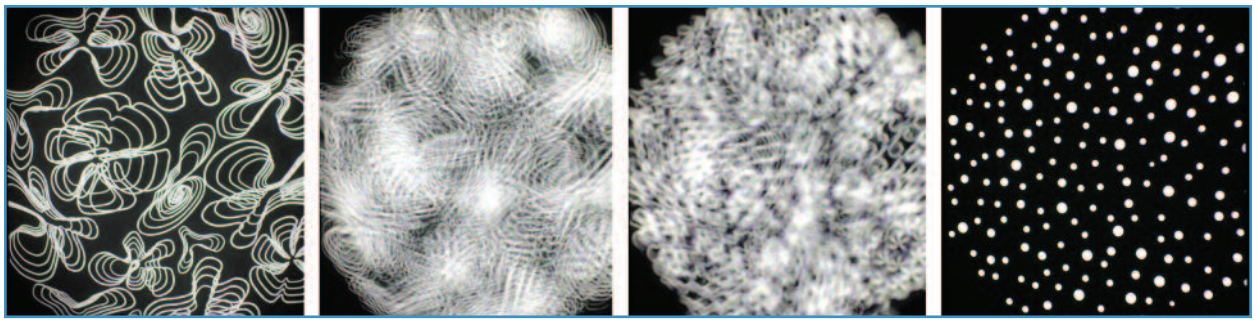

Figure 10: Gobo morph.

Rotation and indexing were smooth, with a good range of rotation speeds. Movement was clean when changing direction, with very little hysteresis. I measured the accuracy at 0.12° of hysteresis error, which equates to 0.5" at a throw of 20'. Both wheels use a quick-path algorithm to minimize change times.

Figure 10 shows the progress of a gobo morph while pulling focus from one wheel to the other. Typical focus quality achievable from the two wheels was very good with very acceptable edge-to-center difference (just visible on the left image) and almost no color fringing.

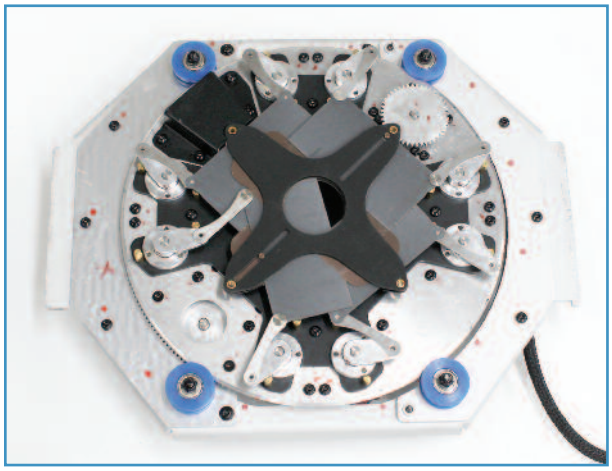

Figure 11: Framing module.

Framing

Framing and iris are on the last removable module. Figure 11 clearly shows the framing system. The iris is buried in the center of the assembly. Martin has gone with a familiar design for the framing mechanics; however, it has lengthened the arms to allow each blade to fully cover the beam. The amount each blade can tilt depends on how far it is inserted, from no adjustment when on the beam edge to approximately +/- 25º when inserted by about 2/3. The insert and tilt channels interact such that you have to set the tilt angle to zero to get full beam coverage. The entire assembly can then be rotated a further +/- 60º. Figure 12 shows the mechanism with a blade at the two extremes of

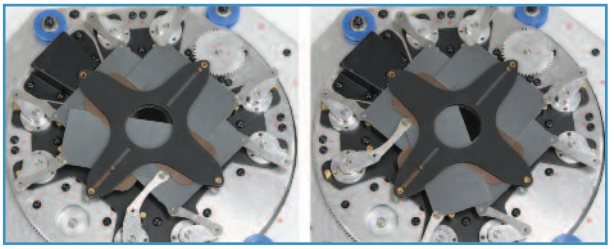

Figure 12: Blade motion.

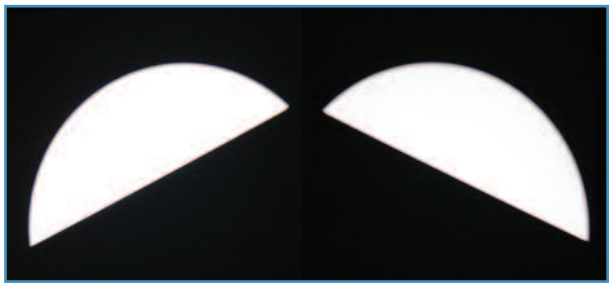

Figure 13: Frame rotation.

tilt angle and Figure 13 shows the same movement as seen in the output beam.

The blades took a maximum of about 0.4 second from fully open to fully closed. Rotation is slower, at 1.3 seconds for a full 120º. Shutter cuts were straight with very little pincushion or barrel distortion. Figure 14 shows the focus quality with all four blades inserted. In this image, I focused on the right-hand blade.

Figure 14: Framing focus.

Finally, for imaging effects, the ERA 800 Performance has an iris. This reduces the aperture to 21% of its full size, which gives equivalent field angles of 1.2° at minimum zoom and 13° at maximum zoom. I measured the opening/closing

time at around 0.6 second. Figure 15 shows the reverse of the framing and iris module. The iris is in the center. Also visible is the circular circuit board containing the drivers for the framing system.

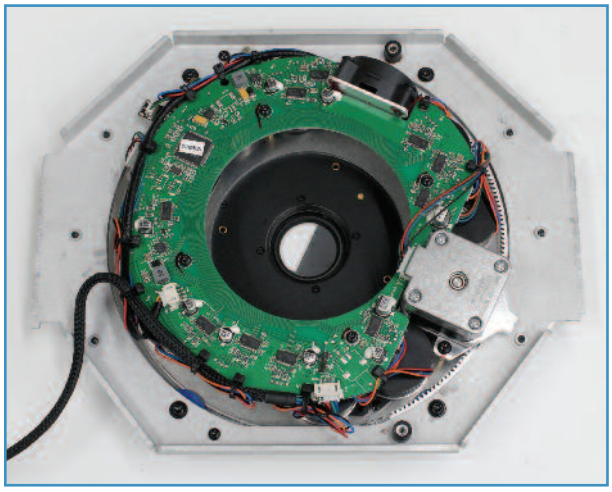

Figure 15: Iris and framing board.

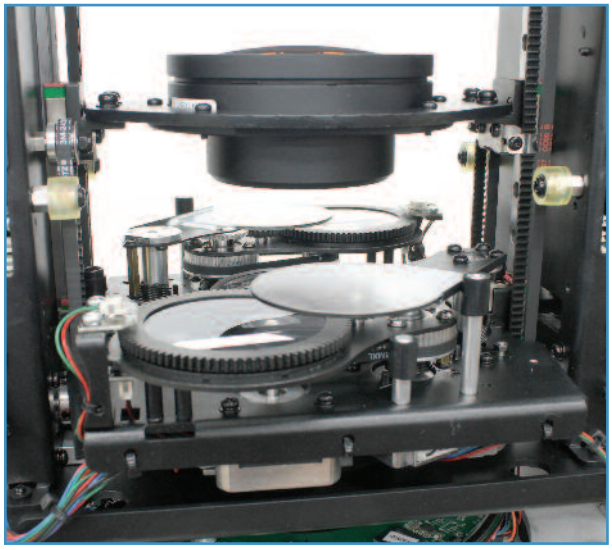

Figure 16: Prisms and frosts.

Frost and prism

The final optical elements in the ERA 800 Performance are the projection lenses and frost and prism systems. There are the usual three lens groups, the first two of which move and provide zoom and focus, while the last element is fixed as the large output lens. The unit has two prisms and two separate frost filters, all of which can be inserted between lens groups one and two and which ride back and forth with lens group one. Figure 16 shows the prisms and frost flags with lens group two at the top of the picture.

The ERA 800 Performance offers a six-facet linear prism and four-facet circular prism. Although on separate arms, these occupy the same optical position so only one at a time can be inserted. Once in place, either prism can be rotated and indexed. Prism insertion or removal took approximately 0.75 second; once in place, they can be rotated at speeds varying from 0.67 sec/rev (90rpm) down to 312 sec/rev (0.19rpm).

Similarly, there are two separate frost flags. Each offers variable frost up to its individual maximum frost. Insertion or removal of either of the frost filters took 0.3 second. The effect provided by these filters is, as is often the case with automated lights, not a true softening frost when only partially inserted. Instead, they act as contrast reducers with no effect on edge sharpness until fully inserted, when they finally soften the image. Figure 17 shows the effect as a frost flag is inserted. It's only in the last picture with the frost fully in place that the image is truly softened.

Lenses and output

I've already mentioned the three lens groups that provide zoom and focus. I measured zoom as taking 1.7 seconds to move end to end, while focus took 0.8 second. Some shuffling goes on when prisms or frost are used to prevent collisions.

As to output, I measured the ERA 800 Performance as providing a zoom range with field angles ranging from 5.9° to 62°. The output in wide angle was 36,153 lumens, ramping down to 14,287 in narrow. Such ramping at the narrow end is typical as the output lenses, large as they may be, aren't enough to prevent vignetting at these narrow angles (Figures 18 and 19). The field is extremely flat at all angles.

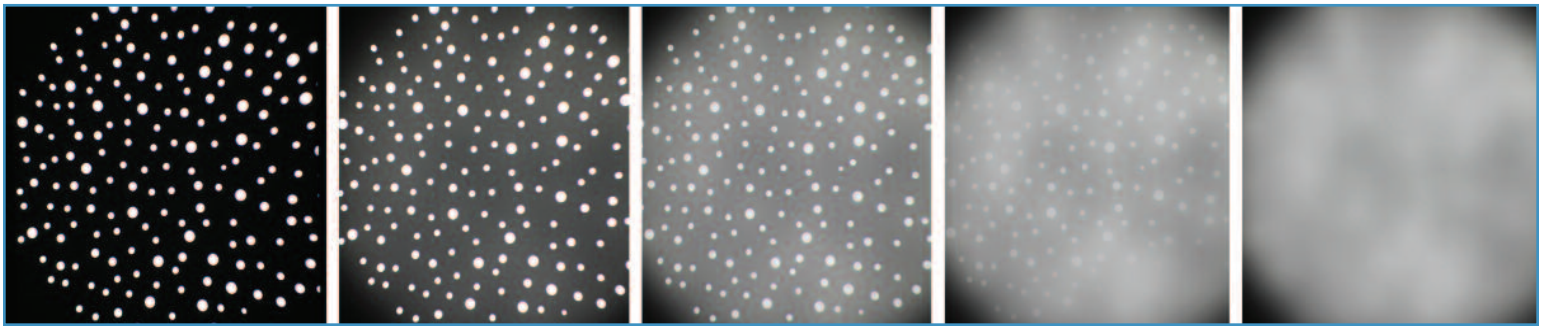

Figure 17: Frost.

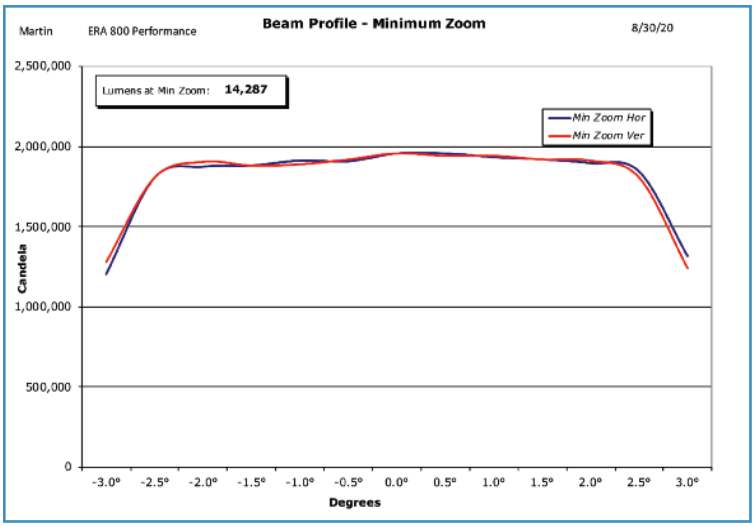

Figure 18: Minimum zoom.

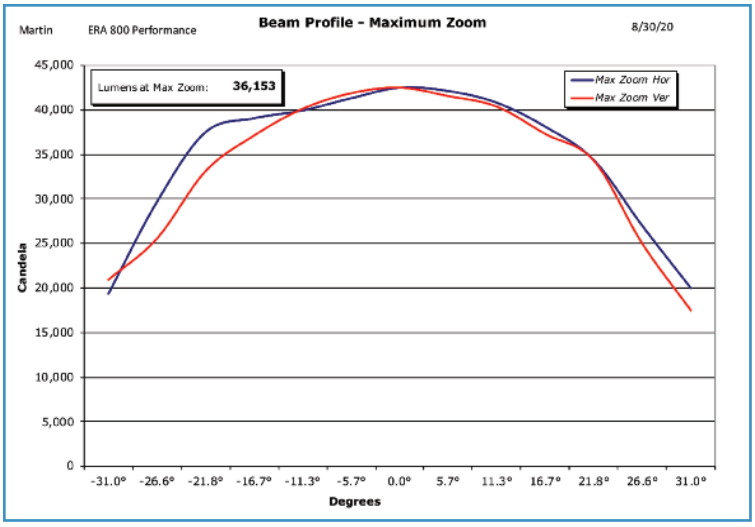

Figure 19: Maximum zoom.

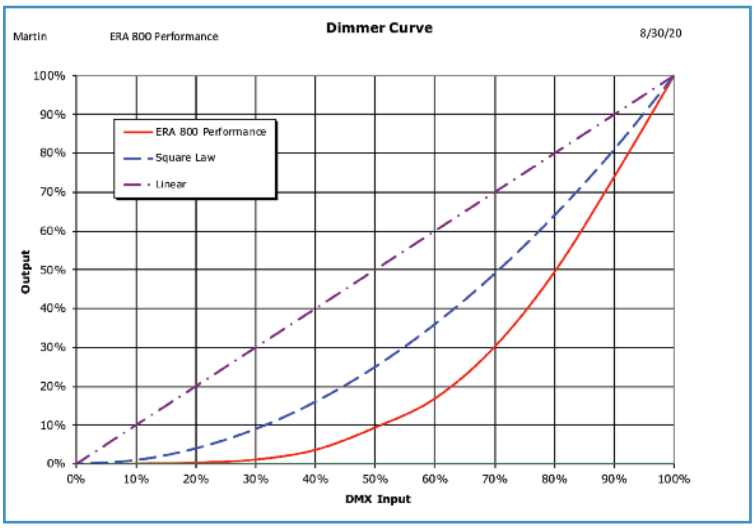

Figure 20: Dimming curve.

Dimming and LED control was very smooth. Figure 20 shows the default dimming curve. It's quite steep, more so than a normal square law, but looked good to the eye. Electronic strobe is provided with speeds up to 20Hz. I also measured the PWM rate of the LEDs at 3,600Hz.

As I mentioned earlier when talking about thermal control, the ERA 800 Performance showed fairly little droop as it warmed up. I measured a loss of 7% over 10 minutes as it heated up from room temperature.

I measured the color rendering with CTO both in and out. The native 6,750K beam had TM-30-18 Rf as 71 and Rg as 98 (CRI 72). With full CTO, the 3,318K beam dropped to Rf of 55 and Rg of 84 (CRI 51). Figures 21 and 22 show the TM-30-18 vector graphics where you can see

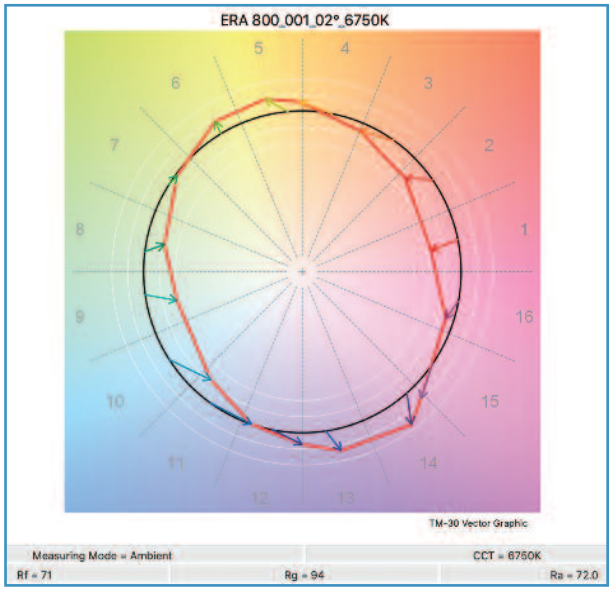

Figure 21: TM-30-18 at 6,750K.

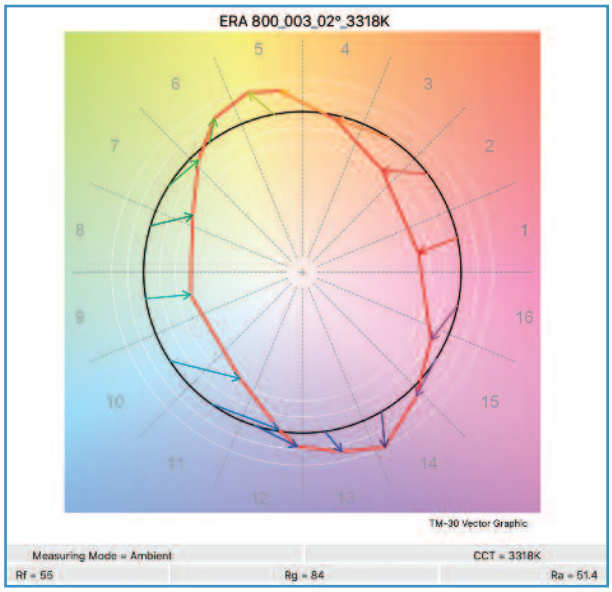

Figure 22: TM-30-18 at 3,318K.

that it is the lack of red and the dip in the cyan/aqua that are the primary concerns.

Pan and tilt

The pan and tilt ranges of the ERA 800 Performance are 540° and 260°, respectively. A full-range 540° pan move took 4.5 seconds to complete, while a more typical 180° move finished in 2.6 seconds. Tilt took 2.9 seconds for a full 260° move and 2.2 seconds for 180°. All movements were very smooth, with very little bounce and no visible steppiness. I measured hysteresis on both pan and tilt at 0.05°, equivalent to 0.2" at 20'. Martin uses magnetic encoders for error correction on both axes.

Noise

The ERA 800 Performance has 800W of heat to dissipate, so the cooling fans provide a constant background noise level with most motor functions quieter than the fan noise. As is nearly always the case, zoom and focus were the noisiest movement functions.

SOUND LEVELS

	Normal Mode
Ambient	<35 dBA at 1m
Stationary	50.0 dBA at 1m
Homing/Initialization	63.5 dBA at 1m
Pan	51.0 dBA at 1m
Tilt	50.6 dBA at 1m
Color	50.1 dBA at 1m
Gobo	50.1 dBA at 1m
Gobo rotate	50.2 dBA at 1m
Zoom	52.5 dBA at 1m
Focus	50.9 dBA at 1m
Animation wheel	50.2 dBA at 1m
Iris	50.1 dBA at 1m
Frost	50.0 dBA at 1m
Prism	50.4 dBA at 1m

Homing/initialization time

Full initialization took 61 seconds from a cold start and 57 seconds from a DMX512 reset command. Homing is well-

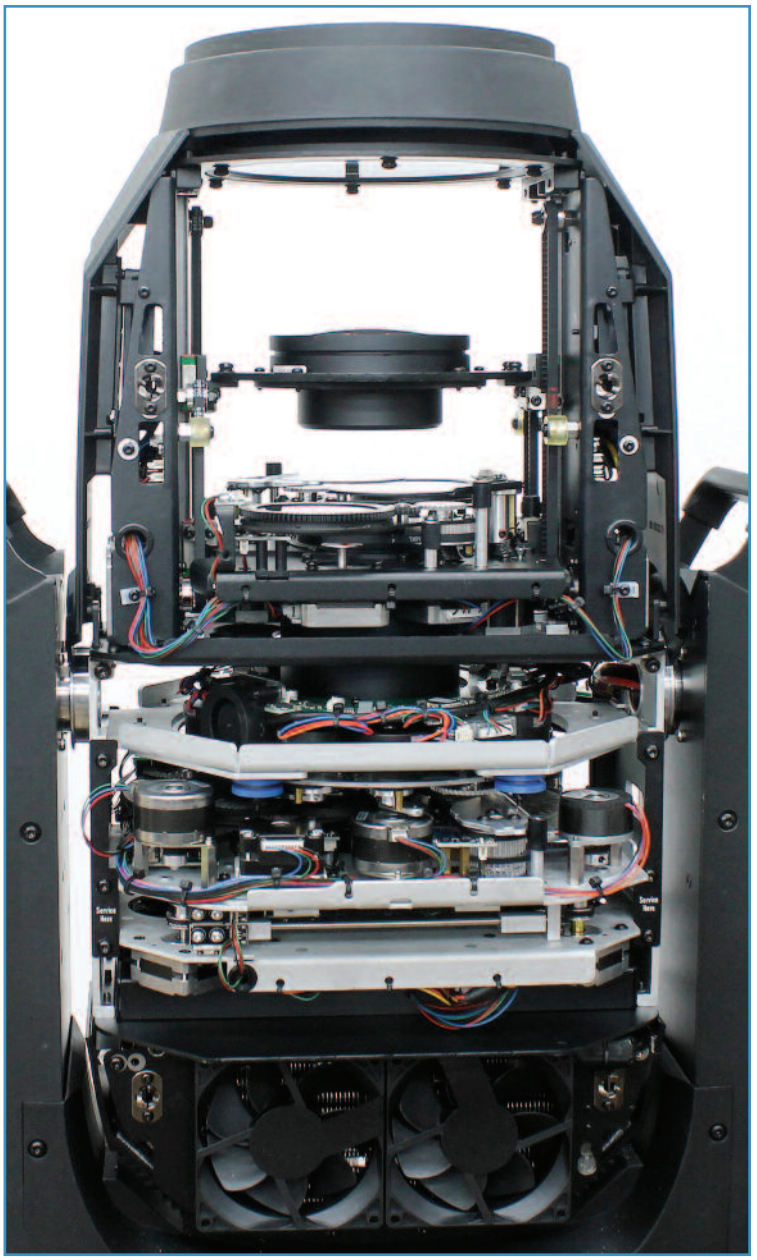

Figure 23: Head assembly.

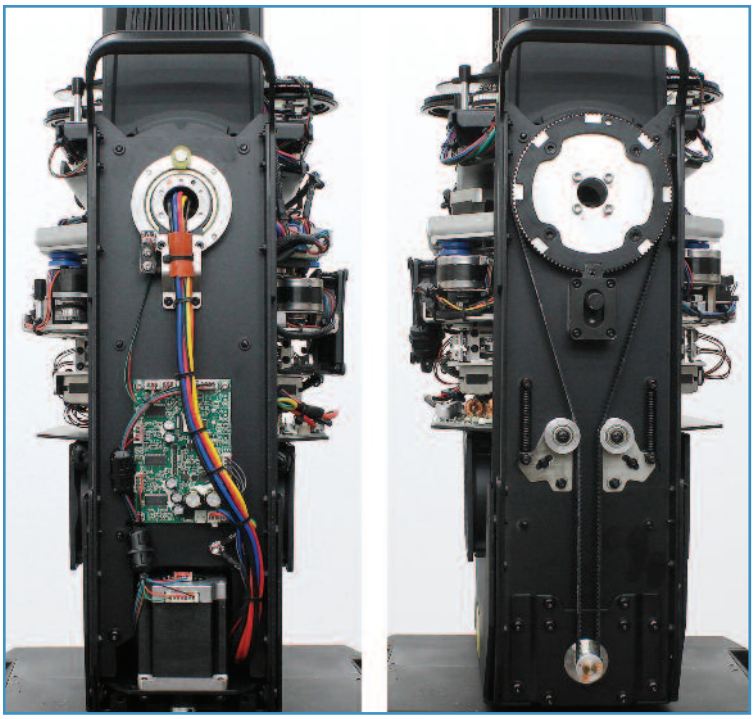

Figure 24: Yoke arms.

behaved from a DMX512 reset in that the fixture fades out smoothly, resets, and keeps its shutter closed before fading up again after all reset movement is finished.

Construction

As is usual from Martin, the ERA 800 performance has a neat modular construction. One change I noticed is that all three modules are held in by single retaining bars. This means you have to be careful when removing a single module as, perhaps without realizing it, you have also released the other two and they could fall out. (No, I didn't do this; I noticed…) My guess as to the reason for this change is that a single small punched retaining bar is likely more accurate than holes drilled and tapped into a larger chassis and serves to hold the modules in accurate alignment.

Figure 24 shows the two yoke arms: one with the power and data cabling, motor drivers, and pan motor, the other with the tilt mechanism.

Power and control

In my tests, the ERA 800 Performance consumed 10.1A, 1156W, 1169VA with a power factor of 0.98 when running at 120V at full output. The quiescent load with the LEDs off was 0.89A, 101W, 110VA with a power factor of 0.92.

Figure 25: Menu.

The unit has a screen and menu system providing access to a comprehensive array of setup and service functions (Figure 25). This includes full RDM functionality, which I tested.

Finally, the connector panel contains Neutrik powerCON TRUE1 input and output for power along with standard five-pin DMX512 connections as well as a USB socket (next to the display) for diagnostic and service access.

That just about covers it for the Martin by Harman ERA 800 Performance. This is a straightforward unit with good light output and a standard set of features. Does your rig have a space that it could fill? I've tried to give you the raw facts and figures to help you make a decision, but ultimately, as always, it's you who gets to decide.

Mike Wood provides design, research and development, technical, and intellectual property consulting services to the entertainment technology industry. He can be contacted at mike@mikewoodconsulting.com.