Elation Power Spot 700 CMY

By: Mike Wood

Fig 1. Unit as tested

Fig 2. Lamp

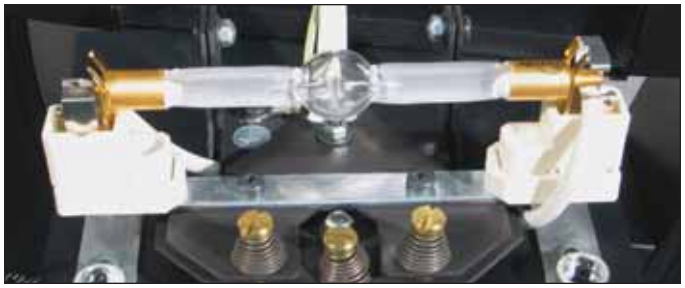

Fig 3. Lamp in holder

About a year ago, we reviewed an Elation fixture in these pages—the Design Spot 250. Since then, the company has brought out a range of fixtures that, as we said last time, seek to blur the dividing line between products designed for the touring market and those designed for permanent installation in clubs and similar venues. From the point of view of the user, this can only be a good thing—the upward pressure from companies like Elation, snapping at the heels of the more established players, will, one hopes, spur those established players to pursue further innovations. In fact, our industry lives by innovation; once a product becomes a pure commodity, innovation ceases and nothing matters apart from price. That this hasn't happened is due to the continual and continuous pressure from users—that's you—for the next new thing. Keep that pressure up!

This time, we're looking at a new fixture that has all the bells and whistles you'd expect from a top-of-the-range touring unit but at a fixed install price—the Elation Power Spot 700 CMY (Fig. 1). How does this unit stack up against the Martin MAC 700 and the High End Systems X-Spot?

As always in these reviews I measure every parameter I can think of and present that raw data for you to analyze. I hope that the consistent methodology will mean that you can directly compare units reviewed in previous issues and get a feel for how they would compare if they were tested side by side. The review works forward through the fixture, from lamp to output lens. Remember, as always, that the data presented here are based on the testing of a particular unit supplied to me by the manufacturer as a typical representative of the product; production units are likely to vary slightly. I always average multiple readings to try and eliminate measurement errors.

Let's start at the very beginning, with the power input; the Power Spot 700 uses a Powercon connector into a universal power supply rated for 90-260VAC 5/60Hz. Slightly strangely though, you have to change fuses if you want to switch voltage. I can't actually see that happening in the field, even though Elation does provide the relevant fuses with the fixture. For these tests, the fixture was run at a nominal 120V, 60Hz.

Lamp

The Power Spot 700 was supplied with Philip's 4mm arc gap, 7,500K, MSR 700 SA2 DE (Fig. 2) from its new "Gold" range. This is a double-ended version of the well-known MSR short-arc lamps normally seen in a single-ended configuration. It's perhaps not quite as bright as some of the other double-ended short-arc lamps, but it has a good reputation for reliability and color stability. The "Gold" in the name refers to the gold-plated end caps, which are supposed to reduce failures from high-resistance connections. I'm sure that's true, but I think the real reason Philips does it is because it looks classy!

The lamp-mounting-and-change system is accessed through a familiar rear drop-down plate held in place with four quarter-turn fasteners (Fig. 3). This assembly also has recessed screws for the lamp Y and Z axis adjustment; the X axis is fixed. I tweaked the lamp in slightly, to get the feel of the adjustment system, and had no problem centering the lamp in the reflector and getting an even field. Figure 4 shows that reflector—the now completely standard faceted cold mirror-coated glass ellipsoidal—with the lamp mounted radially. Slightly less standard is the retro spherical aluminum reflector immediately in front of the main reflector. This captures some of what would otherwise be lost light and sends it back into the system. If you look carefully at the photograph, you can just see this retro reflector, and the two large fans, one each side of the reflector, that provide the main cooling for the lamp, one pointed at each main lamp pinch. I examined the lamp before and after running, and saw no evidence of overheating; in fact, the whole fixture ran acceptably cool during all tests. Immediately in front of the lamp/reflector combination is a hot mirror reflecting

heat back and keeping it out of the optical train. You may have noticed that hot mirrors are nearly always made from two pieces of glass with a join line across the beam center. This is for two reasons. First, it gives the glass a free edge to allow for expansion; if you glue a hot mirror all the way, there's nowhere for it to go when the surrounding metal expands and it can easily crack. Second, it allows you to tilt the glass slightly towards the center in an inverted "V." This slight tilt stops you getting parallel hall-of-mirrors' reflections from the gobos or lenses back to the hot mirror.

Lamp power is supplied from an electronic ballast mounted in the top box, with the high voltage ignitor in the front of the head next to the output lens.

Dimmer and strobe

Immediately after the hot mirror is the dimmer/shutter. This uses a pair of sawtooth flags, each with its own motor. As can be seen in Figure 5, the teeth of the flags also have an area with a frosted material to further soften the dimming edge. This works well and the dimmer output is smooth, with no visible artifacts until just before the system fully closes when the fader is at 2-3%. The resultant dimmer curve (Fig. 6) doesn't make the best use of this very creditable dimmer. It is too flat at the top end, with a very steep drop off from 40%-20%; it then flattens out such that there is almost no change from 20% down to zero. Some adjustment in the software, which Elation tells me is happening, will make this feel a lot nicer.

The same flags also provide the strobe system. The extra weight of the frost on the flags means it's a good system but not the fastest around. The speed range goes from 0.7Hz to around 6Hz.

Color systems

Next in line is the color-mixing system. This uses four pairs of transverse etched dichroics that move linearly across the aperture on tracks like pairs of curtains. Each filter has a familiar etched "fingers" pattern with the fingers slightly offset on adjacent filters to improve homogenization and avoid moiré effects. Figure 7 shows the cyan and magenta plates partially inserted and you can clearly see the offset. The four pairs of plates are, of course, cyan, magenta, yellow, and CTO. Immediately after these is a homogenizing filter mounted across a second aperture plate. This is visible in the middle of Figure 7. The short optical trains in small modern fixtures have made something like this increasingly common—you just don't have the path length to allow the beam to mix, and the filter helps this along. The downside is an inevitable loss of light output, as much as 10-20%. In the case of the Power Spot 700, it works well and the color mixing is uniform and smooth over nearly the entire range. I did see some slight evidence of visible cyan and magenta bands in some pale blues and lavenders, but it is minor and most likely wouldn't be noticeable in normal use.

Color mixing

Color	Cyan	Magenta	Yellow	Red	Green	Blue	CTO
Transmission	7%	5.2%	75%	4.2%	5.7%	0.7%	37%

Color change speed – worst case	1 sec

Fig 4. Cold mirror reflector

Fig 5. Dimmer flags

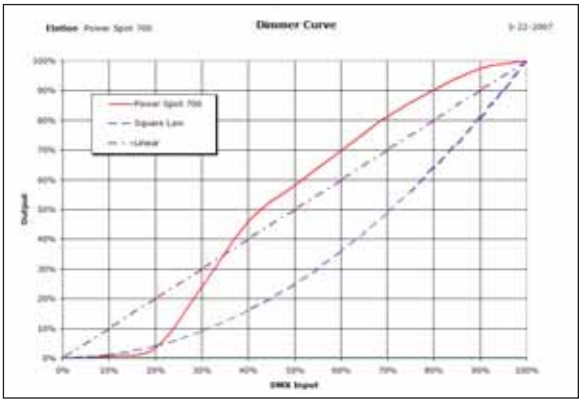

Fig 6. Dimmer law

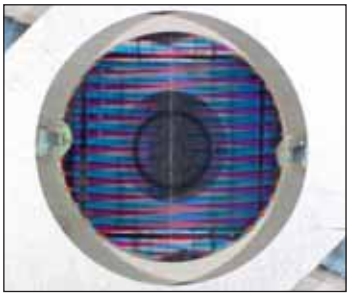

Fig 7. Color mixing

Fig 8. Color wheel

Fig 9. Effect wheel

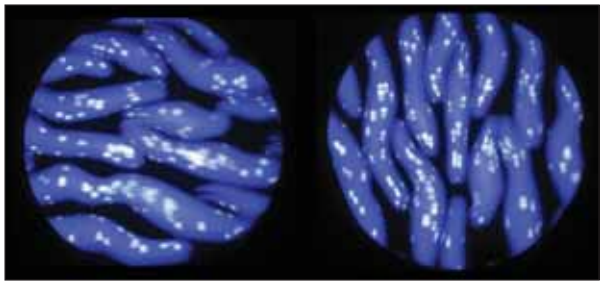

Fig 10. Effects rotate

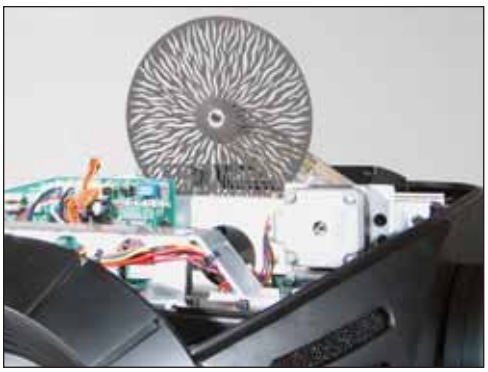

Fig 11. Effect wheel change

Fig 12. Fixture kit

Fig 13. Rotating gobo and color

Fig 14. Optical bay

Fig 15. Optical module

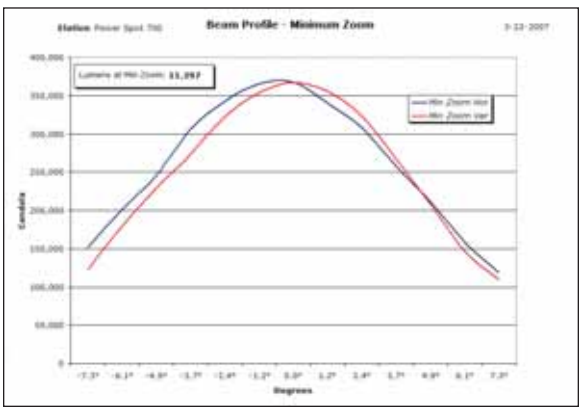

Fig 16. Minimum Zoom

As you can see from the transmission table, all the colors are deeply saturated. Full blue, for example, is almost a congo, and this showed in the mixing. It was definitely easier to get the deeper colors than the pastels—but that's probably fine for the target market. Low red output is a function of the high color temperature lamp (7,500K) as much as the fixture and is symptomatic in current fixtures from all manufacturers.

The other side of the homogenizing filter is a fixed color wheel with eight interchangeable trapezoidal colors (Fig. 8). The colors are glued to small metal clip in frames as seen in Figure 13 and are very easy to replace, as long as you are on the bench—but more of that later.

Fixed Color Wheel

Color	Red	CTB	Yellow	Lavender	Amber	Pink	Green	Congo
Transmission	1.5%	58%	89%	9.7%	47%	41%	15%	2.5%

A good range of colors on the fixed wheel is designed to fill in weaker spots in the color mixing. These colors, particularly the CTB, could be used as color modifiers for the CMY CTO system.

The filters are quite large, but the color-change speed was excellent, with very good half colors. The wheel uses the quick-path algorithm, so moves are always made in the shortest possible time.

Color Wheel

Color change speed - adjacent	0.2 sec
Color change speed - worst case	0.6 sec
Maximum wheel spin speed	0.33 sec/rev = 180 rpm
Minimum wheel spin speed	1197 sec/rev = 3 rph

Note the large range of wheel rotate speeds; this is a general theme in this unit. All rotates and spins will go down to a few revolutions per hour (rph). It's nice to see this and, with a couple of exceptions, Elation has kept the movement smooth at these slow speeds.

Effects wheel

Next in line is the effect wheel. We have a minor nomenclature issue here. This isn't a wheel with selectable effects; it's a single large disc, which can be rotated at various angles across the beam to give break-up effects in differing directions. Other manufacturers call this an "animation wheel," a term that distinguishes it better. In fact, the Power Spot 700 doesn't really have what I think of as effect break-up and ribbed glasses—although I'm sure you could install some in the rotating gobo wheel if you wanted.

Figure 9 shows how this wheel can be moved across the aperture and then rotated. You can stop it at any position across the aperture, so changing the effective center of rotation, and thus the apparent direction of the pattern motion. Figure 10 shows two side-by-side examples of the effect wheel at different angles superimposed over a colored gobo. Pulling focus through the effect wheel/gobo wheel combination gives you a good range of possible results.

It's very easy to change this wheel out. Release a captive thumbscrew and the whole wheel pops up out of the fixture (Fig. 11). It's held in place by a magnetic hub, so you can just snap off the existing wheel and snap in a new one. Elation provides four

alternate wheels. This might be a good point to mention the "kit" that comes with the unit. Included with the Power Spot 700 is a plastic briefcase full of goodies. There are the alternate effects wheel I just mentioned, plus alternate gobos, hanging clamps, documentation, and a little plastic box with spare fuses, gobo clips, and a selection of screws. It's very neatly presented and a nice feature (Fig. 12).

Gobos

Right next to the effect wheel is the gobo system. The Elation Power Spot 700 has two gobo wheels, one with seven rotating/indexing gobos and a fixed wheel with nine non-changeable patterns.

Rotating Gobo

Gobo change time, adjacent apertures	0.6 sec
Gobo change time, max (Gobo 0 to 3)	1.1 sec
Maximum gobo rotate speed	2.9 sec/rev = 20.5 rpm
Minimum gobo rotate speed	2080 sec/rev = 1.7 rph
Maximum wheel spin speed	2.2 sec/rev = 28 rpm
Minimum wheel spin speed	73 sec/rev = 0.8 rpm

Positioning and indexing accuracy on the rotating gobos was good. Measured hysteresis error was around 0.16°, which is 0.67" at a 20' throw. Gobo rotate was slightly steppy at some speeds but overall was acceptably good. The wheel spin showed very apparent steps at low speeds and might need a little work. Figure 9 shows the wheel in place in the opened module. The gobos are replaceable from the underside of the wheel through the plug-in holders shown in Figure 13.

Although the gobo change speed on the rotating wheel is nothing to get excited about, the fixed wheel speed is very impressive. To switch between two adjacent gobos takes less than 0.1 second; the maximum time for two gobos as far apart as possible is still only 0.3 second. These are real "snap" changes and look excellent. The fixed wheel also has a large range of wheel rotation speeds available, from 150rpm to 0.1rpm (or 3.6rph).

Gobo focus is reasonable, with a small but visible difference between center and edge focus that is similar on both wheels. The separation of the three wheels means that you can get good morphing effects by pulling focus between the various layers.

We should discuss how you change out both colors and gobos. All the main components are mounted on a single, unfolding, optical module. Figure 14 shows the optical bay with the main module in the center. By slackening the two large black thumbscrews in the center of the photograph you can release two catches and lift the whole module out of the fixture. Release some more thumbscrews (all captive) and the module unfolds flat, giving clear access to all wheels. Figure 15 shows the module partially unfolded, with the gobo and effect wheels on one side and the color wheel on the other. This is a very simple and effective system and it is easy to remove and replace this module. However, it's not something you'd want to do while the fixture was in the rig. The module is quite large and heavy so this is definitely a bench task.

Iris

Not one of the fixture's strongest points, the Power Spot 700 has a fairly limited iris which reduces the beam size to 35% of the full size when fully closed—i.e., 5° when at minimum beam angle, 12.4° when at maximum beam angle. Movement time from fully open to fully closed was measured at 0.5 second. Although the manual suggests there are ramp and snap effects on the iris channel, the fixture supplied had only a simple open-to-closed DMX protocol.

Lenses and output

The Power Spot 700 has the three group projection lens system that we are seeing in more and more fixtures; it's fast becoming a de-facto standard. The first two groups both move providing zoom and focus while the final group is the static front lens. The system provided good performance with acceptable chromatic and acceptable spherical aberration throughout the range.

The full range lens movement time was 1.9 seconds for zoom and 2.2 seconds for zoom.

The measured zoom range was 14.6° to 35.6° (2.4:1), with total output ranging from 11,300 lumens in narrow to 12,100 lumens in wide. These are perhaps slightly low for this fixture class and zoom range, but the output was very flat (around 3:1, center to edge), and smooth, as can be seen from the output curves (Fig. 16; Fig. 17.)

Prism

There is a single prism mounted on an arm which can be swung into position over the beam just before the output lens. The unit as provided had a three-facet prism but I imagine others could be fitted. This gave good image separation at narrow zoom settings. As with other parameters, there is a good range of rotation speeds for this prism—from 73 rpm all the way down to 1.7 rph, which is glacially slow!

Frost

The final item in the optical train is a very unusual frost mechanism. It uses two textured plastic sheets on flags, which close across the aperture, producing an effect that I can't call "frost" as it's normally understood. To my mind, frosting an image should evenly soften the edges of the projected image and reduce the overall contrast ratio. However, the Power Spot 700 system only reduces the contrast ratio while the edges stay sharp the whole way through the frost range. In fact, when getting near to full frost, it actually sharpens the image slightly, as you get a pinhole camera effect from the narrow gap between the two flags. It's not an unpleasing effect, but it's not a normal frost. Figure 18 shows a gobo with zero, 50%, and 90% frost. You can clearly see that the outside edges of the image start out slightly fuzzy and defocused but end up sharp when frost is at 90%. Full frost does wash out the image completely. The time to open or close the flags was 0.7 second.

Pan and tilt

The Power Spot 700 has a pan range of 545° and tilt of 260°. Movement was very quick, with a full-range pan move taking 3.7 seconds; a more typical 180° move took 2.3 seconds. For tilt, the

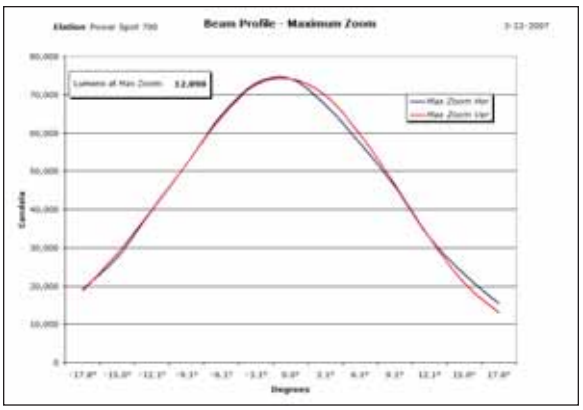

Fig 17. Maximum Zoom

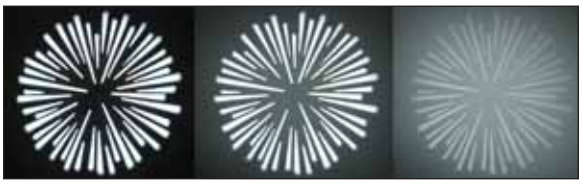

Fig 18. Frost

figures were 2.2 seconds for the full range and 1.6 seconds for 180°.

Positional repeatability accuracy on pan and tilt was moderate at 0.3° for pan and 0.4° for tilt—or around 1.7" at a 20' throw. The penalty you pay for such rapid movement is settling bounce. A full-speed move of the Power Spot 700 is followed by one to two seconds of oscillating bounce with amplitude about twice the static hysteresis, i.e. around 3.4" at 20'. If this is a problem, you'll want to slow down your moves and come to a more controlled stop.

The tilt system has a neat push-to-lock, push-to-unlock system for transportation, which can be seen in Figure 19.

Noise

It's not the noisiest fixture—nor is it the quietest. A few of the motors have noisy resonance spots; particularly noticeable were gobo rotate and zoom. Elation has provided menu selectable fan settings to help minimize fan noise; for these tests the fans were operated in "regular" mode, where the speed is temperature-controlled.

Fig 19. Yoke arm

Fig 20. Hidden display

Sound Levels

Ambient	<35 dBA at 1m
Stationary	45.9 dBA at 1m
Homing/Initialization	55.6 dBA at 1m
Pan	56.1 dBA at 1m
Tilt	55.3 dBA at 1m
Color	48.8 dBA at 1m
Color Mix	51.6 dBA at 1m
Prism	49.1 dBA at 1m
Gobo rotate	52.1 dBA at 1m
Gobo select	49.1 dBA at 1m
Zoom	55.0 dBA at 1m
Focus	51.9 dBA at 1m
Strobe	47.1 dBA at 1m
Effect	47.0 dBA at 1m

Electrical Parameters

Power consumption at 120V, 60Hz

	Current, RMS	Power, W	Power Factor
Stationary	8A	945W	0.99
All Motors Running	8.2A	969W	0.99

Homing/initialization time

The unit takes 45 seconds to complete a full initialization when the fixture is powered up from cold and 37 seconds if a "reset" command is sent.

Electronics and control

The Power Spot 700 uses an increasingly common distributed control system, with multiple motor driver boards throughout the unit driven by a single main board through a data bus. The hidden display is elegant, with the menu and backlit legends invisible until the unit has power (Fig. 20).

The menu system has the usual selection of options and test routines to set up and use the unit and I had no problems with either operating or setting parameters. My one complaint on electronics is the use of non-standard three-pin XLRs rather than standard five-pin for DMX-512.

Construction and serviceability

As already mentioned, I was particularly impressed by the main optical module and its origami-like unfolding. I would love that if I were to be regularly servicing the unit. The top box is a little more difficult to access, as it requires the removal of screws on both the top and bottom surfaces to remove the covers, but, once removed, access was straightforward. Overall, the standard of construction seems solid. A clear problem with these reviews is that I don't run the units long enough to spot any long-term maintenance issues, but there were no obvious problems in the week I had the unit.

Well, that's it, from input to output, from power cord to lens, from electron to photon; the Elation Power Spot 700 CMY is clearly aimed at some of the most well-known fixtures in the market. Can it compete on equal terms? As ever, you get to decide. *Mike Wood provides technical, design and intellectual property consulting services to the entertainment technology industry. He can be contacted at mike@mikewoodconsulting.com*