The Martin Professional MAC 550

by Mike Wood

For our next fixture in this ongoing series of reviews, we have chosen a relatively new light from a well-established manufacturer: The Martin Professional MAC 550 Profile.

The MAC 550 was launched in late 2003 as a mid-range unit to complement the MAC 2000 and fill in the gap between that unit and the now long-in-the-tooth MAC 500. As a 400W short-arc unit, it enters a busy sector of the marketplace, competing head-on with many existing 575W units. Clearly, Martin is capitalizing on the huge success of the MAC 2000 and has unashamedly cloned the styling and many features of that product into the MAC 550. I don't blame them; I'd do the same.

As in previous reviews, I'll work forward in the light, from lamp to output lens, and present the results measured in as objective a manner as possible. Again, these results are based on the testing of one specific unit, so your mileage may vary. However, I do take multiple readings and average them to try and ensure repeatability.

The MAC 550 is fitted with auto-sensing power supplies for both lamp and electronics and can be run on voltages between 90-130V or between 200-260V. In all the tests below, the fixture was run at 118V, 60Hz (Fig. 1).

Fig. 1

ALL PHOTOS: MIKE WOOD

Lamp

The MAC 550 uses the Osram HTI 400 W/D3 double-ended discharge lamp, rated at 7,500K color temperature. This is a short arc lamp in Osram's SharXS family. With a very small arc gap of 3mm, it gives Martin's optical designers an opportunity to produce a highly efficient and compact system. As with many of the newer metal halide short arc lamps from other manufacturers, Osram has solved the issue of protecting the lamp seals from early failure due to the oxidation that dogged previous generations of these lamps by applying a plating (often chrome or similar metals) to the molybdenum foil where it passes through the quartz pinch seal.

The lamp is mounted on a lampholder plate, which is retained by four quarter-turn fasteners; once released, it swings down for lamp access. The lamp change is simple and straightforward, with all parts remaining captive (Fig. 2).

As this is a 400W unit, cooling is much simpler than on the 1,200W units and the fixture ran very cool in all tests. I saw no evidence of lamp overheating or uneven performance at different burning positions, both of which can be evidence of inadequate or uneven cooling.

The lamp is mounted radially in a faceted cold-mirror reflector. You can clearly see in Figure 3 a potential issue with double-ended lamps mounted in this configuration, in that the quartz tubes leading to the lamp envelope on each side and the corresponding access slot in the reflector are always a problem when trying to get smooth and symmetrical output. The output beam inevitably shows slight "dumbbells" on each side where the lamp supports obstruct the light output. The faceting on the reflector helps a lot here and this shouldn't be an issue in normal use.

Lamp power comes from an electronic, square-wave, flicker-free ballast. Both this and the electronic power supply are mounted on one of the top-box end panels (Fig. 4). This positioning, as is the case with much of the unit's design, makes for easy access and servicing. The lamp igniter is mounted in the front of the head, keeping the high-voltage cables short.

Modules

Mention should be made of the construction used for the optical train. Many components—color wheels, gobo wheels, animation system, and so on—are mounted on two removable modules, each of which are retained by two latches, with all electrical wiring going through integral connectors. This makes it simple to remove a module for cleaning or service. Figure 5 shows the gobo module when removed and Figure 6 shows a view of the electrical connectors and the guide pins. There is a knack to inserting these modules without getting them caught up. However, once I realized that the wheels and lenses must be in specific positions to prevent interference, I removed and replaced them easily. I'd practice in good light on the floor before trying it up a ladder on a truss, though.

Dimmer and strobe

Immediately after the lamp, one finds the dimmer shutter module. The dimmer uses the familiar system of two flags with serrated teeth. Note that, as with many features in this product, the software gives you mode options. In the case of the dimmer, you can choose between a linear dim mode and one designed to more closely match the characteristics of incandescent lamps. Figure 7 shows both these dim curves, as well as true hypothetical linear and square law curves for comparison. I have to say that there really isn't much difference between the two curves—they're almost identical for the top 50% and don't differ that much at the

Fig. 2

Fig. 3

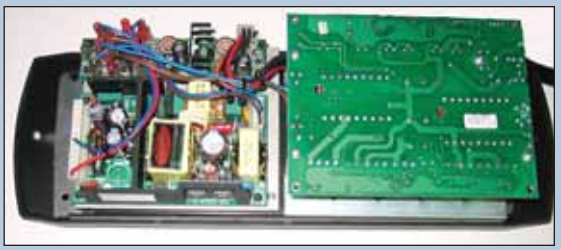

Fig. 4

Fig. 5

bottom end. Of the two, I preferred the "incandescent" mode (DIM1), as it gave a cleaner close to black. Both modes suffered from very visible beam patterning from the dimmer teeth in the bottom 20% of the curve—you'll want to get through that region smoothly and quickly.

The strobe system is very positive and clean, with a measured range of 2Hz - 6.25Hz.

Color wheels

The MAC 550 has two color wheels, each with eight interchangeable dichroic colors. The filters are trapezoidal in shape and are held onto the hub with a molded snap-in clip (Fig. 8 - color filter), (Fig. 9 - color wheel). It's a nice system and it's very easy to change filters. The trapezoidal shape means that there is no visible bar between colors and you can get some interesting half-color effects (Fig. 10).

Color Wheel 1

Color	Red 308	Magenta 507	Purple 502	Blue 04	Green 205	Yellow 60	Orange 306M	Purple 509
Transmission	3%	17%	19%	48%	20%	68%	32%	10%

Color Wheel 2

Color	Green 208	Blue 02	Pink 32	Red 30	Yellow 603	Half Minus Green	CTO	CTB
Transmission	15%	46%	39%	4%	58%	79%	69%	65%

Fig. 6

With a high-color-temperature 7,500K lamp, it isn't surprising that the reds are the weakest colors in terms of output; however, the specific colors chosen are good and those reds are true reds rather than oranges. It is possible to mix colors between the wheels, but, with the exception of the CTO, CTB, and half minus green; the standard filters don't encourage this. Many of the mixed colors are either very similar or somewhat muddy.

Color change speed was good, crisp, and definite.

Color Wheel

Color change speed - adjacent	0.2 sec
Color change speed - worst case	0.4 sec
Maximum wheel spin speed	0.75 sec/rev = 80 rpm
Minimum wheel spin speed	70 sec/rev = 0.9 rpm

Here's one interesting feature: You can select whether the wheel always takes quick path from color to color for the quickest possible change or, if you want to avoid a white flash, you can choose a mode where it always avoids the open-white position.

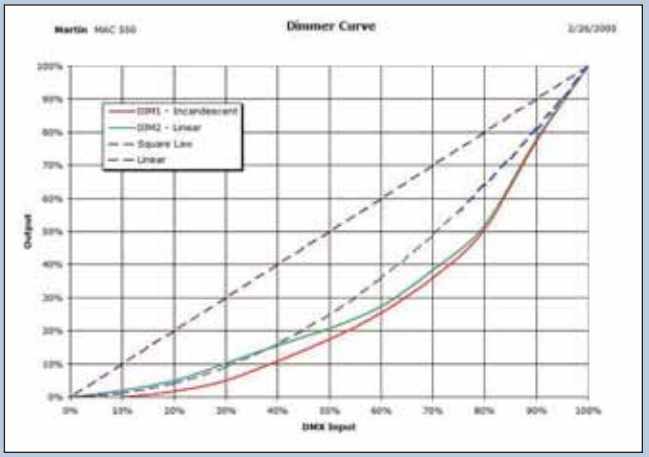

Fig. 7

Fig. 8

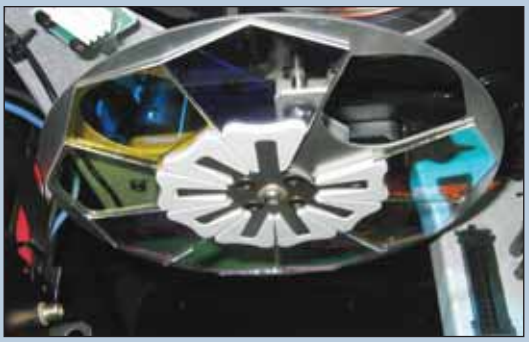

Fig. 9

Fig. 10

Fig. 11

Fig. 12

Fig. 13

Gobos

The MAC 550 has two gobo wheels—the first contains six rotating gobos and the second nine static gobos. All gobos are changeable; in the case of the rotating gobo wheel, the whole gobo cartridge snaps out (Fig. 11), so you can do the tricky part of replacing the actual gobo on the bench. Access to all the wheels is straightforward; remove one or the other of the injection-molded head covers by releasing four quarter-turn fasteners. The cover will then hang on its safety cable while you access the wheel. The only trick involves knowing the appropriate cover for each wheel.

Rotating Gobo (Gobo 1)

Gobo change time, adjacent apertures	0.25 sec
Gobo change time, max (Gobo 0 to 3)	0.5 sec
Maximum gobo rotate speed	0.5 sec/rev = 120 rpm
Minimum gobo rotate speed	435 sec/rev = 0.14 rpm
Maximum wheel spin speed	0.75 sec/rev = 80 rpm
Minimum wheel spin speed	70 sec/rev = 0.9 rpm

Indexing and wheel-positioning accuracy on the rotating gobos was good. Measured hysteresis error was around 0.08°, which is less than 0.5" at a 20' throw.

Static Gobo (Gobo 2)

Gobo change time, adjacent apertures	0.2 sec
Gobo change time, max (Gobo 0 to 4)	0.5 sec
Maximum wheel spin speed	0.75 sec/rev = 80 rpm
Minimum wheel spin speed	70 sec/rev = 0.9 rpm

Having small gobos makes for rapid changes—however, it also means that image magnification is high, so any small errors in the gobos show up in the final image. You can clearly see the rough edges on some of the metal gobos; mind you, this shows that the optics are pretty good!

A nice feature on all the wheels is "on-the-fly" position correction. The system watches each wheel as it rotates and, if it sees the sensor being triggered at the wrong moment, it will apply a correction to put the wheel back in "home." It works a little differently than advertised: The manual says that the system goes to blackout while it corrects; in fact, it doesn't do that, but rather does a slow live correction, which I found very acceptable. For some reason, this doesn't work on the fixed gobo wheel currently, but Martin tells me they've fixed this in an upcoming code revision.

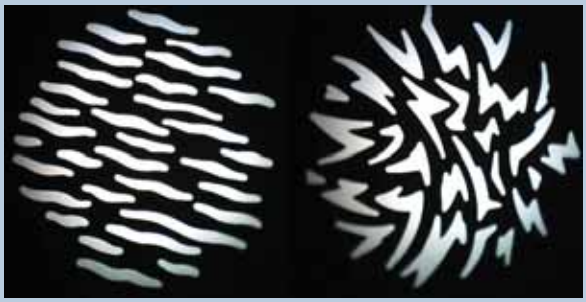

Fig. 14

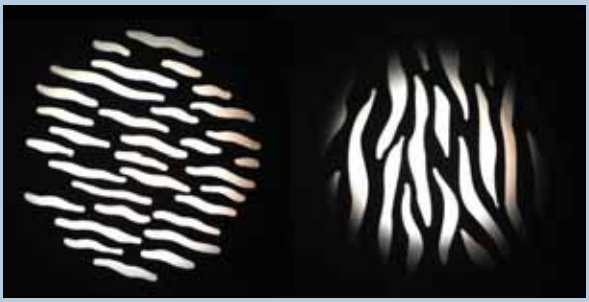

Fig. 15

Fig. 16

Animation wheel

Like its big brother, the MAC 2000 Performance, the MAC 550 boasts a gobo animation wheel. A single replaceable large gobo pattern can be slid into the beam and rotated. (Fig. 12) The mechanics allow the off-center rotation of this wheel to be positioned so as to give any effective angle of movement from vertical to horizontal. The system, when used in conjunction with an appropriate gobo and color, gives an effect similar to that produced by water ripple or fire effects in theatrical projectors. Rotation of this wheel isn't quite as good as the other gobos—it has some slight jerkiness and "hunting" at slow speeds.

This is a good time to talk about the optics; this is a small system optimized for the short arc lamp to give maximum output. A small-diameter optical system means that the axial separation from Gobo Wheel 1 to Gobo Wheel 2 to the animation wheel is effectively quite large. Therefore, the beam profile and center/edge focus vary quite a bit as you change from wheel to wheel. Martin has sensibly put the rotating gobo wheel at the best position, with optimum focus quality and beam profile; the quality then drops off as you go through the other wheels. Figure 14 shows Gobo 1 side by side with Gobo 2, while Figure 15 shows Gobo 1 and the animation wheel. You can see how sharpness reduces slightly at the edge of the field and the hot spot becomes more pronounced as you move through the wheels. The open field, when focused at the animation wheel position, shows what's happening, with obvious vignetting of the image (Fig. 13). Another consequence of this axial separation is that it is not possible to focus on the gobo animation wheel when working at the narrowest zoom angles. This is being very picky, though, as overall this is an excellent optical system and normal use of the animation wheel would have it out of focus, anyway.

Iris

The MAC 550 has a standard iris which reduces the beam to 33% of the full size when fully closed—i.e., 5° when at minimum beam angle and 10° when at maximum beam angle. Movement time from fully open to fully closed is 0.3 seconds.

Prism

There is a good three-facet prism which, interestingly, is sited between the zoom- and focus-lens groups. To allow access for the prism as it is brought into the beam, the system has to move the focus lens forward out of the way. This is quite complex, but I think it's justified to get the good image separation. This arrangement means that you get a visible focus change just before the prism comes in—and again just after it is removed, so you might want to do this with the shutter closed.

Prism

Prism in/out time	1.1 sec
Maximum prism spin speed	1.04 sec/rev = 58 rpm
Minimum prism spin speed	51 sec/rev = 1.2 rpm

Lenses and output

The MAC 550 uses a three-group system: Groups One and Two both move, providing zoom and focus, while the final group is the static front lens (Fig. 16). The performance was very good, with very little chromatic or spherical aberration and high efficiency. Lens-movement time from end to end was 1.5 sec for zoom and 2.5 sec for focus. I measured a field angle range from 15-30°, with totals ranging from 9,860 lumens at narrow angle to 10,600 lumens at wide. These figures are excellent for a fixture of this size and power and compare very favorably with 575W medium-arc units. (Fig 17 - output at narrow angle), (Fig 18 - output at wide sngle).

Pan and tilt

The pan range of 540° and tilt of 240° is pretty normal. Movement speed is good. In Norm mode, a full range pan move took five seconds and a more typical 180° move took 2.9 seconds, while in Fast mode the full range figure was reduced to 3.7 seconds.

The positional repeatability accuracy on pan and tilt was really tight at 0.04°—that's less than 0.25" at a 20' throw. The compromise, as always, is accuracy versus smoothness. It's a bit like the shocks in your car—hard shocks give you the best feel but the worst ride, while soft shocks give you a comfortable ride but not much precision in steering. The result with the MAC 550 is that there is quite a bit of settling bounce as the fixture comes to a rest, something like 2-3" of bounce at that same 20' throw when moving at full speed. Slow it down a bit, though, and you have an excellent compromise. Martin's usual large drive-gear ratio and twin motor drive for each axis is responsible for this accurate system. Figure 19 shows one of the tilt motors, the other yoke arm is very similar.

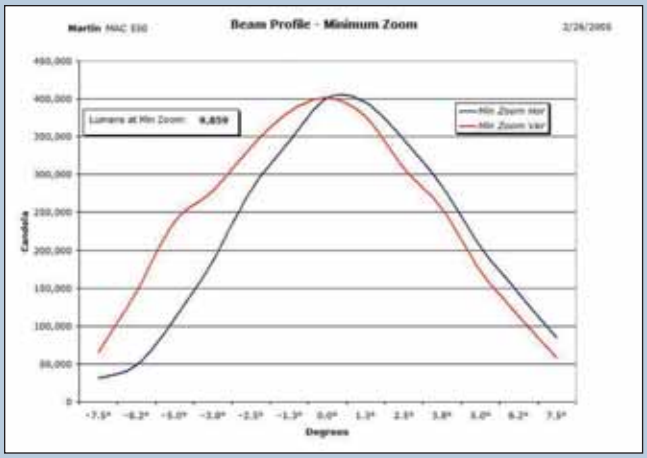

Fig. 17

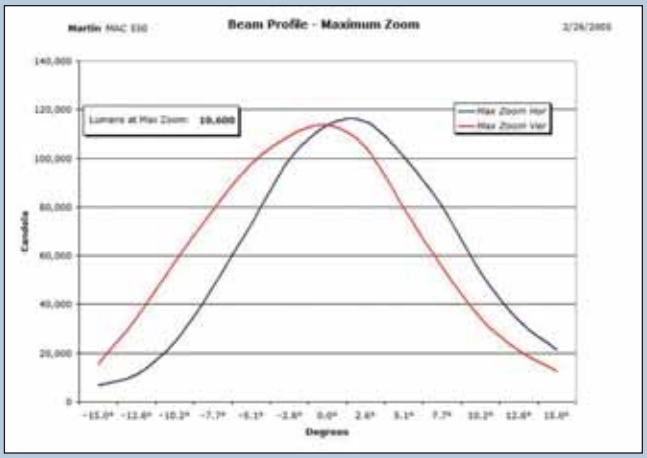

Fig. 18

Noise

Sound levels were fairly constant, with the fans providing the bulk of the noise. There were a couple of points where the system hit motor resonances which pushed the level up.

Sound Levels in Normal Mode

Ambient	35 dBA at 1m
Stationary	50 dBA at 1m
Homing/Initialization	58 dBA at 1m
Pan	54 dBA at 1m
Tilt	60 dBA at 1m
Color	51 dBA at 1m
Prism	53 dBA at 1m
Gobo rotate	54 dBA at 1m
Zoom	52 dBA at 1m
Focus	50 dBA at 1m
Strobe	51 dBA at 1m

The menu system offers a choice of Normal and Studio modes for noise levels. The Studio mode is supposed to reduce overall noise levels on the wheels. In practice, I found it made no difference at all—it did indeed reduce the top speed of the motors, but, as the maximum sound levels were at a resonance point about 2-3% below maximum speed, they were still accessible in either mode.

Electrical parameters

Power consumption at 118V, 60Hz

	Current, RMS	Power Factor
Electronics only, initializing	1.5A	n/a
Normal running	5.65A	0.99

Homing/initialization time

The results were 45 seconds from a cold start and 22 seconds when the fixture was powered up and the Reset command was sent.

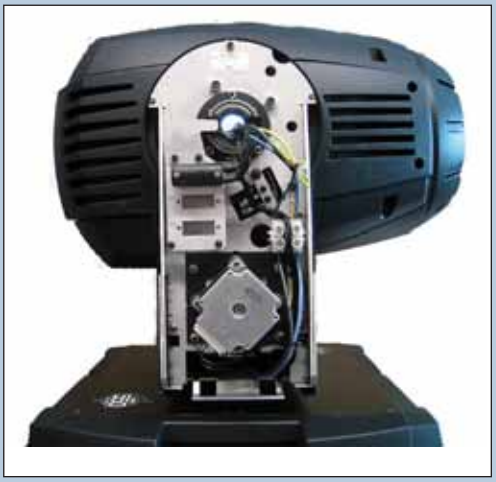

Fig. 19

Electronics and control

The electronics and menuing system are familiar and comprehensive, with many options and settings available in the firmware. I've tried to mention the most useful or unusual in the text above. The MAC 550 offers both the standard five-pin XLR and the legacy three-pin XLR for DMX-512 and has a comprehensive DMX protocol. One feature worth mentioning is that the fixture offers an extended high-resolution DMX mode where most parameters become 16-bit rather than the more normal eight-bit. This may not often be needed, but I can imagine instances where 16-bit control of iris size for example could be very useful.

As I said at the beginning of this review the MAC 550 enters a very busy sector of the market place with a lot of well-established fixtures as its competition. Can this 400W compact unit win support as users start to replace their ten-year-old 575W spots? As usual, I leave it to you to draw your own conclusions.