LIGHTING+SOUND International

MAGIC BALLOON: BILLED AS BERLIN'S MOST INNOVATIVE NIGHTCLUB

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ON THE MOVE

L+SI invited Philip Nye, chief engineer with DHA Lighting, to comment on moving equipment in general and DHA's Digital Light Curtain in particular

When a lighting rig is a simple desk, dimmer and lantern combination, a high level of control over the equipment is assumed and is restricted only by the quality and suitability of the particular components. However, with a rapidly increasing amount of more complex equipment on offer lighting designers frequently find themselves having to wrestle with equipment which is at best awkward and at worst virtually impossible to control.

During the design of DHA's Digital Light Curtain, controllability was a very high priority - previous light curtains, whilst proving the power of the device as a lighting tool, had had the crudest of control systems. The new Digital Light Curtain was designed from the bottom up with a view to curing these defects. However, as other new features were introduced a number of new issues were raised and addressed which are of a more general application than simply making light battens move.

The Digital Light Curtain is self-contained with its own tilt drive and colour scroller built-in as an integral part of the unit - previous designs had been bolted together in lines with a single drive motor while scrollers were a separate add-on. It had 320 degrees of tilt movement driven by a microstepping stepper motor; even without mircrostepping an internal resolution of 0.04 degrees is possible - other light curtain rotators are servo driven with lots of backlash, poor resolution and repeatability. The colour scroller will comfortably hold anything up to 20 colours while previous scrollers for light curtains have been restricted to exactly 11.

These features will raise several questions: How do we adequately control a device of this accuracy? If units are separately driven how do we ensure that when they are hung in a line they will all move together? What if one unit must be hung in reverse because scenery is in the way? How can an operator rapidly select colour 14 on a 17 colour scroll (a nightmare on a conventional desk)? If several units are making different moves at the same time how do we ensure that they all begin and end together?

These are a few of the questions which we met head-on, and they are not unique to the Digital Light Curtain. The traditional solution is to try and make everything 'look' like a dimmer with a range from 0 to 100% and rely on the desk operator to sort things out. But even though desk manufacturers - particularly Celco with the Navigator - are waking up to some of these difficulties, the basic approach becomes increasingly untenable with new products.

The Digital Light Curtain control system is completely new and is designed to be low-cost, extensible and to address many of these difficulties. The first point established is that the operator or designer should be free to think in terms of real units and not to continually convert percentages and numbers. The Digital Light Curtain is given its tilt angles in degrees (to one decimal place) and they can be positive or negative. Colours are specified by their position on the scroll so that colour seven is the same whether there are only seven or 20 colours on this scroll. To allow the designer to select split colour for special effects the scroll position can also be given to one decimal place so colour 8.5 will be half way between colours eight and nine. All moves for both tilt and colour are timed in seconds (to one decimal place) so no matter how long or short the move is, the time taken can be precisely controlled.

The DHA Light Curtain as seen at the PLASA Light and Sound Show.

One implication of this way of specifying moves is that if two adjacent units receive the same command at the same time they will move in perfect unison - there is no worry about whether they have identical ranges set - however, to allow greater control of rows of light curtains each unit has a movable zero point (the position it goes to when 0 degrees is specified). As all other positions relate to the zero point this allows units in line to be finely aligned with each other to produce a continuous sheet of light many metres wide. Since the zero position can be anywhere within the 320 degree tilt range of the unit it is also possible to set zero at whatever point is convenient to the designer: straight down, the front of the deck, the bottom of the cyc, or whatever.

If a unit has to be swapped with a spare the new light curtain only needs to have its zero point adjusted and it's ready to run. Another refinement here is that the direction of movement can also be reversed so that positive tilt angles can be set to be up-stage or down-stage without re-hanging the fitting. If one unit in a line must be hung reversed, because of scenery constraints, for example, it can still be made to move in unison with all its fellows by telling it that it is a reversed unit.

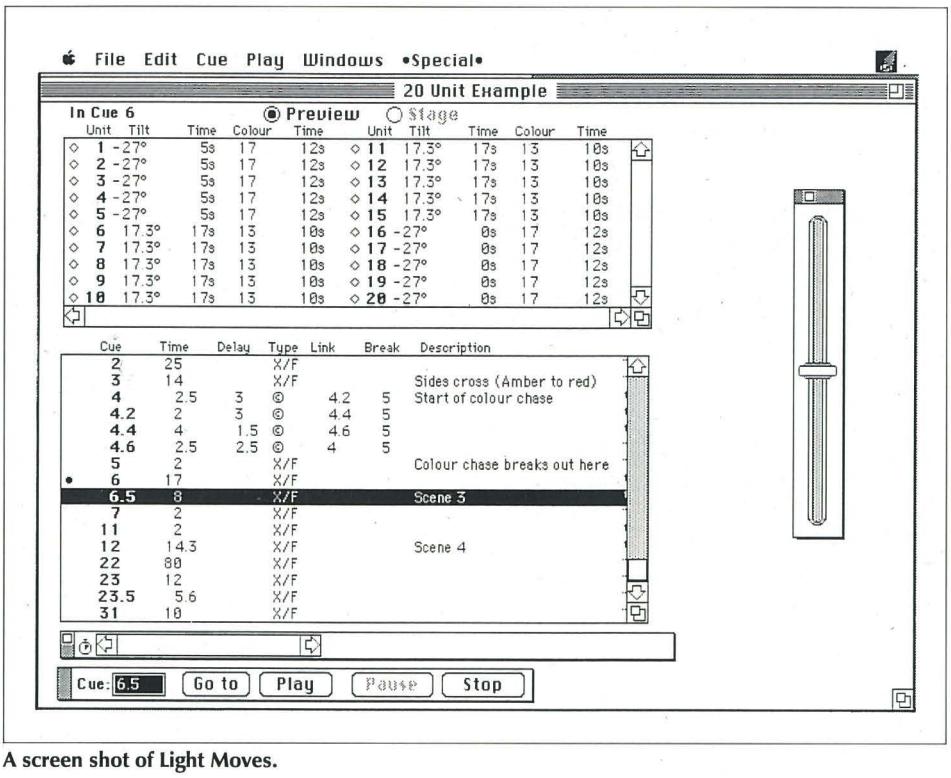
To prevent light curtains blinding the audience inadvertently or lighting things they shouldn't, the user can set high and low limits of tilt beyond which they cannot be made to move.

The colour scroller works by sensing tape markers at each colour. It keeps a table of the positions of each colour which is updated as it scrolls back and forward so that it knows how many colours it has and where they are. Because it knows where to expect the marker tape it can ramp down its speed and stop precisely at the marker at the cue time given. If a gel panel has been cut too wide the device will not be fooled but will adjust its speed accordingly. Once the unit has been calibrated (it scrolls from end to end counting colours and noting their positions) it is even possible to remove a sensor tape - the scroller simply goes to the point where that tape used to be! As with tilt the scroller can be reversed so that colour 20 becomes colour one and vice versa, so it is even possible for a unit hung backwards in a chain to appear to scroll in the same direction as its neighbours. Unfortunately, it's also necessary to make a reversed scroll for this!

Tilt and colour moves are independent; a colour move can be started during a tilt move or vice versa, and both are individually timed in seconds from 0.0 up to 3600.0 (one hour). Obviously, a real move cannot be made in zero seconds but this translates as 'as fast as the hardware will allow'. If a new move is transmitted to a unit before it has completed the last, the latest takes precedence and the unit will change smoothly from one move to the next, finishing at the right position at precisely the right time.

At the slow end of the range movement is uncannily smooth, particularly in the scroller which can be made to creep imperceptibly from one colour to the next over several minutes - great for sunsets!

All these control features are built into each light curtain and are not a function of the



A screen shot of Light Moves.

controller. Important configuration features such as zero point, direction reversal, and tilt limits are retained even when the device is powered off so they need only be set once. The control system is fully bi-directional; it is possible for the controller to interrogate each device in a rig not only for such things as its current positon but for the number of colours on its scroll, its current velocity, the time remaining for a move, and what kind of device it is (in this case 'Digital Light Curtain') etc.

All this may suggest a very high cost but in fact saves on the cost of both producing the Digital Light Curtain and running a rig in a number of ways. On the production side the unit itself simply has two control connections, Logic In and Logic Out. It has no switches, knobs or other adjustments, not even address switches. The control network operates at modest speeds (in electronic terms) using standard protocols so there is no need for expensive specialist hardware in the electronics and the microprocessor, which does all the work inside, does not have to spend most of its time decoding the control input. All this means much simpler, smaller and cheaper electronics. In use the Digital Light Curtain can be simply hung on the bar (it comes with hook clamps fitted) connected up and flown out. All adjustments such as zero positioning etc. are done remotely from the controller. The logic cables are daisy-chained from the controller through all the units from one to the next using robust, low cost, crimp-on connectors.

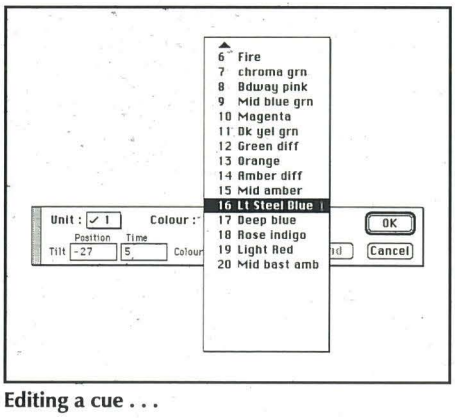
The controller option - 'Light Moves' - currently supplied free with the units runs on a Macintosh computer (even an $800 Mac Classic). Light Moves extends the principles established above with additional functionality and the full benefit of the Macintosh's intuitive user interface, while still maintaining a format of cues familiar to any board operator or lighting designer.

Cues can be set up with separate times for each unit and for tilt and colour moves. Tilt positions and colours can either be typed in - in degrees and colour numbers - or they can be moved directly using a mouse or track-ball. The colour name (or any other useful text) is displayed beside the colour position in a pop-up selection menu making it possible to scroll to 'Dark Bastard Amber' by simply choosing it by name with the mouse. Cue editing this way can be performed on individual units or whole groups of units at once with equal ease.

Groups of units can be selected for editing by single keyboard short-cuts giving very rapid access to groups of Light Curtains which are required to work in unison, while still allowing individual control when required. As with virtually all Macintosh programs, cutting and pasting can be used to transfer values between cues, between different cue sheets, or even into or from other programs.

Units may be freely patched or re-patched to different numbers by 'point and shoot' menu choices - if a unit must be replaced the new one is simply patched in. All the configuration features mentioned above, such as zero point, direction reversal and high and low limits can be altered at will. Cues (numbered from 0.1 to 999.9) may be linked with timed follow-on for sequences and chase effects. Cues can overlap, and certain units can be moved manually whilst others are timed during a single cue. The list goes on. . . Despite the dedicated controller Digital Light Curtains don't have to work in strict isolation from the rest of the show. It is possible to slave the Macintosh to a variety of other lighting desks. At the simplest level this can be a simple 'play next cue' input, but with certain desks more sophisticated communication is possible. The Strand Palette 90 can be set to send a remote trigger which includes a cue number, so that even if cues are played out of sequence Light Moves can keep up. The cue numbers don't even have to be the same on both desks. (The main desk in Miss Saigon on Broadway triggers the Digital Light Curtains this way.) With a Celco 88 series desk (Major, Gold etc) it is possible, within Light Moves, to attach a particular Digital Light Curtain move to any cue fader on any page on the main desk. As that cue begins to come up the corresponding move is automatically triggered.

To conclude: by going beyond the limitations of 0-10volt or DMX control schemes we have been able to make a moving light which will 'whirl around' with the best of them but is capable of extremely subtle fine or slow movements which are vital for theatre applications. At the same time control of these movements is not a chaos of multiple channels, speed to time conversions and looking up percentage values in scribbled tables, but a simple matter of degrees, colours and seconds. From this starting point we hope to extend the approach to other devices and controllers, freeing the lighting designer to design the lighting instead of wrestling with the technology.



Editing a cue . . .