

Lightboard at 50

The Genesis of the National Theatre's First Lighting Controls

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In 1967 Richard Pilbrow of Theatre Projects, just appointed as stage technical consultants for the new National Theatre, declared their manifesto:

'The art of drama is a supreme national asset – one in which, by general consent, this country presently leads the world ... How can it best be housed? How can it be provided with a stronghold – a citadel in the capital city – where its achievements can be seen to the best advantage by the largest possible number of people? ... What it desperately needs to preserve its standards is housing worthy of its talents.'

It was an auspicious decade for the British National Theatre (NT) campaign. After 119 years since the first publicised call for one, followed by two books, three wars, four Acts of Parliament, five architects and six sites it was to be finally built. A location, architect and government funding were all secured. Building contracts were finally signed in 1969 with completion promised in 1973.

But the architect, Denys Lasdun, had no experience of theatres, so initially co-opted a building committee to guide the stage design. From 1963 this included chief lighting designer for the embryonic NT at the Old Vic, Richard Pilbrow, eventually formally engaged as Theatre Projects Consultants (TPC). The above manifesto introduced their first Proposed Stage Equipment report.

This year marks the 50th anniversary of the opening of the British National Theatre's building. Amongst many innovations, it supported the design of the ground-breaking Lightboard stage lighting control system, specified by Richard Pilbrow with colleague Richard Brett, and designed by Rank Strand Electric (Strand).

Although Pilbrow was a skilled lighting designer, he and Brett were not lighting console engineers. Their initial rudimentary requirements of that era were developed much further by invention and a variety of external inputs, then finally honed by the practicalities of achieving their ambition. It was a study period that started in the era of simple manual presets and ended with 1000 channel memory control by minicomputer.

The theatre's demand was to perform in repertory on the two main stages, each with potentially three different shows a day, requiring saturated lighting rigs to reduce change-over time and labour needs. Pilbrow further sought a lighting control that not only enhanced performance but also offered tools to help designers create better lighting within limited rehearsal time.

The only UK memory lighting consoles at that time available were Strand's IDM and Thorn Lighting's Q-File, both with just one playback. While Pilbrow preferred Q-File for its keyboard access channel control, he felt both systems had gone backwards artistically. Manual controls, such as his Old Vic's LP with three presets, each with three groups, offered subtleties of multi-part timing now impossible with automated crossfades.

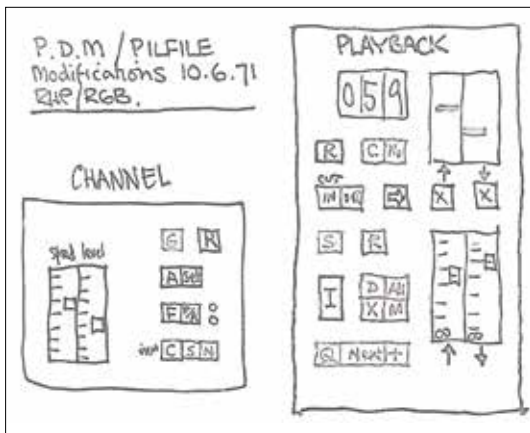
Pilbrow and Brett toured Europe in 1967 seeking inspiration from continental theatres, but found no improvement over British lighting controls (though plenty of stage machinery ideas). Thus, they somehow had to predict how development would progress for a planned installation in 1973. Their initial specifications simply required up to 270 dimmers for the open stage, with extensive outlet patching to support repertory changeover (as already used at the Old Vic).

By 1969 Strand had started development of the DDM system using eventually the DEC PDP-11/15 minicomputer. Its inventor, Fred Bentham, thus started lobbying Richard, showing the ideas in design. This intrigued Richard but he concluded the DDM rocker channel controls were no easier to use than Q-File's keyboard selection. Regardless the resultant 1971 DDM installation at the Royal Shakespeare Theatre in Stratford-on-Avon demonstrated that computer control of lighting was practical and particularly the use of software provided specification flexibility. The DDM idea had clearly germinated since by 1971 Pilbrow drafted his initial 'P.D.M./PILFILE' concept, being a DDM/Q-File amalgam.

This idea was expanded on shortly afterwards in the 1971 first control panel layout. Here the

Richard Pilbrow (1933-2023) at the Lyttelton Theatre Lightboard, 1976 credit Philip Sayer





two playbacks have reverted to A/B style stores with an additional four submaster stores W–Z. The channel control approach then is undocumented, though could only be rocker or keyboard and motorised fader. A slightly later draft specification makes clear the memory submasters were for more complex playback requirements.

TPC eventually decided that the theatres would normally use 200-300 lights per show, but to permit rapid repertoire changeover would need 600-700 lights, each on their own outlets. There would also be the need to remotely control the colour and position of some to save labour. Since in 1971 the largest memory lighting systems available were still only 390 dimmers, this mandated the need for an additional large contactor patch system, ideally memorised on a cue-by-cue basis. (Ultimately there were 720 and 494 outlets in the two theatres.)

That December TPC invited indicative tenders from seven UK vendors to a basic outline specification including memorised patch and remote controlled luminaires. However, only Thorn and Strand quoted, both offering their standard Q-File and DDM systems. TPC eventually concluded in June 1972 they were 'satisfied with the facilities offered by the DDM system' but still wanted improvements.

Then later that year Pilbrow was shown Strand's still secret MMS developments with wheel and keyboard channel selection. This was immediately adopted and by the end of 1972 the proposed control system was updated with all wheel controls. The channel control panel now provided keyboard selection with five wheel controllers to balance multiple channels. TPC also started calling their system 'Total System Lighting Control', the probable source of Strand's project name of TCS (Total Control System). Pilbrow didn't finally christen it 'Lightboard' until 1975.

By now the theatre was scheduled to be nearing completion, yet no stage lighting had been ordered – or even specified! TPC was fortunate that the builders were also delayed, currently forecasting completion in 1974.

Then Bentham reappears. In December 1972 he sent Pilbrow a copy of his latest paper 'Lighting Control by Memory' (LCM). It declared:

'Both at rehearsal and at performances ... it is necessary to put groups of lights together – sometimes taking into account levels and at others merely as an identified family of lighting. It is seldom that channels are used solo, it is rather a matter of choruses ... There need be no patching whatever. Every dimmer or logical combination of dimmers is a memory ... The system consists of two components only – Memories on the one hand and Playbacks on the other.'

He proposed using just five memory wheel controllers which did dual duty as lighting design controls then playback controls. This he called the 'lighting designers palette', the first use of the term. LCM clearly inspired Pilbrow, as he immediately started revising his specification, declaring:

'Lighting compositions shall be built up from individual circuits or groups of pre-mixed circuits on LIGHT PALETTES'.

For a short while the system model continued to consist of playback submaster and timed A/B style playback stores, with separate multiple channel controls. Store interaction was optionally latest-takes-precedence (LTP), highest-takes-precedence (HTP) or independent (IND). But LCM kept influencing Pilbrow, with the realisation that memory submasters and channel controls were indeed two sides of the same coin as Bentham had postulated. Thus combined, the new Light Palette supported channel plus memory group and cue control with eventually complete Palette recording – achieving lighting design by memory.

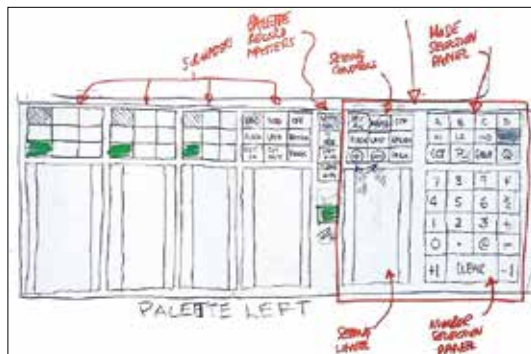
Based on this, TPC completed a full specification for tender in July 1973, still requiring memorised patching within each

Pilbrow's P.D.M./PILFILE sketches 1971 – credit Pilbrow

First Control Panel layout, 1971 – credit Pilbrow



The LIGHT PALETTE takes shape, 1973 – credit Pilbrow



cue. They also assumed that with an order in October 1973, two completely new consoles could be designed, manufactured and shipped by November 1974 (the then promised building completion date).

Again only Thorn and Strand bid. Thorn recognised the impossibility of the timescale and just offered standard Q-Files with manually controlled patching. Strand however was determined to beat Thorn (Q-File was becoming too successful) and submitted an extensive tender. This had several options including memorised dimmer patching or full dimmer per outlet. But after negotiations Strand finally offered version 'CY' as the only way to achieve the timescale. This provided dimmer per outlet in lieu of memorised patching but only offered LTP & IND lighting store interaction. As a benefit, the need to run extra playback cues on the Palettes was obviated by Strand providing up to six multi-speed fades simultaneously on each playback.

Acceptance of only LTP/IND operation was an act of faith by TPC. Whilst comparable to Q-File, and also the old Strand CD systems, it retreated from the HTP of the Old Vic's presets and the new MMS. Strand's tender was accepted in October 1973, after which Strand promised to be ready to 'light shows' by January 1975. This timescale to design and build two systems of such complexity was of course wildly optimistic. Luckily theatre construction delays took even longer than Strand due to an oil crisis, miners' strikes and three-day working weeks.

While the worsening British economy caused Strand to declare 1st April 1975 as the contract end date, it was also internally in turmoil. Chief Engineer David Baker was replaced by Martin Moore in November 1973, who then reorganised his engineering department three months later. System design thus didn't complete until May 1974. Electronic designs started straight afterwards as did programming the new, more powerful PDP-11/35 computer.

The systems were finally ready for training by September 1975, with initial Lyttelton installation that November. At the same time, desperate to start work, the NT now under Peter Hall had 'occupied' the building before it was finished. Beginning rehearsals for *Hamlet* on stage on 17th November, Hall recalled:

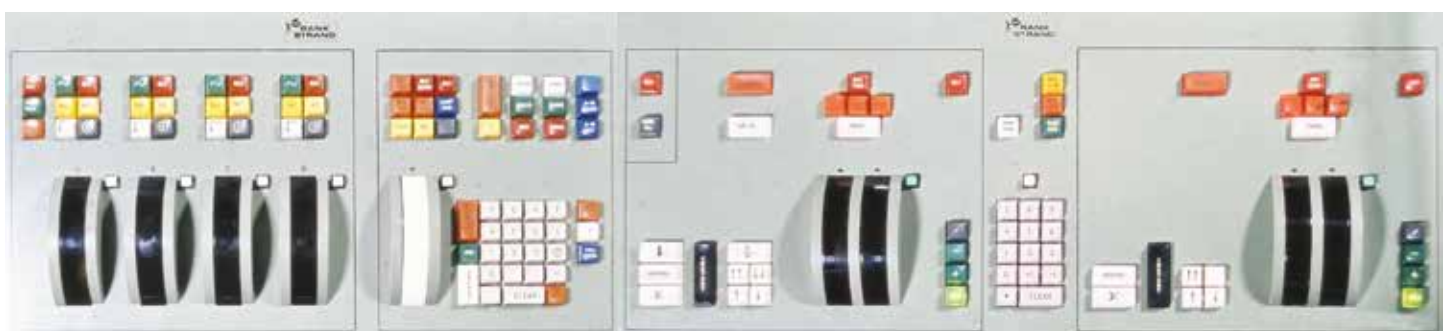
'A thrilling day. Sets and costumes patchy, half finished, but everything working ... I tried experimental lighting cues with David Hersey. What we did would have taken about six hours with conventional equipment. Yet now, on the new computerised board, we were able in two hours to dash through various ideas.'

The Lyttelton Theatre officially opened three months later with a gala performance of *Plunder* on 15th March 1976. However, the Olivier Theatre lighting control installation was repeatedly delayed due to building problems, including floods, cleanliness and lack of air-conditioning. It finally opened on 4th October 1976 with Hall's epic four-hour *Tamburlaine The Great*, after which HM Queen Elizabeth

Lyttelton Theatre Stalls Control in first use for Hamlet 16/nov/1975 – credit ArenaPal



Final Strand Palette and Playbacks, 1975



officially opened The National Theatre on 25 October 1976.

Each theatre was also equipped with a Modulation Trolley which could modulate the four palette submasters from a sound source on a pre-recorded cassette or programable flashers. The purpose was particularly to simulate the shimmering of sunlight through trees or flashing neon signs etc.

The Lightboard specification had always included the ability to memorise and remotely control colour change, slide and automated luminaire position to assist repertoire working, using a theatre-wide data bus. However, it was not ordered until 1975, thus progressively 76 colour changers, 10 slide changers and 12 PTF 2kW Fresnels were installed from 1977-78. The system remained in use after the Lightboard was replaced.

The prototype Lightboard was later taken to the 1977 USITT conference and exhibition in Washington DC and demonstrated there by Pilbrow in person. Despite this it achieved no US sales, probably because Strand's Century subsidiary was already secretly developing their competing 'Light Palette' – the name Pilbrow gave permission to use despite borrowing it from Bentham!

Lightboard was ground-breaking in its scale and facilities. It offered up to 1000 intensity or non-dim channels plus many more for colour and position, 12 simultaneous different speed cues, VDUs displaying full operational data for the first time, and as Hall and Hersey discovered, powerful new lighting design tools. Though there was no patching, the system could format the geographically numbered channels (called 'sockets') on the VDUs to only display those in use for that show to reduce clutter. The NT's lighting was ultimately lucky with the building delays; if completed on time the theatre could only have installed standard DDM, commercially affordable technology had not yet advanced enough.

The vital new electronics only just becoming available was complex and expensive to engineer; just the minicomputer with program memory was twice the price of an average London house! Each system contained over 200 custom PCBs as well as much bought-in electronics. The final total dimmers, controls and automation cost with BEAMA inflation was £318,700 – equivalent to £2m today. With the R&D Strand could not have made a profit.

Only two more similar sales were made, then after updating with colour VDUs, six more to German theatres from 1978-82. The much cheaper but similarly competent Galaxy



Lightboard console and computer racks in Strand's laboratory, 1975.

system of 1980 heralded Lightboard's demise, finally replacing the NT Lightboards in 1986 when manufacturer support ended for their PDP-11s.

While the brutalist theatre architecture (certainly a 'citadel') received a mixed response, Lightboard received only praise. Helmut Grosser wrote in 1977:

'A special hymn should be dedicated to it. At present, there is no comparable light control installation in the world which offers so many facilities with such little effort in personnel or technical work.'

More information and pictures are available on the Backstage Heritage website. An extensive and referenced monograph fully describing the history and the technology is also available to download at <http://doi.org/10.2139/ssrn.6299862>

Images courtesy of Philip Sayer, Signify Strand Lighting, NT Archive, V&A Museum, Bristol University/ArenaPal, Theatre Projects and the Richard Pilbrow estate.



Last Lightboard with Galaxy backup in Stuttgart Oper, 1982.

