

The COMPTON / STRAND Story: From Sound to Light!



The COMPTON Built / STRAND Light Console along with all its 1929 organ technology installed in the Theatre Royal, Drury Lane, London, UK in 1950.

Foreword...

Did you know that the UK Compton Organ Company was building some of its grandest cinema organ consoles long after cinemas stopped installing them – right through to the mid-1950's? Strangely, there seems scant or minimal interest shown in published cinema organ journals of this venture; perhaps simply viewed as being outside the realm of cinema organ preservation and its tradition. Yet Compton's involvement with the UK Strand Electric and Engineering Company in the development of the Strand Light Console in 1935 changed stage-lighting and the entertainment industry forever. They continued in operational use in London's premier West End theatres long after most cinema organs had been removed to make way for multi-cinema complexes. A story that deserves to be told in detail, for the record.

The COMPTON Built STRAND Remote Lighting Control System

Whilst not exactly *'theatre organ'* per se, the John Compton Organ Company (and perhaps only an organ-builder could have contributed on such an idea) became very much involved from the early 1930's and for a further twenty years or more with the Strand Electric and Engineering Company in the production of what became a revolutionary change in theatrical lighting systems for live theatre entertainment from plays, variety theatre to opera from that time onwards!



*An operator at the controls of a remote Strand Light Console with full view of the stage-action.
The 17 note key octaves and 5-1 black note configurations would befuddle the best of organists.*

The thought of a single lighting control desk where just one person could control hundreds of lights came to a bright 21-year-old Frederick Bentham, who joined the UK Strand Electric and Engineering Co. Ltd. in 1932. As Bentham himself described it, the idea first came to him after seeing a cinema organist controlling a vast number of stop-tabs with the use of capture action Key-piston pre-sets. Reminiscing some 40 years later, he could only marvel at his youthful powers of persuasion and the foresight of Strand Electric's directors in 1933 to spend £1,000 on its development.¹ So successful was the concept that he went on to become Strand's director of Research and Development and changed the course of history.

The **Strand Light Console** made its inaugural appearance with a recital of “Colour Music” by inventor Fred Bentham in Strand’s demonstration theatre in June 1935 to much acclaim – “*the theatre seemed like a cathedral, filled with sound and light of great beauty*” – “*it was simple, eloquent and the work of an artist*”. ^{Note i} Newspapers of the day reported that the social elite of London flocked to see it, even promoting a visit by Prince George, Duke of Kent in 1936.²

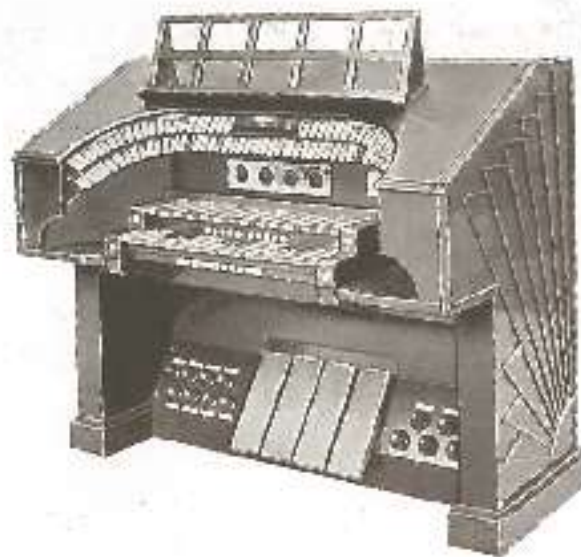


Photo: Strand Archives.

Duke of Kent at Strand Electric’s demonstration theatre, Floral Street, London 1936. ^{Note ii}

In an article published in 1996³ by Brian Legge, one of Strand’s electrical engineers involved in installing the last (and biggest) of Strand’s Light Consoles mentions that “*little is known*” of the Light Console’s technology, explaining that lack of technical records within Strand Electric was neither commercial secrecy nor deliberate mystique, but simply that a complete Light Console (and later, its SYSTEM CD successor) were in fact manufactured by two different companies – Strand Electric Co. for the heavy hardware and John Compton Organ Co. for what he described as the hardwood. The two very different contributions did not always meet until they were joined on the site. ^{Note iii} Likewise, very little of this era of Compton’s history has survived as all the records before and up to the time of an air-raid during WW2 were destroyed in the fire that ensued⁴. In subsequent years, technical ‘know-how’ was confined to those supervising on the ‘shop floor’, so to speak. Innuendos aside, one can rightly expect that the ‘re-purposed’ consoles retained original organ control relays and piston setter board functionality with the usual cotton-sheathed umbilicus cable (some installations more than 300 feet) terminating at the backstage logic relay-stacks and connector interface boards to all of Strand’s peripheral resistance dimmer banks and equipment. Without doubt, this new opportunity gave impetus for the continued production of Compton consoles and componentry at a time when cinema organ installations were waning. ^{Note iv}

STRAND LIGHT CONSOLE



70-way Light Console

On June 13th, 1935, Strand Electric introduced for the first time the "Light Console," the perfect stage switchboard on which their resources have been concentrated.

Three years previously the Directors had decided that Strand Electric must be in a position to supply a lighting control that would fulfil literally every theatre and cinema requirement.

To this end a close study was made of existing controls in this country, on the Continent and in America. A schedule was made of all their outstanding features; to this schedule was added every humanly conceivable requirement of the future, including those of the new art of colour music.

It was found that a control to carry out the items on the schedule would have to make an absolute break away from present practice, and it was from the one-man orchestra, the "Cinema Organ," that inspiration was derived.

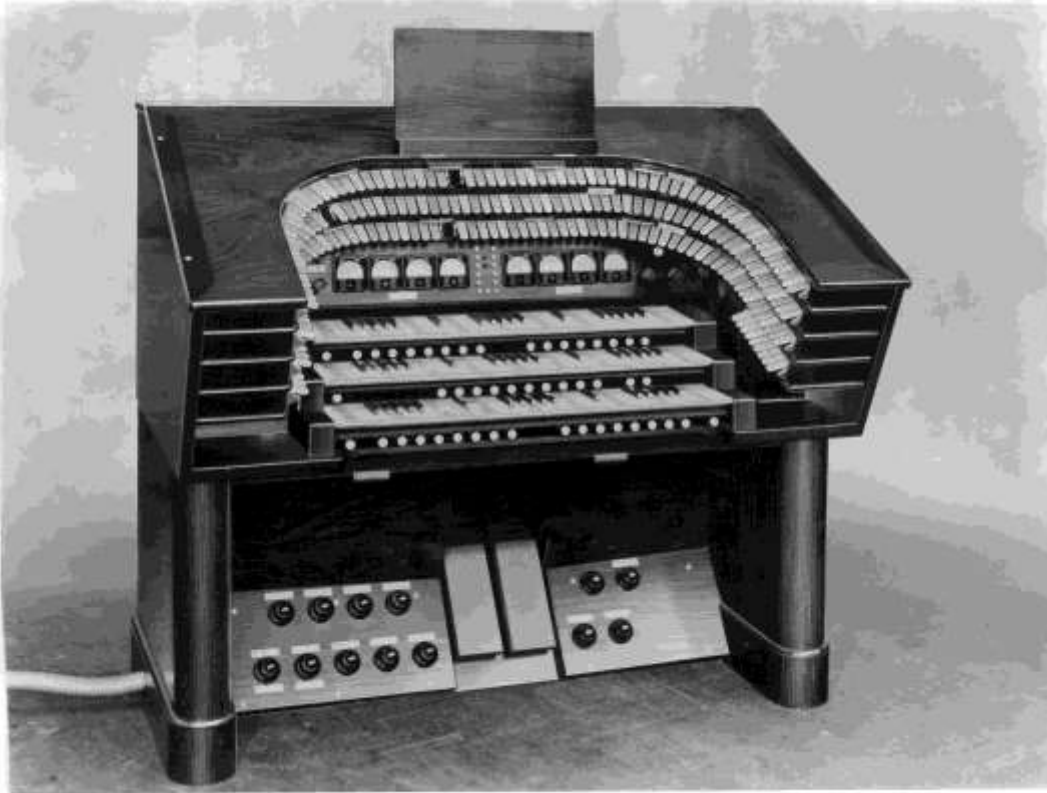
The Strand Electric claims perfection of control beyond the wildest dreams of the producer's brain, and asks you not just to believe their own claims, but to come and test them for yourself at the Console, in the seclusion of their private theatre.

Right from the start perfection has been sought regardless of expense, with the result that the Light Console joins the Cinema Organ in this respect. However, if the cinema or theatre installation is complete enough, it will be found that the publicity, artistic and showmanship value, quite apart from the labour and time saved at rehearsals, will amply repay the initial high cost of installation of this, the Rolls-Royce of switchboards.

Telephone: Temple Bar 7264 (6 lines). **STRAND ELECTRIC AND ENGINEERING CO., LTD.** Telegraphic Address: 540116, Rand., London.
FLORAL STREET, COVENT GARDEN, W.C.2

Promotional brochure of the Strand Light Console, 1945

This collaboration between the two companies continued for another 30 years during which time the Compton built Strand Light Consoles proved to be highly innovative in scope and included some of the largest console configurations that Compton ever built. ^{Note v}



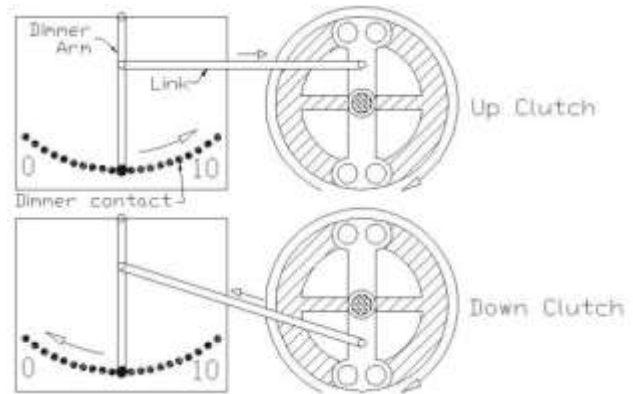
The London Coliseum Strand Light Console (1952), with its polished mahogany casework, was one of the largest of its type.

By way of historic background, it should first be mentioned that up to the early 1930's all stage-lighting equipment comprising electrical Great Master control boards, dimmers or faders, blackout switches, etc. were operated by a team of backstage technicians turning wheels, switches, and levers from gantry-perches high above the wings with no 'action' view.

Strand Electric's engineer Moss Mandell in 1929 had invented and patented a landmark magnetic clutch invention for gripping onto or releasing from a constantly driven rotating shaft that made it possible for extant manually operated dimmer wheels to be remotely activated in either direction by a switch. With the advent of the Strand Light console in 1935 it then became possible to achieve absolute control of all lighting intensities and dramatic contrasts by a single lighting operator having full view of the stage action.



Left. Multiple dimmer bank relays operated from the Strand Light Console, National Opera House, Lisbon (1940) ^{Note vi}.



Schematic of how the dimmer was moved by the Clutches. The dimmer speed for full travel was

controlled by the speed of the rotating motor-driven shaft, which was set by the Light Console's Speed Pedal for that keyboard. Automatic cut-out switches instantaneously disengaged the moving Clutch at each end of the Dimmer Arm's travel. AutoCAD diagram by courtesy of Robert Oxlade⁵.

The Strand Light Console became a landmark in the remote operation of servo-assisted mechanical switching controls and became historically important for its influence on subsequent theatre and television lighting developments³. Acknowledgement should equally be accredited to the effectiveness of Compton's cinema organ technology as being both imminently and eminently adaptable and successful in meeting, not just Strand's requirements but for its wider legacy contribution to the whole live-entertainment industry spanning a further forty years in controlling a totally new medium, from 'Sound' to 'Light'.

The Strand Light Console – Technical description

To try and de-mystify this behemoth of Compton consoles, a simple overview would be inadequate - we need to look into its unique design layout and its mode of operation. Most of the technical and general information has largely been sourced from the referenced Strand Light Console Instruction Guide (57 pages) published in Strand's Catalogue of 1945⁶; and in trying not to get too technical, I trust a fair and correct interpretation is presented.

Comparing the layout with any cinema or theatre organ console, we can readily recognise that the Stop-Tabs (stop-key sweeps) represent individual lights, battens, spots or separate

lighting circuits that can be individually selected from the Stop rail or by using the pre-set Piston capture actions. Every stop-key lighting circuit has externally associated with it, its own remote mechanical dimmer controller to vary the lighting intensity of that circuit.

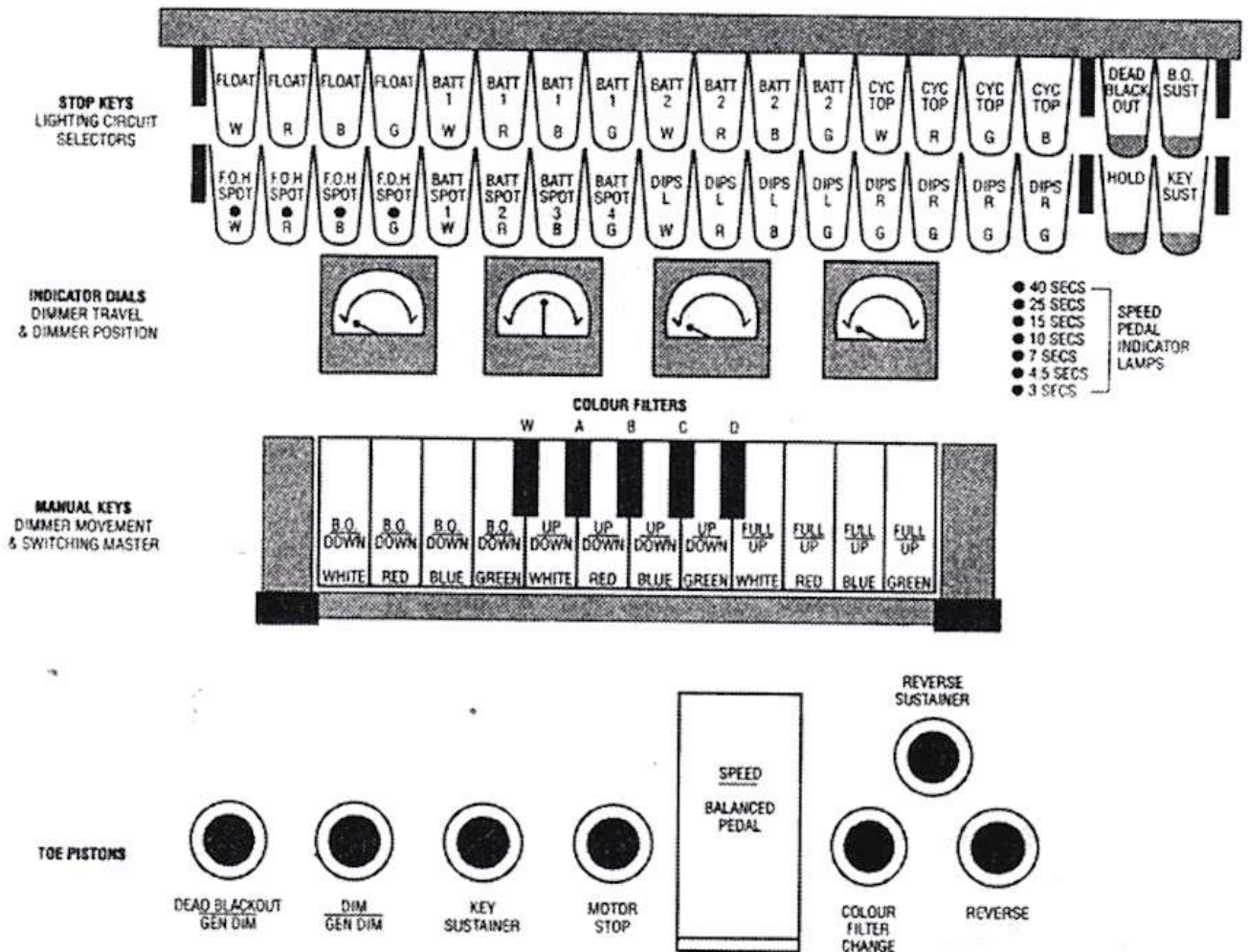


The Strand Light Console, Theatre Royal, Drury Lane. London (installed 1950; operational till 1975) with 216 independent lighting circuits across three keyboards, programmable thumb pre-set pistons, dimmer indicator dials and separate speed pedals for each manual. Each sweep would control two remote mechanical dimmer banks of the type as pictured previously. The combination setter board at the rear of the console contained 1,728 setter switches. ^{Note vii}

The Swell Shoes are 'Speed Control' Pedals – one for each key manual or keyboard – to increase or decrease the dimmer travel speeds for all stops set for that keyboard from 3 sec., 4 1/2, 7, 10, 15, 25 and 40 seconds, depending where the pedal is statically positioned in its travel. ^{Note viii} Unlike the usual organ swell shoe action, the speed pedal control was not infinitely variable, but consecutively engaged discrete tappings for activating the dimmer bank's fixed motor shaft speed settings. Illuminated lights on the console (right side dashboard) indicate the speed position of each pedal. ^{Note ix}

The Toe-Stud Pistons, as in any organ console, are pre-wired for selective swift actions, such as immediate Dead-Black-Out, Full-on, Raise/Dim, Cancel settings, etc. The side-panel

switches included Automatic House-lights Up/Down with pre-set dimmer settings or as Immediate; customised settings for House Calls and other theatrical effects such as mechanical Cloud operation. All of the stop-keys, keyboard manuals and toe-pistons have 2nd touch capability as in conventional Compton consoles. Note x



A schematic layout of the console configuration showing a single Master keyboard Set marked out with each lighting colour selector key in white, red, blue, green sequence; and the respective 1st and 2nd touch functions per key. (Referenced later.)

So, pretty straightforward, one might think... However, a whole range of intriguing design capabilities extend far beyond these generalities. As an example, a stop-key's 2nd touch Cancel facility, as on all Compton Stop assemblies, whilst facilitating the same purpose in selecting only that solo circuit whilst Cancelling other stop-tabs that were 'On' for that manual, will also fully restore them again to 'On' once the stop-key is released back to first touch. Further, when any stop-key is pressed to second touch then the last stored dimmer position

(i.e., its lighting intensity) for that circuit is displayed on the appropriate colour Indicator dial for that manual. ^{Note xi} Thus, it is possible to check individual stop-key dimmer positions and pre-adjust accordingly, even in a stage-blackout. The stop-key for each circuit also sets a path for a contactor switch across the dimmer and one in series with it, such that when activated the selected stop-keys will be switched Full-on or Blacked-out, irrespective of the dimmer position.



Theatre Royal Drury Lane, London. Photos: Jim Laws Collection⁶

Without doubt, the most obvious difference in the Light Console's layout are the 'refashioned' coloured key manuals and their bizarre key configurations. The keyboards principal functions are in controlling the dimmer/fader requirements for the stop-keys that are selected at any time. The key notes themselves act as simple switches that are held down for the duration of the required selected colour group action, and turning off once released.

In lighting parlance, one needs to imagine each key manual as divided into three Master Control Boards or Sets, each visually spaced between the single black keys as marker dividers. A Master Set may be Locked In or Out so that separate Master set-ups can be adjusted whilst 'Locked Out' until required; the single black key (affirmative 2nd touch only)

also serving to quickly Lock Out its particular Master. The left-hand end Master has its own group of up to 44 Stop-keys it can control; the right Master has another such group; the centre Master operates the stops of left and right simultaneously as a 17 note Intra-coupler Master for that manual only. Other Coupler stop-keys are provided to couple multiple key manuals if required. Each Master set has its own array of pre-set pistons with each piston storing up to 10 stop-key combinations from that Master set at a time.

Within each Master grouping the sequence of 5 black keys also serve as spatial markers for different functions of the four colour keynotes including white, laid out between them. The schematic layout as shown earlier, outlines the respective functionality for both 1st and 2nd touch keyboard actions for each colour grouping key. One action, for example, when using the Master set keys might be to simultaneously raise and lower dimmer intensities for the different colour circuits selected or even within the same colour grouping. Generally, holding down a colour key will raise the lighting intensity for that colour group, depressing it to 2nd touch will lower the lighting intensity for the colour selected. Only those stop-keys selected of that colour grouping will operate. Theatrical lightning flickers can be achieved by 'playing' the Blackout action key whilst simultaneously working the dimmers up and down to control intensity of the flashes – just by using the keyboard facilities.

The 5 black keys have their own distinct function where multiple colour filters are installed on remote motor-driven Automatic Spots. Any colour change can be affected by playing one of the five black key colours (as marked above each black key) for the selected Auto-Spot. The Filter change can be stored and then activated when required by the Filter change toe piston.

Trite as this might sound, it is important to realise that each keyboard key is simply the means of activating a particular effect for the stop-keys put on for that colour grouping, until released. The toe-stud Hold or Sustain action can be triggered whilst the note is depressed to continue that effect allowing a 'hands free' capability until hitting Sustain Off. Another basic consideration is that no selected stop-key circuit will operate unless/until its relevant Master set is Locked 'On'.

As most consoles have two key manuals, generally one is allocated to flood-lighting circuits such as overhead battens and cyclorama, the other for directional Spots and action areas. Whereas cinema organ keyboards are generally identified by their separate pipe-rank Divisions (Great, Solo, Accompaniment) Compton's technicians, for purposes of the

console's control logic, have ingeniously re-defined a 'pseudo pipe-rank' Division as comprising 88 stop-key placements where 44 stop-keys are assigned to either the LH or RH Master sets, respectively. The more lighting circuits to control, the more key manuals required. A two-manual console can then control to 176 and a three-manual console up to 264 separate stop-key lighting circuits configured around the horse-shoe sweeps – all conveniently, with minimal change in the use of Compton's standard combination setter boards and remote switch-stack crossbar relay technology – just one sideways paradigm shift from playing the entire compass range of an organ pipe rank from the organ's key manual (61 notes) and pedal board (32 notes) to 'playing' a near equivalent number of lighting circuits from the stop-keys or as many stop-keys as will fit around a single horse-shoe - 88! The cinema style Light Consoles were purposely angled forward at the front to maximise this capacity of stop-key lighting circuits for each horse-shoe sweep.

From an organ perspective it is bemusing to read that ... *Even when a hundred or so stop-keys are moved simultaneously by the combination action, rubber buffers dull the sound in approved organ fashion!* And a statement of the obvious... *As with any keyboard, the 'keynotes', unlike the stop-keys, always return to the 'Off' position as soon as the fingers are removed!*

Nevertheless, in case one gets the impression that all this is getting too confounding, the new owner may take comfort from Strand Electric's Light Console Instruction Guide that says: *"No complicated finger technique similar to that of a pianist or organist is needed. Any reasonable person can easily acquire the technique in a week. To ensure that lighting will progress, the console should be in the hands of an artist (not necessarily an engineer) of imagination during rehearsals and initial performances. Subsequently a lower grade deputy, who merely follows*

the lighting plot, can be employed."

Hilary Gould featured at the London Palladium Strand Light Console, installed in the Grand Circle, 1942.

Allan Ashton Collection⁶.



There were from 12 to 14 Compton cinema style Strand Light Consoles installed in London theatre auditoria including *London Palladium* (1941; and 1949), *Theatre Royal Drury Lane* (1950), *Royal Festival Hall* (1951), *Coliseum* (1952), *Her Majesty's Theatre* (1954) and others were exported as far as Ankara, Caracas (still operational in 2019), Lisbon (1940) and Warsaw (the last cinema console style, built in 1955 ^{Note xii}).

Inventor Fred Bentham, ^{Note xiii} writing on the development of Strand's Light Console some 20 years later⁷, commented: *"To my mind, the Light Console has never looked better than when it used an orthodox Compton organ console ... The truth is that the organ console is a survival of another age and technique, but it has survived out of sheer merit in providing many controls to hand and enabling much apparatus to be packed into such a small space."*



*Bronze nameplate on the Strand Light Console,
National Opera House, Lisbon, 1940*

In the face of technology moving forward from the mid-1950's, a more compact and versatile Strand (SYSTEM CD) Light Console was released utilising a Compton church style console body, cinema organ stop-keys as channel selectors and with modern dimmer wheel controllers replacing the key manuals. The SYSTEM CD models continued as the preferred control system of choice in either a Theatre or Television Studio version for the next 10 years. The John Compton Organ Company continued manufacturing the consoles complete with original Compton memory setter actions (invented 1929) ^{Note xiv}; and Strand made the servo-dimmer banks. The two were joined by a special cable pre-formed on jigs. They were functional, users liked them – and above all, reliable!

Such was the pace of electronic advancements that by 1966, BBC engineers 'looked askance' at the Compton technology, which worked, but by now was very much dated and demanded a move to solid-state / computer technology. Electromechanical systems were out and silicon-controlled Thyristor rectifier dimmers were in!

Strand came up with the SYSTEM C/AE (Console/All-Electric), that was based on the Light Console with more pre-set features, but still no memory. Further advancements eventually succeeded in the development of a computer-based control system – a move which ultimately triumphed though with heavy development costs to the company, leading to a takeover by the larger Rank organisation in 1968. After successive mergers and with the new Rank Strand Century later being acquired by Royal Philips Lighting, de-merger arrangements in 2019, allowed Strand Lighting to once more regain its stand-alone STRAND brand status.⁸

Right: The Compton built Strand SYSTEM CD Theatre Light Console (from 1956) showing 120 stop-key channels, 14 Pre-set Piston buttons with in-built combination setter board, foot speed pedals and toe stud actions.

Below: Lyric Theatre London. SYSTEM CD Theatre preset control – the type to be found in the majority of London's West End theatres over the next decade.

Photos: Frederick Brown Collection⁶





Two Strand SYSTEM CD TV Light Consoles with conventional Compton hardware and memory pre-sets, in adjacent BBC Television installations, Wembley Studio 5, UK.

Strand Lighting, in its various guises, continued to remain at the forefront in modern lighting systems and its global successes include a Strand Console (320 channel) installed in the Teatro La Scala, Milan in 1975; the first fully transportable and automated computer stage-lighting control system premiered in 1976 with the US and International roadshow of the Broadway musical hit *A Chorus Line*; Universal Studio's *Islands of Adventure* theme park lighting with up to 18,000 lighting devices across two miles of Ethernet cable network connected to a central control system in 1998; a special illumination of the Eiffel Tower in 2004; and in 2016 with the LED lighting installation of the Niagara Falls with multiple effects operated from two Strand Lighting Control Consoles⁸. *One each side of the border, perhaps?*

Quoting from Robert Oxlade's published academic dissertation of 2007⁵, in part:
The development of stage lighting has taken a long time, and was often totally reliant on technology advances outside of the theatre. It has been fascinating to see how much work went into the design of the Light Console and other parts of stage lighting, and how much we take for granted today. The Light Console was ahead of its time, with its innovation of remote control, but relied on an old technology to work, which had major limiting effects, and meant it could not compete with the later developments in electronics and computing.

Notwithstanding the above, for cinema organ technology inventiveness of 1929 to be equally instrumental as the first remote stage-lighting control system in the world and

its continued use in London's well-dressed West End theatres and Opera houses for a further 35 years from 1935 to the 1970's is an incredible achievement in any sphere of operational endeavour or equipment.

And, as the Light Console's inventor, Frederick Bentham first determined in 1933, it was only Compton Organ technology that could achieve it! ^{Note xv}

With acknowledgement and grateful appreciation of the extensive archive resources, references and documents of *TheatreCrafts.com - Backstage Heritage Collection*; *Robert Oxlade's published treatise, 2007*; and *Strand Archives* from which referenced citations, extracts and photo references are sourced. It is important to point out that copyright of all of the original material referenced for historic and educational purposes only is held by *Strand Lighting*. All photos are from *Strand Archives Jim Laws Collection* unless where otherwise stated.

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End Notes:

Note i. Fred Bentham's "*Colour Music*" comprised playing a melange of lighting variations on a suitable set of drapes or objects where the visual impact is evoked by the changes of mood of whatever music is playing at the time. Items played included Wagner's *Flying Dutchman* overture, *Twelfth Street Rag* and *Tchaikovsky's 4th Symphony* (1st movement).

Note ii. The original Light Console (as shown) with dimmer banks was salvaged intact from beneath a ledge overhang following bombing of Strand's newly completed King Street demonstration theatre and then moved to the London Palladium in 1941. The console is now in the collection of the V&A Theatre Museum, London. ⁹

Note iii. It is customary for all Compton console and logic relay-stacks to terminate with test/connector output boards. All logic switching is controlled within the Compton console and hardware. Strand Electric would simply only need to 'Plug and Play'.

Note iv. The *cinema organ* originally went in to cinemas to accompany silent second features instead of just a pianist while the resident orchestra took a rest. By the thirties, this purpose had vanished and organs were put in purely as an entertainment interlude between features.

Note v. As lighting designer, Fred Bentham, naturally would have provided the console specifications for each installation. Twenty-five years later, he remarked as having always enjoyed laying out the stop-key configurations of all the 19 Light Consoles built, except for 2.¹ Many original operators have reminisced about using a Light Console and most say it was a pleasure to use. ⁵

Note vi. Each dimmer bank has 4 tiers of dimmers – one for each colour, including white. And there may be up to 88 dimmers controlled from the same keyboard.

Note vii. The 1,728 setter board switches (a matrix of 216 x 8 setter positions for each lighting circuit) would be used, inter alia, to assign each stop-key lighting circuit to its particular keyboard Master Set and respective Colour grouping key actions.

Note viii. For each manual, the dimmers move at whatever speed is imparted to the driving shaft as governed by that manual's speed pedal's position. The thought of memory capture of speed settings as well as dimmer intensities across all the stop-keys would have been of almost Enigma proportions for its day. That capability is now a standard feature for all memory-based computer light control systems.

Note ix. Conventionally an organ swell shoe increases sound intensity incrementally as it is further depressed. Confusingly, by depressing the speed pedal, the dimmer time is reduced from 14 seconds to 3 seconds at full travel distance. But, yes, toe pressure increases, heel pressure reduces speed.

Note x. It is the writer's assessment that the 2nd touch or double key-action facilities across all the stop-key sweeps (a patented John Compton Organ Company invention) and on all key manuals were the primary operational controls that facilitated the immediate and responsive actions the Light Console was successfully able to achieve. For those not familiar with the terminology, the 2nd touch facility is activated by heavily depressing a key or stop-key beyond its normal travel position to activate a further contact as if on a second 'hidden' keyboard – which it is!

Note xi. What actually happens is that the dial is connected back to read the position of a servo-dimmer circuit. A variable potentiometer levered directly to the magnetic clutch controller is able to travel and register a % voltage displayed back to the relevant console dial of its relative position through utilising the same single connector wire.⁷

Note xii. *"We were there (Theatre Polski, Warsaw, Poland) to see the organ shaped control desk designed by Sir Frederick Bentham at work – a very sophisticated and neat machinery with a mechanical memory."* A letter description from ELEKTRIM, the Polish Foreign Trade Company included in F. Bentham's autobiography, *Sixty Years of Light Work*, p.116.⁹ The quoted reference should rightly have provided equal attribution to the John Compton Organ Co. for the console's inherent control logic.

Note xiii. Frederick Bentham (1911-2001) worked for 42 years with Strand Electric and was instrumental in many lighting innovations, editor of *TABS* 1957-1974, highly respected as the doyen of *luminaire luminaries* of the lighting industry into his 80's, published his autobiography *Sixty Years of Light Work* in 1992 and was warmly regarded as a rare combination of artist and engineer whose other energies were directed towards the design of theatres and scenery, writing, lectures, cinema and television.¹⁰

Note xiv. It is gratifying to read Robert Oxlade's commendation of Compton's cinema organ electro-mechanical switching technology as '*directly linked to the binary storage system used today in digital technologies such as computers. The system pioneered the idea of memory control.*'⁵

Note xv. *Compton cinema organs* were the most prevalent cinema organs in the UK; 261 were installed in cinemas and theatres in the British Isles. The John Compton Organ Company also made many fine church and concert organs as well. The company was awarded a range of original patents for innovations ranging from simple pipe-organ mechanisms to state of the art electric and electronic inventions. John Compton (1876-1957) was assisted by the very capable and inventive James Isaac Taylor. Taylor died a year later in 1958, and the business was wound up and sold off as two separate entities (electrical/electronic and organ-works) in 1965.
