CASE HISTORY

MERMAID THEATRE AND THE DIGITAL DISPLAY 'PLOTLITE' DIMMER LEVEL MEMORY BOARD

Preface

A lighting board has to serve a number of functions, the two most important of which are to set each of the spotlights focussed at the stage at a selected level of brightness in composing a picture, and to provide a means of changing these pictures, either fast as a 'snap' or slowly as a fade. Often a show will involve as many as a hundred or more different pictures, often overlapping one another - for example, a character may be required to switch on a table lamp at the same time as dusk is gathering outside the window.

In a 'manual' system, each spotlight or 'circuit' is associated with its own fader. In the average medium or large theatre, there will therefore be a hundred or so of these faders in a row, and they will be brought into play by a master fader. This gives a means of settingthe picture up and fading up and down in its entirity with one hand. It does not, however, give a means of altering the picture smoothly, unless we alter each individual lever by hand - a task surely beyond all but the most practised of octupuses! And so the whole thing is repeated underneath complete with its own master fader. So by using the two systems (or 'presets' as they are called) alternately, and resetting each bank while the other bank is in use, picture changes are made possible. However, when cues come fast one on top of the other, or overlapping, this means that the operator has to set anything up to 120 individual switches or faders accurately in a very short time - perhaps as short as a few seconds.

When a production is finalised, the actors will have learned their lines, the scenery will have been painted and erected, the music will have been composed and rehearsed. But the principal agent, the board operator, for the visual scene has not learned his part, he has not even seen it for the simple reason that it has not even been composed. Like Moses, he will hear the word of the Lord and will have to write it down pretty damn quick. Unlike Moses, he will receive more than ten Commandments, and certainly 'the Lord' will change his mind many times, and put in extra commandments, until his tablets are in a sorry state indeed. Further, like Moses, he will be expected to put these commandments into action there and then, without any previous rehearsal. And the Lord help him if he makes a mistake.

In recent years, it has become possible to ameliorate the problem by recording the lighting changes accurately without the need to write them down, and recalling these pictures instantly and accurately and in any order, using modern digital or computor techniques. The automatic board 'Plotlite' is a unique blend of memory and manual boards. It has two full sets of faders, complete with associated maskers, and also a means of memorising and recalling the results. There are three modes of operation:

1) As a normal manual switchboard. 2) As a 100 memory board (dynamic').
3) As a board with an infinite number of memories available on cassette tape, which can be fed into the dynamic memory, a hundred at a time, reprogramming new lighting states, and erasing the old.

It must be appreciated that the contents of the dynamic memory hold for only as long as the board is switched on. If the memories are lost, they are reprogrammed in from the tape memory. Thus the normal mode of operation would involve switching offevery night after the show, and running the cassette tape in the following day. This enables two or more shows to be performed alternately, merely by selecting the correct tape.

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The system has two further facilities: 'normal', enabling recording from the levers which directly affects the lighting on the stage; and 'blind plotting', which enables modifications to be made to previously-recorded pictures without affecting the lighting in use at the time.

When the Mermaid Theatre was built in 1959, the board that was installed was a 54-way S.R. - a perfectly reliable, if a little to say the least limited board, which if trouble was taken to understand it could produce some beautiful fades. It had however two limiting factors - firstly, the fact that it had virtually no presetting facilities, and secondly that when fully loaded, it had a capacity of only sixty killowatts - and on an acting area of some thousand square feet this did not go far - any thought of a multi-lantern complexity was quite out of the question unless large scale live patching or replugging individual lanterns and sharing a large number amongst a few dimmers was undertaken (as happened whenthe Prospect Richard/Edward tour played at the Mermaid).

This board, however, did very well for us on the whole for a number of years - often a degree of compromise was required when plotting lighting for it to be operable at all - and it was very reliable (I believe a fuse went in 1969, but apart from that it was fine) despite various forms of surgery it underwent in recent years- sprouting bits here and there, extra variacs of doubtful origin on dexion construct- ions bolted on to the side, odd switches, relays, tannoys etc.

The crunch came when we were planning COWARDY CUSTARD - a highly successful, fast- moving revue, involving what for us was a very large rig at that time - some two hundred lanterns. Obviously it was necessary to expand the control system some- what to cope with this, and so an Electrosonic 60-way two-preset was hired - well, not quite a 60-way two preset - actually it was two 18-ways and one 24-way, two preset boards to be precise, linked together with a strange system of mastering and connected to a series of towing racks, which were piled high in the sound room.

It soon became apparent that COWARDY CUSTARD was going to run for some time, and it was discovered that with a weekly hire bill for lamps and control it would be cheap- er to buy the equipment outright than to continue to hire these on an indefinite basis. Strand and Electrosonic co-operated and sold us the lot outright.

COWARDY CUSTARD happily running with first three then two operators, it was time to take stock of what we had finished up with - and a strange assortment it was. It was shown that no new complete system, that would take over the function of both the S.R. and the Electrosonic board, would be forthcoming, financially speaking, for some time. So this strange assortment 'did us' for the eighteen months of CUSTARD and another year after that.

Now almost as soon as CUSTARD went on, the Mermaid was considering and planning its follow-up, COLE, which was to be if anything bigger, more lavish, and lighting-wise more spectacular. It was generally agreed that a new board was absolutely essent- ial, and it was at that time that we received a letter from John Knightley of Digital Display Ltd., who wished to hire the theatre in order to demonstrate a 'revolutionary new memory board system'. Having established that the system inter- faced with our Electrosonic dimmers, the demonstration took place. Roger Weaver and Dorian Kelly had already had a look around to market for a suitable board for the Mermaid, and had rejected the concept of dimmer level memory, as we were absolutely convinced that an all-lever approach was essential for our require-

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ments, doing as we were so many different shows requiring the lighting to be invented as we went along in most cases, and at that time the major manufactures could not supply an all-lever system at a price we could afford, only limited Digital leverless systems. Because of our professional interest, we started to talk to Mr. Knightley about the board and pointed out that although the conception of the board was right, it was no use to the theatre as it stood because of operational shortcomings. For example it was only possible to fade in either 1 second, 10 seconds or 60 seconds, and that there was a great deal of difficulty in modifications to lighting already plotted. We agreed to meet John informally and to discuss what was really required in a theatre lighting board. We met one Sunday and on several subsequent occasions, and worked out what was considered the ideal specifications, and on the basis of these verbal specifications, John, having candidly admitted that he hoped to sell us one of his boards, said that he would work out and send us a 'hypothetical' proposal and specification. This arrived very soon after, but it was apparant that in trying to keep the cost down to £8,000 the system as proposed was still unsuitable, and we made a number of corrections and sent them back to John, who re-submitted the proposal on 11th May 1973, altered to our requirements at additional cost. Apart from minor quibbles about the layout of the components, we accepted this and it was discussed in the offices with the Managing Governor, Sir Bernard Miles, and the General Manager, Jonathan James-Moore, and, after a visit to Horsham by all concerned on 26th June 1973 to see the prototype in action at the Capitol Theatre, Sir Bernard met John Knightley on 10th July and decided to place an order for the supply of one 100 channel 99 memory unit with full manual two preset section. It was planned that it would be delivered in time for our Christmas production TREASURE ISLAND - a very demanding show for a lighting board by any standards.

Conditions in the lighting control room were about average for the type of theatre, bearing in mind that it was a multi-purpose room, catering for 35 mm film projection as well as lighting control. The maximum permissable dimensions of the equipment were given orally to John Knightley at the time the order was placed. Adherence to these would have enabled projection and lighting control to work side by side without the necessity to move either unit. We were assured by John Knightley that no change of any description would be required to be made to our Electrosonics dimmers, apart from the 100 control connections between his unit and ours. He impressed upon us the need for us to buy a full set of spares, to which we concurred. Meanwhile just to take care of the unexpected, we arranged that the Electrosonic board would have the same plug as the new board for the control cables, so that in, as the brochure might have put it 'the unlikely event of a failure', the old board could be put back at a moment's notice.

The order was placed and we sat back and awaited developments, the first of which was that we discovered that a number of changes had been made to our specifications. We were able to put right some of these, such as the fact that he had decided to put the basic operator panel at the far end of the board so that it would not be in front of the window, and worse yet so that the leg-room left under the console was at the other end of the console from the operating position. But other changes we were not able to alter, such as the fact that the modification system we had devised was proving to be ostensibly technically not practical, and that an inferior system was to be substitited. We also discovered that the overall dimensions were larger than specified, which was an annoyance as this meant that we had to move a 35 mm projector out of the way to accommodate the extra 18 inches in length, which meant in turn that if we wished to show films we would have to do some furniture shifting.

As the delivery time grew nearer, it became apparent that there were some difficulties in manufacture and that the board would not be delivered by the original date. We agreed that the delivery would be put back one month, which would bring us to the middle of the run of TREASURE ISLAND, and so we laid plans for it to arrive on a Saturday night, with overnight installation and testing and a special technical

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rehearsal on Sunday night. However, this was not to be. Further delays in delivery were asked for by John Knightley. TREASURE ISLAND passed by, and a new production, SOMETHING'S BURNING, began.

Delivery:

Delivery of the equipment took place on 7th February 1974. It was brought into the control room, which had previously been cleared to make room for it. The first thing that struck us was the fact that it was too big to come through the door. This involved removing two door frames to enable it to be brought in. We also noticed the extremely bad finish and lack of mechanical strength. When the board was being assembled it became obvious that, with the exception of the majority of P.C. cards and the loom wiring, the board appeared to be electrically badly wired and soldered. The control connections were made and on 'switching on' it became obvious that all was not well. The stage lighting behaved in a completely random manner, and control was not possible. It was decided that the earthing system of our racks was at fault, that is that whilst effectively earthed in the manner that lighting racks are normally earthed, from a safety point of view, the signal return paths to the electronics cards in the dimmer racks were also connected to mains earth, which caused an earth loop between the units. This was rectified, and wewere able to control the stage lighting in the manual mode with the exception of seven circuits or so, which, together with some faulty coincidence lights, were traced to wires having come off in transit. These were rectified.

The following day, David Owen, Digital Display's engineer, came in to demonstrate the automatic section. This did not work. Then followed some weeks of activity with oscilloscopes and test equipment that produced a slight improvement. We learned at this time that there were very few spare parts in existence, as is still the case at time of writing. Attempts to use the board in an automatic mode produced the following effects: random flashing of the stage lights, memories not working at all, circuits not selected coming on, circuits selected not coming on, whole unit switching at random from 'normal' to 'blind plotting' facilities causing blackout on stage, random changes in the cue number selected.

Performances:

All in all it was not possible to use the automatic section at all, and the manual section was used in the next, and all subsequent performances, because the modifications we had had to make to the dimmer racks precluded putting the Electrosonics control back in. John Knightley spent a considerable amount of time with his engineer to get the equipment going. Over the next few days faults began to show themselves. One direct result of the failure of the auto section was the fact that two operators were necessary for the whole run of CHILDREN.

17. 4.74. - During performance of CHILDREN, one manual master fader started to flicker. After consultation on the telephone with John Knightley, we replaced both master faders with unused faders taken from the main preset bank. These were eventually replaced with new faders, and, on test, we discovered that no fault could be found with the original faders, although this replacement cured the fault as far as we could tell.

19. 4.74. - During performance of CHILDREN, the lights on stage began to flicker badly. We could not trace this fault, and the show proceeded, with a certain amount of anguish and dislocation. The following morning (John Knightley not being available to come in that day), we traced the fault to anelectronics panel. A glimpse of this card was enoughto show that every single solder joint in the card was a

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potential failure, so badly were they made, so the card was remade by us. At the same time, we observed that the electrical connector plug was in a similar bad condition. This was repaired and the board was re-assembled in time for the performance.

1. 5.74. - Before performance of CHILDREN, stage lights appeared a little dim. A smell of burning was noticed. The front of the board was removed and it was observed that the manual amplifier board was severely damaged by an overheated transistor, a hole was burnt into the fibreglass base. The board was switched off, and David Owen was telephonedin the absence of John Knightley. He suggested correctly that this was due to one of the individual channel faders becoming detatched from its plastic face plate, due to the fact the the screws which held the two parts together were far too short - often only one thread was caught. We had previously had trouble with this, and it turned out that John Knightley had seen the possibility of this happening whilst manufacturing, and changed the length of the screws for about half the faders. He said he would provide us with a box of long screws, and we could replace them as and when they fell to pieces. This highlighted the fact that no fuses of any description had been fitted to the manual dimmer system, against normal practice. As the show was due to start in fifteen minutes, and no spares being available, we camberlised (cannibalised) a part from the power supplies on the 15v rail on the inactive automatic section, and replaced the now-defunct JS3055 on the manual amplifier card. The fader having been repaired, the board was then switched on and tested, and the show proceeded as before. When John Knightley was well enough to get out of bed (he had been ill) he complained to the Mermaid Management that we had been interfering with the electronics. An instruction was therefore given, and attached prominently to the control that no work of any description was to be undertaken without written permission of Digital Displays, except in an emergency. As previously remarked, the board tended to switch itself from 'normal' to 'blind plotting' modes at random, resulting in a blackout on stage. As this was becoming a nuisance, and considering (a) that 'blind plotting' did not work and (b) neither John Knightley nor his engineer knew what it was supposed to do, we asked them to temporarily disconnect this facility until the rest of the board worked. This was done. It has never been reinstated despite a request for it to be done.

10. 5.74. - During performance of CHILDREN, a loud buzzing noise came from the interior of the board, accompanied by a dimming and flickering of the indicator lights on the board. Stage lights were not affected.

11. 5.74. - During performance of CHILDREN, several circuits of stage lanterns would not quite extinguish (this is known as 'ghosting') when the dimmer levers were down. At John Knightley's suggestion we made some adjustments to our dimmer racks. This cured the problem temporarily, but the real cause became apparent later.

22. 5.74. - During matinee performance of GREAT SOCIETY, the main fuse to the control panel blew several times, causing a great deal of embarrassment to the actors on stage. John Knightley was telephoned and he advised us to test all the power supply modules and remove the faulty ones. We found that one of the power packs was faulty.

22. 5.74. - During evening performance the mains fuse blew again. This was traced to the 24 volt power unit. Removal of this would mean no light at all. The fuse was replaced and the show continued with the constant risk of the board failing agán. The following day John Knightley made the system safe.

Over the next month or two, we had a great deal of trouble with power supplies failing.

23. 5.74. - System 'ghosting' but cured itself.

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By this time, very little progress had been made on the automatic section. It was capable of programming to a certain extent, about twenty per cent failure, correctable manually, the tape section not working at all. On 'playing back' the previously recorded lighting states, it was noticeable that the characteristics of the fades were very bad, lighting changes taking place in twelve steps instead of 128. This was cured by making drastic changes in the arithmetic unit, after much heated discussion between John Knightley and David Owen, as to the proprieties of such surgery. A second fault was that certain circuits which came up by 'mistake' were not able to be corrected by any method. This was traced and cured. The other outstanding fault was that circuits 1-16, which had previously worked only intermittently, were traced to a loose connection. It was decided to attempt to use the automatic section for the matineee of GREAT SOCIETY on 11. 6.74., and it was set up and run through a couple of times with some success (a small amount of manual over-riding was necessary). The audience preset was put onto the stage at the half-hour call, and when the show was about to begin it was seen that the preset had changed drastically, and as we watched it started to alter again. It was hurriedly switched back to manual and the show proceeded. At this time John Knightley was informed of the necessity of getting the board working in time for COLE, the projected Mermaid spectacular. He was informed 'we must have a good board for COLE. Ir we cannot have your board, then we must have someone else's'. This must have worried him as he spent the next two weeks working daily, either with David Owen, with whom he had parted business company but whom still worked on a free-lance basis, or with David Le Maistre, an independant engineer, who owned Horley Digital Data Services Ltd. Mr. Le Maistre spent at least three weeks getting to know the system, during which it emerged that the circuit diagrams and documentation was somewhat inaccurate, to say the least. Mr. Le Maistre informed us of the progress from day-to-day. It emerged that John Knightley himself knew very little about the system at the time, relying as he did on David Owen. Amon the things that Mr. Le Maistre told us was that there were certain built-in reasons why certain functions of the board did not and could not work. These could be rectified by a slight re-design of the logical processes. This was done and a slight improvement took place. At this time there were about 10% inaccuracies on the dynamic memories and 100% inaccuracies on the tape system.

John Knightley was reminded at the time and from time to time of the deadline he had to meet - this was to be six weeks before the fit-up of COLE. This gave us time to think of alternatives if he could not get it working.

Each day John Knightley sounded more and more encouraging and slight improvements began to show. We gained enough confidence in the board to believe that/board /the would work fully 100% in time for this major production. Accordingly, we agreed to extend the deadline, having taken the decision to use it in COLE.

Nick Chelton, a free-lance lighting designer of some repute, who was to design the lighting for COLE was informed that he had at his disposal a 100 channel memory board. He accordingly designed a highly complicated lighting plot - perhaps more complicated than he would have done had he known that a less sophisticated board was to be used.

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Day of COLE Fitup

John Knightley in bright and early in a last attempt to fix the system, having been informed that we were almost desparate. At 5.30 p.m. he announced that he hadn't been able to fix it and could he come in at 7.00 a.m. to have another go? He was informed that at that time in the morning the board would be well and truly 'on line' and that we were more than somewhat dissapointed. We could however ensure that the board would be available through the night from 10.00 p.m. until about 5.00 a.m., for him to have another attempt. He accepted this offer, and at about 2.30 a.m. appeared from the interior of the board and announced that he had fixed it, and that all systems were 'go', and that the board now worked fully. We were very glad to hear this, and, when opportunity presented itself, we gave the system a thorough test. It was ascertained that two circuits were not working in the automatic mode and that tape still required correction - about 20% error rate. The rest of that night and the following day were occupied with setting up and focussing lanterns, the board being in only intermittent use and only in the manual mode. During the light rehearsal, as each cue state was being set up, it became obvious that the two circuits which did not work on automatic were going to be vitally important. It was therefore decided, pending calling John Knightley in to correct these two faults, and also the tape system, to attempt to work the show manually. A second operator was called in, and seconded to the board operator, and the run through technical rehearsal was begun. We got as far as cue eight. The show was just too complicated for manual operation - an average of one cue every six seconds took too long to preset manually on such a simple system as the Plotlite manual. After much shouting and acrimony, Nick Chelton postponed the rehearsal until 9.00 a.m. the following morning, in order for us to get the automatic working. Working through the night, by replugging some of our lanterns on to different circuits so that the two faulty circuits were not so important, we set about trying to programme the system with the previously arrived-at lighting states. The idea was that we would programme in the cues and then play it back from tape and try to establish what correction procedures to adopt. About halfway through the procedure, all the lights on stage went out, and the various indicator lights started flickering and buttons appeared to 'press themselves' by lighting up. It was discovered that any vibration on the panel top would start or stop this, and it became apparent that a loose connection was to blame, although we had no idea where. After a few minutes the 'record' button lit up permanently, and pressing any memory select button caused the recording of whatever the individual levers happened to be at, at the time. This caused a complete cessation of work. The panel of the tape cassette unit was removed and it was immediately seenthat a wire had come off from somewhere - due to an extremely bad dry solder joint, totally unsupported,and was waving about in the region of several exposed contacts, and bare copper busbars. It appeared to me to be obvious where it had come from - there was only one contact which was empty and had obviously previously had a wire affixed to it. John Knightley was phoned at home, and was unceremoniously hauled out of bed. As he lived some miles fro m London, and would take perhaps three hours to get there, and with the clock remorselessly ticking its way to 9 o'clock, I took a chance and in something of a panic soldered the wire on (John later was to contend that I had soldered the wire onto the wrong contact, but he did not say anything at the time, and the wire remained where it was). The board did not respond to this treatment, but settled down to a stable 'wrong' state.

John Knightley arrived at 7.00 a.m., looking very sleepy, and proceeded to repair the board by the 'empirical' method - that is, by replacing each of the integrated circuits one atta time, plugging in the board and trying it out each time. This was not successful, and it was not long before Nick Chelton came and, in the event, agreed to hold the rehearsal for another two hours while someone was dispatched to buy a further supply of spare parts, and John continued to take measurements. The cast arrived and were told that there was a delay. At 11o'clock representatives of all the various disconsolate groups talked together, and with John Knightley, and decided that alternative equipment was to be obtained without delay.

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Nick Chelton and Dorian Kelly telephoned everyonethey knew and after an hour obtained a small board from Thorn Industries and another from the London Festival Ballet. Forbes Nelson took the theatre van and collected these, and awaiting his return, John Knightley, spurred on by a conversation with Sir Bernard Miles, started to dismantle his equipment. Nick Chelton having had a long cool look at what he had at his disposal decided that the two manual boards would not be replacing the Plotlite completely, but would be used to supplement it, by enabling three operators to split the operation between them without getting in each others way. John Knightley reassembled the board and left the building.

Splitting the lighting into three sections necessitated regrouping and recabling each of the spotlights, and a number of men were hired from White Light Ltd. to carry this emergency work out. They did this in record time being highly experienced men, and starting at 3.30 p.m., finishing by 10.00 a.m. the following morning. They supplied all the necessary materials and equipment themselves. COLE resumed rehearsals, having been delayed for two days, and the public previews began. In our opinion we were not ready for the public to see what we had achieved but the date of opening was immutable. The first night came, and there was much praise for Nick Chelton's lighting effects, which contributed materiallyto the production's success.

After the show had been running for two or three weeks, we again invited John Knightley to make another attempt to put the system into working order. The reasons that we took this step rather than to reject the board at that time were that we were all rather sorry for John because he too had his problems, and was deeply upset, and that due to the very tight financial circumstances of the Mermaid which had taken the almost unprecedented step of borrowing money from outside sources in order to pay for the enormous extra expense of COLE, no money of any kind was available to purchase extra equipment, even supposing that any manufacturer could supply a new control panel from stock, which was unlikely. John made a number of attempts to correct the faults on the board, which had deteriorated slightly since the fitup, and worked through the month of June. The condition of the system at this time was as follows:

1. Manual section - generally O.K.
2. Dynamic memory section - 90% correct.
3. Tape reprogramming section - 100% incorrect.

John Knightley was of the opinion that the fault at this time was that there were damaged integrated circuits still remaining after the incident of the loose wire, and also some weakened components which were liable to go at any time. At his request we 'soaked' the system by leaving it switched on for a long time in order to make these components which were weak show themselves by failing. Various components were changed and the system of dynamic recording improved dramatically. The tape system was still faulty however.

John Knightley came on his own one Sunday and was able to announce the following day that the tape failure rate could be cut drastically by allowing the system 3-4 hours to warm up, and also that the temperature in the cabinet was far too high. He asked us therefore not to use the system for longer than was absolutely necessary at any time. When we pointed out that the board was sometimes of necessity on for 72 hours at a stretch, he suggested that we purchase a fan and install it in the board for cooling purposes, and to cut a hole through the floor to the storeroom below to admit fresh air. We could see no reason why we should bear the expense of the fan, as we had made a special point of asking him in the initial consultation stages whether temperature control would be necessary and if so we were prepared to 'plumb' it into our existing silent ventilation system, which would have been easy on original installation. As it is, the fan which John Knightley eventually purchased and fitted made a dreadfully loud noise, which drowned out the

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tannoy system from time to time in quiet shows. There was some delay in cutting the hole in the floor that he had asked for and after about a fortnight he cut a small hole himself and requested that it be enlarged without delay. Due to interdepartmental confusion, and coupled with holidays being taken in both the electrical and carpentry departments, this was not done straight away, a fault on our part, which we admit. On 22nd July, the Management, wishing to see an end to the problem, decided to ask John Knightley to make a special effort to get the system in full commissioned order by 24th August, on the understanding that if he didn't do so the equipment would be rejected.

Here is reproduced the exact state of the board on 26th July -

Test A

Process: All circuits were checked that they were working in the auto mode.

Result: Circuits 64 & 68 were not working.

Note: The following circuits could not be tested since they are not used in COLE - 1-20, 23, 24, 27, 34, 44, 45, 51, 55, 61, 64, 65, 81, 95, 97, and were therefore disregarded and assumed to be correct, to give benefit of any doubt.

Test B

Process: Act I of COLE plot was recorded on memories 00-62 on the dynamic memory only (i.e. the cassette was not engaged in the record mode), and the memory numbers recalled to compare the coincidence lights with the plot.

Result: 1) Memory numbers 01-62 showed a 100% accuracy bearing in mind that not all circuits were used, and that most of the fader levels were at full although wherever the levels were less than full these had been accurately recorded.

2) Memory number 00 which should have recorded a blackout had picked up circuit 64 at.2 - re-recording this memory number in the blackout state would NOT remove this error although other memory numbers could achieve the required state.

Test C

Process: The memory numbers were recalled from dynamic and the lights on stage were compared visually with the remembered plot.

Result: With the exception of the absence of circuit 68 as noted in Test A (circuit 64 was not used in the plot) the memory numbers were reproducing the show as plotted.

Test D

Process: Without wiping the dynamic memory, the memory numbers were recorded in a virgin cassette direct from memory (i.e. the fader levers were not matched to the plot) and then recalled into the unwiped dynamic memory.

Result: 1) All circuits showed a drop in light level of 20% (i.e. circuits plotted at full were recalled at .8 and those plotted at .5 were recalled at .4) - there were a few exceptions to this e.g. circuits 73, plotted at full was always recalled at .2 and circuit 33 plotted at full was recalled at .4 (see note 2) - this drop was shown on both stage and coincidence lights.

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Result: 2) Circuits 32 and 33 were not recalled in any memory number in which they were plotted with the exception of memory numbers 54-57 when circuit 33 was recalled at .4 but circuit 34 was not recalled at all.

3) Circuit 50 was not recalled in any memory number.

Test E

Process: Without wiping the dynamic memory, the cassette was programmed into the memory by depressing the recall button continuously.

Result: Approx. 75% error rate noted.

Notes:

1. Additional circuits were always recalled at full.
2. All circuits which were plotted showed the drop revealed in Test D.
3. Although the only memory numbers to remain accurate (not regarding the fader level drop) contained only a single circuit, not all memory numbers containing a single circuit were recalled accurately.
4. Circuit 20 is recalled as 20 + 22 or 22.
5. C 22 was not recalled.
6. C 28 was recalled as 28 + 30; or as 30; or as Nil.
7. C 32 was not recalled.
8. C 30 was not recalled except in memory numbers 18, 28, 29, 34, 35.
9. C 50 was not recalled.
10. C 68 was recalled as 68 + 70; or as 70.
11. This correlation of faults is not exhaustive.

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Here follows extracts from the Diary covering the period between the end of July and August 24th 1974. Unless otherwise specified, none of these incidents happened during a show.

Tuesday 6th August -

A fault that we had noticed from time to time before re-appeared. When switching from the auto mode to the manual, or when transferring data from one memory to another, the level of light on the stage dropped perceptibly. If the action was repeated several times, the light on stage would be extinguished, and the memory lost completely. Board began flashing after about 7½ hours of auto operation, and memories were lost. Push buttons behaving erratically.

Thursday 8th August -

Board left on all day in an effort to coax it into a fault condition, so that John Knightley could see flashing for himself. No flashing. Memories held. Board left on overnight.

Friday 9th August -

All memories checked to see if they still held. Memory No. 65 was found to be blank.

2.30 p.m. - Violent flashing at random of stage lights. Some memories vanished, but later re-appeared.

5.30 p.m. - Lights on stage suddenly snapped out and system was found to be inactive, or 'frozen'. Control intermittently recurred from time to time, and at 11.00 p.m. the board was working again, with all memories available.

Sat. 10th August -

3.30 p.m. - System froze. John Knightley arranged to come in on the following day (Sunday) and later cancelled due to previous engagement, and said he would come in on Monday or Tuesday. The board was switched off for weekend.

Monday 12th August -

John could not come in, but asked if the board could be left on in auto - it was still frozen.

Tuesday 13th August -

Still frozen. Manual lever failed and was replaced.

Wed. 14th August -

John now not coming in until Friday - board still frozen.

Thursday 15th August -

Certain parts of the system revived - but other parts still malfunctioning.

Friday 16th August -

John Knightley came in with David Owen and found a faulty component. Not having brought the correct tools, he took the card away for repair at Horsham.

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Sunday 18th August -

John Knightley and David Owen in all day.

Monday 19th August -

John Knightley reported system to be 100% perfect. Tests were made by us. Error rate reduced very considerably to 5% - John said that he thought that that was an acceptable error rate. We told him the only acceptable error rate was 0.0001%.

Wednesday 21st August -

Day was spent in programming the board from scratch, checking and eliminating errors, with a view to working the first show of the day in the auto mode. John stayed in attendance. During the show, six of the indicator lights on the panel began to glow, showing that something was wrong, and by the time the 22nd lighting cue was given, lights on the stage began to flash on and off. This was disastrous and so we switched smoothly back into the manual mode. John went home. Before he went, we agreed that the date set for the commissioning tests - 24th August - could be extended by another week.

Thursday 22nd August -

John Knightley worked on the system all day, with no success. Flashing did not recur. He arranged to come in next Sunday.

Work continued by the Mermaid electrical department completely replacing the oldest of the dimmer racks for new units, which had been delivered on Friday, and completely renewing the control cables between the Plotlite and our dimmer racks.

Tuesday 27th August -

John suggested that the faults were due to electrical 'noise' on the control cables and talked about bringing in equipment to measure it - the noise he now claims is known to be prevalant on Electrosonics dimmers. The heads of the cassette unit were thoroughly cleaned. We asked him whether using computer quality tape was a good idea - he said it was not necessary.

Wednesday 28th August -

John was in by himself and managed to reproduce the symptoms of 'flashing'. The faults were observed to be confined to a group of six consecutive circuits. John asserted that the fault was therefore without doubt caused by a faulty dimmer rack as nothing in the Plotlite worked in sixes, or multiples of six, whereas the dimmer racks did. He had almost convinced us, until a method of completely disconnecting the dimmer racks was found. This was done. The fault remained. This proved unequivocably that the Plotlite was at fault. The fault was eventually traced and repaired. The only fault that remained at that time was the cassette unit. John told us that he was building a new cassette recorder to computor standards (this never materialised). He then went on holiday.

Thursday 29th August -

It was decided to attempt the show in automatic again. The day was spent in programming and checking, correcting where necessary.

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The show was run right through and the following observations were made:

1. There were a number of complaints from the Cast that the lighting was 'different'.
2. A great deal of 'ghosting' occured.
3. Instead of fading in and out gently certain circuits 'stepped', that is came up from zero brightness to full in only fifteen steps or so, instead of the proper 128.
4. Because we could not use the cassette facility, only 100 memories were available, so a number of cues had to be very slightly simplified and compressed to make it possible. Also a number of cues had to be operated manually for the same reason. Consequently the work involved was greater in many ways than the work in operating manually. It was decided that as soon as John got back from holiday we would ask him to fix these faults. In the meantime we would revert to manual operation.

Thursday 5th September -

John was back from holiday, and was informed of all that had happened. He suggested that the fader stepping was due to trouble from the Electrosonics dimmers. We were not convinced of this, as we had had similar faults before (see P4 May 1974) which had turned out to be component faults. He said he would look at the record fault on Sunday. He asked for a delay in the acceptance test which we granted. This would also enable us to complete the rewiring and replacement of dimmers that we were engaged in. At 8.15 p.m. the 'stage record' button came alight and did not go off.

Friday 6th September -

'Record' button stayed alight erratically and memories were cutting into the system without pressing the 'cut' button.

The date for the final acceptance tests was set for 17th September 1974, and John Knightley was requested to attend. As it turned out, Jonathan James-Moore, the General Manager, had fallen ill, and Sir Bernard Miles had gone abroad, and therefore no Management presence was available at this Meeting. We had,however, decided that the best qualified person to conduct these tests was Dorian Kelly, Chief Electrician, who with his staff had worked out a carefully graded set of tests.

John Knightley was invited to provide an observer if he wished to do so.

When John Knightley arrived he was very angry that noone with authority to write cheques was available, as he had confidently expected that payment would be made on the spot., However he agreed that the tests should continue and we took notes. The results of the tests showed without doubt that the system did not work to our satisfaction. He left at 12.30 to attend an engagement elsewhere, stating that no further work would be undertaken until full payment was made.

Action has been started by John Knightley to recover the money. The Mermaid Theatre have formally rejected the equipment.

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NOTES -

1. John Knightley was given ample opportunity to inspect the Contract Room and site and conditions of use, temperature and so on, before the order was placed.

2. He was given an opportunity to examine the Electrosonic dimmers, to which the system would be connected, and a card containing the Electronic parts of the system was given to him to examine, which he still has.

3. He assured us that the system would interface with all known types of dimmer (see first proposal).

4. He was given, in our opinion, more than adequate time to get the system working and final deadlines were extended many times and many warnings were given.

5. Due to the changes which were made by him during manufacture and after, the system is not as flexible as that which was described originally e.g. blind plotting facility no longer exists, and the method of modifying already recorded states is very crude and time-consuming.

6. It appears that John Knightley has very little knowledge of the system himself, inaccurate diagrams, and no engineering help except on an occasional basis, therefore there seems no reason to suppose that further service will be any more efficient than in the past.

7. Film projection has been rendered impossible due to the restrictions imposed by Digital Display Ltd.

8. Mechanical construction of the system gives it in our opinion no more than two years of service.

9. A great deal of anxiety has been caused to individuals.

10. A great deal of harm has been done to the reputation of the Mermaid Theatre and individuals.

11. The lighting of shows has been the subject of arguement between the performers, who have a reasonable right to expect that the show will be the same every night, and the technical departments who do not know where or when the next failure is going to occur.