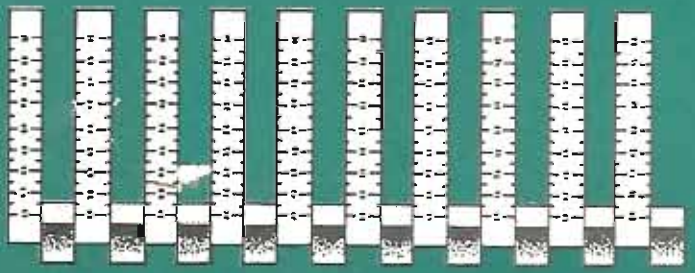
RANK STRAND ELECTRIC

# OPERATORS HANDBOOK

# LIGHTBOARD

# (TCS-2)



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# 1. INTRODUCTION

## 1.1 THE LIGHTBOARD SYSTEM

The lighting control system described in this handbook is the Rank Strand Lightboard (TCS-2) System. The system was originally developed by Rank Strand in conjunction with Richard Pilbrow of Theatre Projects Ltd. for the new National Theatre on London's South Bank, and has since had further improvements incorporated to expand its facilities and keep it abreast with the latest electronic hardware developments.

The system uses a sophisticated mini-computer (Digital Equipment Corporation PDP-11) which has a software program to determine the operational facilities of the lighting system. This software, in conjunction with some special purpose microprocessor based hardware to carry out simple repetitive calculations, gives the system unprecedented flexibility, and the capability of handling many complex lighting changes on large numbers of sockets simultaneously. The use of a proprietary general purpose computer which is produced in large quantities offers the user better reliability and value for money.

This section outlines the major facilities and options available. More detailed descriptions are available in later sections of this handbook.

### a) Control of Sockets

A keyboard is provided on the setting panel to call up sockets for level setting or modification. When a socket has been called up, its level, which is displayed on the V.D.U., can be modified using the setting panel wheel or the 'AT' facility (labelled @) on the keyboard. Any number of sockets can be called up and controlled in this manner. Memories, pre-recorded groups of sockets and individual sockets can be combined and controlled together.

Sockets controlled by the setting panel can be recorded, identified by flashing to full or out, transferred to a submaster for balancing with other sockets, or returned to their former level.

Sockets need not be numbered sequentially - it is often advantageous to geographically number socket outlets according to their positions in the theatre or studio. When this is done, there are often numbers missing from the socket sequence. The setting panel allows the operator to control those sockets fitted to his system.

b) Control of Non-Dim Sockets

It is frequently necessary to control effects motors or other equipment that cannot be connected to a dimmer-controlled socket. Any number of sockets controlled by LIGHTBOARD can be specified as non-dim sockets, and controlled, recorded, and modified as if they were normal dimmed sockets. Their level is displayed on the V.D.U. as "ON" when they are live. Dimmed and Non-Dim socket numbers can be mixed in any order on the system.

c) Balancing Lighting

Submasters are provided (normally 4) on each palette to enable the operator to simultaneously balance several groups of lighting, for example the different colours on a cyclorama. The sockets under the control of each submaster can be faded, cut up or down, returned to their original level, recorded, or controlled from an external input, such as an audio tape or microphone, by means of the modulation unit.

Memories can be controlled from the submasters, and multi-part memories recorded and played back in a single action using the Palette Record/Play facilities.

d) V.D.U. Displays

The V.D.U. displays provide the operator with an up-to-date display of the state of the lighting. The upper part of each screen is normally used to display the sockets currently in use on stage. Each socket display contains the socket number, the current level, and

another character indicating the controller (e.g. Submaster A, desk setting panel, etc.) that is controlling the socket. Alternatively, the upper screen can be used to display sockets (and their levels) in either red or green preset stores, the Automod store, the currently selected memory, those sockets controlled by a particular submaster, or a list of memories in core or on disc with their titles.

The lower part of each screen provides the operator with a display of the status of the lighting control. Play and Record memory numbers are displayed above the memory select panel. Each playback has an area of screen displaying memories that are selected or fading, with their fade times and progress indicators. Likewise, each setting panel and submaster has an area of screen displaying the sockets, groups or memories that were selected to it, and their master level.

Messages indicating operator errors or system malfunctions are displayed on the top and bottom lines of each screen when these conditions occur.

A colour V.D.U. option is available.

e) Recording

The system uses a flexible recording process to optimise the use of the ferrite core memory provided within the system. About 300 typical-sized memories can be recorded, and these can have any number in the range 0.1 to 999.9, in increments of 0.1. Normally memories are recorded on whole numbers, leaving room for the operator to insert up to 9 at later plotting sessions. There are interlocks to warn the operator should he try to over-record a previously used number. It is possible to record 'blind', i.e. without bringing the lighting up on stage. Separate up and down speeds and a title can be recorded as part of each memory.

f) Playback

Two separate playbacks, each with separate control of the up and down fade times are provided. Up to six separate lighting changes, each with different up and down fade times, can be controlled

simultaneously on each playback. Memories can be added to or subtracted from each other in either preset store, then faded by using one of the fade action buttons, providing a choice between crossfades, separate up and down move fades, raise, dim or All Dim. The fades can be stopped at any point, completed instantly or reversed. The fade time can originate from the memory or be set up manually, and may be modified either before the start of a fade or while it is running.

g) Automod

An Automod store is provided to enable a socket to be temporarily replaced by another at a different level, and substituted automatically for the memorised socket when it is called back from the memory.

h) Library Storage

A Floppy Disc system is provided to enable the operator to build up a library of lighting plots. When several shows are being performed in repertoire each can be saved on a diskette and the relevant one loaded into the memory before each show. The disc system also enables the operator or maintenance engineer to load alternative programs into the computer to test the system hardware.

i) Test Program

A Hardware Test program is provided with each system to enable the operator to carry out quick, simple tests of the system hardware. This is loaded from a diskette in place of the main system program, as described in the technical handbook.

j) Printout

A hard copy printer can be fitted to the system to provide a permanent printed record of lighting memories.

## 2. EQUIPMENT

### 2.1 MASTER DESK

All controls for normal operation of lighting circuits and intensity memorisation are mounted on the master desk. A standard master desk would contain the following:-

Playback Panel, containing the Red and Green playbacks, and the memory select.

Desk Palette, containing the desk setting panel and 4 submaster controls.

Two V.D.U. Displays, either monochrome or colour.

Supervisory panel, containing various supervisory functions.

Alphanumeric keyboard.

Disc Drive and control panel.

Momentary cut panel.

Backup Masters panel.

Plinth, containing desk electronics and power supplies.

### 2.2 BACKUP PIN MATRIX

This is normally mounted in the control room separately from the master desk, and consists of a 10 group matrix controlled by the backup master panel on the master desk, providing an independent backup system.

## 2.3 EQUIPMENT RACK

The equipment rack contains the PDP 11 computer and interfaces to drive the desk, V.D.U.'S, dimmers, and other sections of the system. It is normally installed in a separate room, since the cooling fans fitted produce a higher noise level than would be desirable in a control room. The room containing the equipment racks may be up to 100 metres from the control room if required, allowing multi-auditorium complexes to have a centralised computer room.

## 2.4 OPTIONAL EQUIPMENT

### a) Stalls Wing

The stalls wing is a complete palette (setting panel and submasters) with a few additional controls, built into a self-contained portable case with its own separate V.D.U. monitor. Three cable connections are required between it and the equipment racks, power, data, and video (3 video cables for colour).

The stalls wing can be placed in the auditorium or on the stage to provide control of the lighting remote from the master desk, or stood alongside the desk to allow more than one person to set up lighting (assuming suitable outlets are available in these areas).

### b) Printout

A printer can be supplied with the system to generate printed copies of memories. The printer would normally be supplied with a keyboard to control the printout, and can be sited either with the equipment racks or in the control suite. It requires a separate connnection to the computer via a 6-core cable. Alternatively, a faster serial printer can be supplied, and controlled from the supervisory panel alphanumeric keyboard.

c) Modulation Unit

The Modulation Unit is a self-contained trolley normally containing up to 4 modulation channels corresponding to the palette submasters. It connects via a short lead to the electronics plinth in the master desk. It is used to modulate the levels of the submasters from an internal flash sequencer, internal audio cassette drives, or an external audio source. The Audio response can be modified by switch-selectable filters of variable bandwidth.

# 3. GENERAL DESCRIPTION OF FACILITIES AND TERMINOLOGY

## 3.1 SOCKETS

The Lightboard system is capable of independently controlling up to 1000 dimmers or non-dim units. Each of these units is connected to one of the system's output channels. To simplify the electronics and processing required, these channels are always sequentially numbered, and are grouped in multiples of 64. Dimmed and non-dim channels may be mixed in any order. To cater for installations requiring socket numbers related to the geographical location of the socket, the system provides a flexible means of numbering the sockets. They can be numbered in any order with any whole number between 0 and 999 inclusive. Thus bridge 1 can be given numbers between 100 and 199, bridge 2 between 200 and 299 etc., even though there may not be 100 sockets in each of these areas. When the operator wishes to control the socket labelled 102, he keys in 102 on the setting panel keyboard, and does not need to know which internal channel it corresponds to, or whether it is a non-dim. If he keys in a socket number not fitted to the system, a warning sounds as soon as he tries to control it. The term SOCKET is always used throughout this handbook to describe an outlet controlled by the system.

## 3.2 V.D.U.'S

The Visual Display Units are used to tell the operator the current state of the system, and mimic the current levels of sockets. They are arranged to display 32 lines of 80 characters each. The upper 21 lines on each screen contain the socket mimic, with space for 140 sockets per screen. The first 140 sockets 'in use' (see 3.3) are displayed on the palette V.D.U., and the second 140 sockets on the playback V.D.U. Two examples follow:-

```
023          145
4HB          3*
```

The first example is displayed with 'FULL DISPLAY' selected. It shows socket 23 at level 4H on a 0 to 10 scale (i.e. 45% of full

intensity). The letter H represents half, similarly Q and T represent Quarter and Threequarters. Level 100% is indicated as F (for Full). Alternatively, the system can be supplied with percentage levels, i.e. 0 to 99 in 1% steps, with F for full. The letter B indicates that the socket is being controlled by Submaster B on the desk palette. The desk palette submasters are identified as A, B, C, and D, and its setting panel by a *, flashing if the socket was one of the last called up on the setting panel. Similarly the stalls palette is identified by W, X, Y, Z, and #.

In addition, colours are used to further clarify controller assignations. Sockets controlled on the playbacks, or not currently controlled, have their socket number in green and level in red. Sockets controlled on the desk setting panel display in yellow, reverse video being used to indicate those currently on the keyboard controller. All sockets controlled by submasters display in reverse cyan.

The second example has 'FULL DISPLAY' deselected. Only the first digit of the level is displayed, and only setting panel control indication is given. The lower line is not as bright as the socket number line, which can under some circumstances produce a more easily readable display.

An exclamation mark will appear to the right of the level if the socket has been Identified (see 5.5.10).

The sockets and levels displayed on the upper section of the screen can be the stage or either preset state, depending on which of Stage Mimic, Green Mimic, or Red Mimic (on the setting panel) is selected. Alternative upper screen displays such as Automod, Memory list, memory select, or mimic off can be selected and are described in 5.8.4 and 5.2.7.

The lower section of each screen displays information relating to the playbacks, palettes, and memory select, and will be described more fully in the section on those topics.

Error messages are sometimes displayed on the top and bottom line of each screen. The messages on each screen are identical and flash to draw the operators attention to them. There is space for 4 messages on the screen, which may refer to operator errors, disc or memory warnings, system malfunctions, or equipment overheat. Non-persistent errors can be cleared by pressing 'ERROR CLEAR'. Persistent ones, such as overheat or program corruption messages cannot be cleared until the error condition is rectified.

## 3.3 V.D.U. FORMAT

Although the system can control up to 1000 sockets, to display them all would require a large number of V.D.U.'s. The usual reason for requiring as many as 1000 sockets is to be able to work from a saturation lighting rig, with some lanterns permanently angled for specific purposes, and others frequently re-angled for more general use. The display limit of 280 sockets should be adequate for even the largest and most complicated production when used in this way. To enable any combination from the 1000 available sockets to be displayed, sockets have "in use" bits saved in the computer (a 'bit' is the smallest piece of information the computer can remember). Whenever a socket is called up, either individually or as part of a memory, its 'in use' bit is set, ensuring it a space in the V.D.U. format. In this way, unless the V.D.U.'s are already full, a socket that is ON can always be displayed on the V.D.U.

The V.D.U. socket display is in socket-number order, and has space reserved in it for all sockets that are in use. This socket space may be blank if the socket is currently off.

If a socket is called up that was not previously in use, or if new sockets come back from the memory they will shuffle into the format, and all higher numbered sockets on the screen will move up to accommodate them. This can be distracting during a plotting session or performance, and there are facilities to set up the format from a block of memories, or from memories being transferred from disc. The full format can also be displayed, and cleared down when a new one is required.

When working with a saturation rig, it is often desireable to prevent the operator from accessing and using sockets assigned as specials to other productions. This may be achieved by calling up all sockets allocated to the current production, thereby ensuring that they are in the format, and selecting 'FORMAT LIMIT'. This prevents the operator from calling up and controlling any further sockets, either individually or from memory.

## 3.4 CONTROL PHILOSOPHY

Lightboard is organised as a Latest-Takes-Precedence switchboard. This is by far the easiest for an operator to understand when dealing with large numbers of sockets and many ways to control them. It overcomes some problems exhibited by pile type or additive mastering switchboards when it is necessary to immediately modify a socket or group of sockets. It is not necessary to search the controllers to gain control of a socket - calling a socket up removes it from the other controllers (unless specifically held under 'INDEPENDENT') and gives the setting panel direct control of it.

The system has a maximum capability of 64 controllers, 32 of which are assigned to the two playbacks (6 up-controllers, 6 down-controllers, and 4 used for other purposes, per playback). The other 32 can be used for up to 4 palettes, with 6 submasters maximum on each, (the setting panel requires two controllers, to allow 'MASTER' to operate).

This philosophy also simplifies multiple playback fades - there is no confusion over the level a socket will reach in a set of fades, it always fades towards the last level it was instructed to fade to.

## 3.5 FADE PROCESSES

Three fade types are provided within Lightboard to cater for all of the different fade actions required. These fade types are referred to as MOVE, GROUP, and INHIBIT fades.

a) Move Fades

The system will always try to process the sockets on a controller with a move fade, but if it cannot, it will use a group fade. All playback fades are Move-type fades. To compute a move fade, a destination level (i.e. level to which the socket has to go) is required for each socket in the fade. The destination level is taken from the relevant preset store at the start of a playback fade, or from other internal stores for palette move fades. All sockets in a move fade travel smoothly from their original level to their destination level, without any dips or discontinuities, and all arrive at their destination level together when their controller reaches 100%. A crossfade is a special case of a move fade - all sockets without destination levels are faded down as if the destination was zero. (This is called the remainder dim part of the fade).

b) Group Fades

Group fades behave in a different way to move fades. A group fade is used when sockets under control have no destination levels, such as individual sockets or groups of sockets called up on the setting panel. A memory combined with a group or socket will also behave as a group fade, since some of the controlled sockets have no destination levels, and lighting changes become unpredictable when move and group fades are mixed on the same master.

Group fades have definite advantages in some situations. Sockets are controlled in a similar manner to earlier electro-mechanical systems using "shaft mastering" i.e. if the master increases by 20%, 'two points' are added to each level. This tends to preserve the lighting balance between sockets within the group, provided the correct transfer characteristic for the system and dimmers is selected. Lightboard preserves the balance between sockets even if all sockets are faded up to full or down to out. When the wheel is returned, the same relative balance will be maintained. The controller position in a group fade is constrained between the limits of -100% (by which time all sockets will be out) and +100% (ditto, full).

c) Inhibit fades

Inhibit fades are used for system override facilities such as FADE TO BLACKOUT or SOLO. Each fade controller can be assigned to FBO or SOLO. Normally all but one are assigned for SOLO, and all are assigned for FBO. When a controller is assigned in this way, the stage level output is computed normally, and then constrained to be less than an FBO/SOLO level before being sent to the output circuitry. Normal Move and Group fades continue under an inhibit fade, and the levels displayed on the V.D.U. are pre-inhibit. As an inhibit fade progresses, the FBO/SOLO level is reduced from full to zero. Sockets at higher levels are inhibited first, all sockets reaching zero as the FBO/SOLO level reaches zero. The reverse can also be performed, sockets dropping off the fade as their move/group levels are reached. The mechanical analogy of an inhibit fade is using a 'broomstick' on a slider dimmer board to fade all circuits to out - those that are higher will be collected by the broomstick earlier in the fade.

## 3.6 MEMORY NUMBERS

Lightboard uses a flexible system of storage, to efficiently use its internal ferrite core memory, and to provide a flexible and easily understood method of memory insert.

Memory numbers can be anywhere in the range 0.1 to 999.9, in increments of 0.1. If regular plotting sessions are restricted to whole numbers, up to 9 memories inserts can be made at a later date. To this end 'RECORD SEQUENCE' increments the memory number in whole numbers. However, 'TAKE SEQUENCE' uses the numerical sequence of recorded memories, e.g. if only 1, 1.2, 2, and 4 have been recorded, it will step through them in that order (it will not try to take memory 3, and will take 1.2 between 1 and 2).

All numbers used and their locations in the computer core are saved by the computer in a list reserved for this information. This list is variable in length - if small memories are recorded, the the list will expand to allow more than 300 to be memorised.

The information saved is in a compressed format to efficiently use the space available. The number of memories that can be recorded depends upon their size. The following table shows the % of a 32K word core store used by various types of memories:-

| | 400 way | 800 way |
|---|---|---|
| Lighting only, 100 sockets | .262 | .348 |
| Lighting, title, speeds, 100 sockets only | .299 | .385 |
| Lighting only, all sockets | .726 | 1.410 |
| Palette memory, 100 sockets 4 submasters | .494 | .800 |

If recording is attempted when there is insufficient room in the memory, "memory full" is displayed on the V.D.U. Similarly, if a recording is attempted when less than 5% of the memory is available, "memory almost full" is reported.

Due to the packing methods used and the variable length of memories, new memories or re-recorded memories are always put at one end of the store, and older versions or cleared memories are shuffled out by a routine in the computer program that is constantly monitoring the state of the store. This is a low priority routine, and may take 20 to 30 seconds to eliminate unused areas and shuffle all of the available space together at the end of the memory. If recording is frequent, it is worthwhile waiting and trying again if the "memory full" message is reported, especially if the memory to be recorded is a re-record of one already in the memory.

## 3.7 SYSTEM WARNINGS

Lightboard has several methods of warning the operator that all is not well or that he has made a mistake. These are listed below:-

a) Hard Warning

This represents a serious error and is indicated by a high pitched bleep from the desk, or the red warning light on the stalls. This warning may sound as a result of an operator action, e.g. trying to record when recording is not enabled, or when the store is full, or to bring the operator's attention to a message on the V.D.U., perhaps one requiring a decision and action on the part of the operator. It will also sound if the computer halts or a serious fault occurs in the hardware, or while loading programs, or when the hardware test is overlaying a new subtest. Both indicate that the system is not available for lighting.

b) Soft Warning

This represents a less serious error, and is indicated by a low pitched hum from the desk, or the orange warning light on the stalls. This warning will sound at the first attempt to re-record to warn the operator that the memory number has already been used, or if the operator presses a button not available to him (e.g. submaster 'TRANSFER' with the setting panel in preset mode).

c) V.D.U. Messages

These messages are largely self-explanatory and will either clear automatically when the condition causing them clears, or will clear when "Error Clear" is pressed. Sample errors are "Disc Full", "Desk Overheat", etc.

# 4. BASIC OPERATING PROCEDURES

This section of the handbook describes the recommended procedure for carrying out certain basic operations with the system. No attempt has been made to describe the use of the system in detail as the experienced user will soon discover methods of use beyond the scope of a handbook of this nature. The detailed functions of the controls are fully described in section 5 of this handbook.

## 4.1 SYSTEM SWITCH ON/OFF

Insert a TOK3 key in the DESK keyswitch on the keyswitch panel and turn it clockwise (it is spring-loaded). The system should now be on. The desk mimics will update almost immediately, and the monitors show a display when they have warmed up. To turn the system off, turn the key anticlockwise.

### 4.1.1 CHECK PROCEDURE

If the system fails to turn on correctly, or the hard warning bleep continues to sound (it may sound momentarily during switch-on - this is normal) check the following:

a) that the main supply to the equipment is ON

b) that all circuit breakers, other than unlabelled ones, and the one labelled 'AUX' on the Rack Power distribution Unit (P.D.U.) are ON (Operating levers UP)

c) that all circuit breakers on the desk P.D.U. (located behind the left hand plinth cover) are on.

If all is in order, and the system still fails to switch on, refer to the TECHNICAL HANDBOOK.

## 4.1.2 INITIALISING THE SYSTEM

When switched on, the system will revert to exactly the same state as it was in when switched off. To set the system to standard conditions for simple operation, the following procedure should be carried out. Note - when 'Select' or 'Deselect' are referred to, 'Select' is indicated by an illuminated button, and 'Deselect' by a non-illuminated one.

a) Press the GREEN PRESET CANCEL button to clear the green preset.

b) Press the RED PRESET CANCEL button to clear the red preset.

c) Press ALL DIM then INSTANT twice on the green playback. (If the stage lighting is required to fade out, simply press All dim and wait for the push to go out before pressing a second time).

d) Press FORMAT CLEAR on the supervisory panel.

e) Press CLEAR on the memory select keyboard.

f) Deselect the following:

| | | |
|---|---|---|
| USE A.M. | ) | |
| REC SEQ | ) | |
| TAKE SEQ | ) | Memory Select panel |
| TAKE TIME | ) | |
| MANUAL | - | Green Playback |
| MANUAL | - | Red Playback |
| SET LEVEL | - | Setting Panel |
| REV. V.D.U. | ) | |
| FORMAT DISPLAY | ) | |
| FORMAT LIMIT | ) | Supervisory panel |
| LARGE FORMAT | ) | |
| MEMORY BLACKOUT | ) | |

g) If 'LAMP SEQ' is selected on the setting panel, press it with the footpush depressed to deselect it.

h) Select STAGE mode and stage MIMIC (adjacent white pushes) on the Setting Panel.

i) If FBO is on (not flashing), press GREEN INSTANT. If it is flashing, press FBO and then GREEN INSTANT.

## 4.2 SETTING SOCKET LEVELS

This operation is performed on the SETTING PANEL KEYBOARD and WHEEL. Select SOCKET, and enter the required socket number on the keyboard. It will appear at the bottom of the setting panel area on the V.D.U., with its level to the right of the screen. To take control of the socket and adjust its level, two options are available.

a) If the wheel is moved UP (away from the operator), the level of the socket selected will rise. Similarly if the wheel is moved down, the level will fall. When the wheel is moved, the level displayed against the socket in the setting panel area of the V.D.U. will display as a % variation from the level at which control was taken. The socket's absolute level is displayed on the top of the screen, and will have a flashing * against it (and display in reverse yellow) to show it is being controlled. The upper screen level will either include quarter points (or full % level) if FULL MIMIC is selected, or will have these suppressed if deselected.

b) The socket level may be adjusted using the '@' facility on the keyboard. If the @ button is pressed, it will light at full brilliance and a whole number level can be entered, e.g. @5. The @ button will then go out, and extra decimal points may be entered by pressing POINT (@ lights dimly) followed by the second level digit. Note that when sockets are set at a level on the keyboard, the setting panel level display shows the actual level. This is because it is possible to control several sockets at the same time, and only

when '@5' (or another level) is used are all of the sockets definitely at the same level. The level of the sockets can also be adjusted up and down on the keyboard, by entering @ + 2 (add 20%), or @ - 3.5 (subtract 35%). To put a socket at full, @F may be used.

Note - Do not use the button labelled NEXT and LAST when adjusting the levels of sockets - they are reserved for calling up the next or previous socket numbers (see below).

To control a further socket, enter the socket number and control it as above. It is not necessary to re-press SOCKET if it is still selected, or to press CLEAR. When a further socket is selected, the previous one rolls up the VDU screen, to make room for the new sockets. For a further explanation of the facilities available on the setting panel see section 5.5.

## 4.3 BALANCING LIGHTING LEVELS

To balance the lighting on stage, it is convenient to use the SUBMASTERS. The lighting can be split into up to 4 groups in the following way:

Call up the sockets required in the first group on the setting panel keyboard, pressing the (+) button between each one. The sockets called up for the group should already be in balance with each other. When they have all been called up, press the TRANSFER button above SUBMASTER A. This will add the new group onto any already controlled on submaster A. Do the same for the second group of lighting, and transfer this to submaster B, etc. The groups of lighting will then be controlled by the submaster wheels, and can be balanced one-to-another by adjusting the wheels.

## 4.4 RECORDING

When a lighting scene has been set up on stage, it can be recorded in the following way:

Check that the Record keyswitch is turned on. On the MEMORY SELECT KEYBOARD, press CLEAR, followed by the number required. This will appear on the Memory Select area of the V.D.U. (between the playbacks) under the heading REC. Press REC STAGE to record the lighting. If the hard warning sounds, the memory has not recorded due to recording not being enabled - turn on the record key. If the soft warning sounds, the memory number selected already has a lighting section - a second push on the record button within approximately 6 seconds of the original push will over-record the original memory, alternatively another number can be selected. The record button will illuminate for approximately 2 seconds after a successful record.

## 4.5 PLAYBACK

Memory numbers for playback are also selected on the MEMORY SELECT KEYBOARD. They are displayed in the lower section of the memory select area of the V.D.U., under the heading PLAY.

### a) Preset Actions

Before a memory can be faded up on stage, it must first be put into one of the preset stores. Both work in the same way - this simple description will concern itself with the GREEN playback only (the left hand one).

TAKE copies the memory selected by the memory select keyboard into the preset store, completely replacing any memories that were previously there.

PLUS adds the memory to the previous contents of the preset store, with a LATEST TAKES PRECEDENCE action.

MINUS - sockets in the selected memory are reduced to zero in the preset store.

CANCEL - removes all memories from the preset store.

The memories combined in the preset store will display on the lowest line used in the playback area of the V.D.U. (Cyan on Blue).

b) Fade Time

Only manually set fade time is described in this section - recorded time is further explained in section 5.2.5 and 5.3.5.

When a memory (or combination of memories) is set up in the preset store, the fade time allocated to it is the same as the time currently set on the wheels, and displayed at the bottom of the screen. The fade time display format is MINUTES:SECONDS. The time set for the memories in the preset store is displayed on the same playback line as the memory selections, and is split into two parts, UP TIME and DOWN TIME, i.e. fade time for all sockets moving UP and for those moving DOWN.

These times can be preset when they are bracketed by the TIME CONTROL CHEVRONS. If these are not bracketing the preset times, press the controller button bearing the same line number. The fade times can be adjusted by moving the wheels - away from the operator decreases the fade time. Three full sweeps are necessary to go from maximum (60 minutes) to minimum (less than 1 second).

When a fade is started, the wheel fade time control automatically changes to those controller lines containing the fade just started, and the operator has immediate control over the speed of the running fade. This will continue, until a further preset button is pressed, when control reverts to the preset line. Alternative fade controllers can be selected at any time to adjust the fade time of the last fades or preset the next.

c) Fade Start

There are several types of fade available on Lightboard playbacks:

CROSSFADE - Replaces all current lighting by the new lighting in the preset store.

MOVE UP - Sockets that are higher in the preset store than on stage move to their new level.

MOVE DOWN - Sockets that are lower in the preset store than on stage, but are NOT AT ZERO in the preset store, move to their new level.

COMBINED MOVE - Both of MOVE UP and MOVE DOWN may be selected at the same time, or one after another, and are then considered to be part of the same fade.

DIM - All sockets that are non-zero in the preset store are faded to OUT.

RAISE - All sockets that are non-zero in the preset store are faded to FULL.

ALL DIM, PLAYBACK DIM - All sockets, regardless of the preset store settings, are faded to OUT. Since these fade actions do not use the preset store, the current down wheel time is taken as the fade time. The difference between these two buttons is that PLAYBACK DIM will not park (collect) sockets that are controlled on INDEPENDENT CONTROLLERS (playback or submaster). This applies to all of the previously mentioned fades also. However, ALL DIM cancels all independents before starting its fade.

While the fade is running, the fade times may be modified as outlined in b) above. A new scene may be compiled into the preset store without altering the currently running fade. Fade progress indicators display the fade state, one to the left of the UP time indicating the UP PROGRESS (0 to F) and one to the right of the down time indicating the DOWN PROGRESS (F to 0). The fade action button pressed will be illuminated until the fade has completed.

PAUSE - will cause the fades selected (i.e. with chevrons) to pause. It illuminates to show it is selected, and a further press will allow the fade to continue. It is automatically deselected when a new fade is started. A paused controller is indicated by a 'P' on the V.D.U. line between the chevrons and fade progress indicators.

INSTANT - completes the fades selected immediately, and can be pressed with any fade action buttons for snap lighting changes.

ALL FADES - INSTANT and PAUSE only influence fades that are currently being controlled (i.e. those that display chevrons on the V.D.U.). This button may be used to quickly gain control of all running fades.

REVERSE - reverses the last fade started, and illuminates with the fade button when selected. Sockets that were controlled by the UP fade time controller on the normal fade will be controlled by the SAME CONTROLLER on the reverse fade.

A running fade can be interrupted at any time and a new fade started. Some fades (Crossfade, All Dim, and Playback dim) inherently cancel all previously running fades, since they take control of all sockets. If either MOVES or RAISE or DIM fades are started, they do not disturb previously running fades, other than by taking LATEST control of common sockets. It is possible, therefore, to have several fades running at the same time on a playback. This topic is more fully described in section 5.4.

d) Sequential Operations

If memories are to be faded in numerical sequence, TAKE SEQ can be selected. Select TAKE SEQ, set up the first memory number and press TAKE. This memory will be taken into the preset store, and the next memory number will be displayed in the memory select. Each time a fade action button is pressed after this (both MOVES together, or CROSSFADE, or RAISE or DIM), the following memory will automatically be taken into the preset store, and the memory select number again incremented.

## 4.6 MODIFICATION OF SOCKETS

A socket can be called up and adjusted at any time on the setting panel keyboard. As soon as its level is controlled, it will be removed from any playback fade and will be completely under setting panel control. If the playback controlling the socket is selected to INDEPENDENT, this may be over-ridden by selecting USE IND on the setting panel before calling up the socket.

## 4.7 PREVIEW OF NEXT MEMORY

The sockets set up in the preset stores can be viewed by selecting GREEN MIMIC or RED MIMIC above the setting panel keyboard, or by pressing the momentary preset preview buttons on each preset store.

Alternatively, the currently selected memory can be viewed by pressing the LTG preview button above the memory select keyboard.

# 5. DETAILED OPERATIONAL DESCRIPTION

This section of the handbook describes in detail the operational facilities provided by the control system. There are many more facilities explained here than outlined in section 4, since many of the facilities require a fuller understanding of the system before they can be used effectively.

## 5.1 KEYSWITCH PANEL

### 5.1.1 DESK POWER SWITCH

This is a three position centrally biassed keyswitch, operated by a TOK3 key, to enable the system to be turned on and off from the master desk. It operates a contactor in the equipment rack power distribution unit via a low voltage circuit.

### 5.1.2 DIMMER POWER SWITCH

(Not fitted to all systems).

This is a two position TOK3 keyswitch, that may be connected to external equipment to control the power to the dimmer racks (low voltage control only).

### 5.1.3 RECORD ENABLE

This is a TOK4 3-position keyswitch. When it is OFF, recording in the memory from any of the system record buttons is inhibited.

When ON, it allows recording on any number between 1 and 999.9 from the master desk record pushes (i.e. playback and desk palette pushes).

When switched to its third position, HOUSELIGHTS, it also allows recording on numbers 0.1 to 0.9 inclusive. These are reserved as houselight memories for installations where the houselight dimmers are controlled by the main lighting control.

Note that MEMORY CLEAR and READ DISC actions are not inhibited by this keyswitch, since they have their own interlocking keyswitches. However, unless this keyswitch is switched to HOUSELIGHTS, neither actions will modify memories between 0.1 to 0.9.

### 5.1.4 STALLS ENABLE

This is a TOK3 3-position keyswitch. When it is off, the stalls control is completely disabled. It still has power applied to it, but any buttons pressed or wheels moved will be ignored by the computer.

The switch has two ON positions - labelled PARTIAL and FULL. Using these in conjunction with the Record Enable keyswitch, the desk operator can restrict record access by the stalls control to the memory.

In either on position, the Stalls operator can call up memories, groups, or sockets, adjust their level, and balance lighting on the submasters.

In the PARTIAL position, the stalls operator can do NO RECORDING if the record enable key is OFF, and can only use memory numbers 900 and above if the record enable key is ON.

In the FULL position, the stalls operator can use memory numbers 900 and above if the record enable key is OFF, and can use all memory numbers available to the desk if the record enable key is ON.

Lightboard is so arranged that if the main desk is switched off or has a serious fault that prevents the computer from scanning the keyswitches, the computer considers the keys to be all fully ENABLED, thus control of the system can continue from the Stalls unit.

### 5.1.5 DESIGNERS PANEL ENABLE

This switch is fitted to allow a small portable control to be added to the system at a future date.

## 5.2 MEMORY SELECT

The Memory Select keyboard enables the operator to call up memory numbers for use by the playbacks and system record buttons. Two numbers are available, which may differ as described in 5.2.2 and 5.2.4.

### 5.2.1 MEMORY SELECT KEYBOARD AND PLAY NUMBER

The memory select keyboard has buttons for the numbers 0 to 9 and in addition, CLEAR, +1, -1, NEXT, LAST and POINT buttons. Numbers can be entered as on a calculator, most significant digit first. There is no need to enter leading zero's - they will be ignored by the program and will not be displayed. To enter a decimal number, press POINT followed by the decimal value. When three digits have been entered, (hundreds, ten and units), only a decimal point can be entered followed by a decimal number. When a decimal (insert) number is displayed, the fractional part of it can be changed by re-pressing POINT followed by another number. To enter a new whole number CLEAR must be pressed before the number.

+1 increments the selected number by 1, or takes it up to the next whole number if a fraction.

-1 decrements the selected number by 1, or takes it down to the next whole number if a fraction.

NEXT steps the number to the next highest memory number recorded.

LAST steps the number to the next lowest memory number recorded.

The number selected is displayed on the V.D.U. in the Memory Select area, below the heading PLAY. This number is referred to in this text as the MEMORY SELECT PLAY NUMBER, and is used whenever any of the following buttons are pressed:

TAKE )
PLUS ) On either RED or GREEN playbacks
MINUS )

LTG PREVIEW on the memory select panel.

5.2.2 MEMORY SELECT RECORD NUMBER

This number is displayed on the V.D.U. in the Memory Select area, below the heading REC.

The number, and its heading REC are only displayed if recording is enabled.

With REC SEQ deselected, the RECORD NUMBER is exactly the same as the PLAY NUMBER. They may however differ when REC SEQ is selected (see 5.2.4). The Memory Select Record number is always used when the following buttons are pressed:

REC PRESET ) On both RED and
REC TIME ) GREEN playbacks

REC STAGE on the playback panel

The Desk and Stalls palettes have their own record numbers, displayed on each V.D.U. It is possible to change these numbers using SET REC, but normally the desk and Stalls Palette numbers are identical to the memory select record number.

5.2.3 TAKE SEQUENCE

When TAKE SEQ is selected, any action that causes the memory select play number to be used (as listed in 5.2.1), also causes the number to step up to the next available with the required section (e.g.

LTG), after the action. The TAKE SEQ button illuminates when selected and "SEQ" appears on the V.D.U. between PLAY and the play number.

TAKE SEQ steps through only those numbers corresponding to memories previously recorded and containing the required section (e.g. LTG). It will thus step through inserted fractional numbers, and miss out any numbers that have been cleared using MEMORY CLEAR. Recording a blackout is not sufficient to remove a number from the sequence. When the sequence passes the highest number in the memory, it steps to the lowest.

The Playback action buttons CROSSFADE, both MOVES, RAISE and DIM also cause the number to sequence. This is better considered as follows: The playback buttons automatically press TAKE (if TAKE SEQ is selected) after starting the new fade. Since TAKE has been pressed (automatically) the play number will sequence.

### 5.2.4 RECORD SEQUENCE

REC SEQ is illuminated when selected and causes the memory select record number to increment by 1 (or go to the nearest whole number if fractional) after any recording that utilises that number except REC TIME. It is this incrementing that causes the memory select record and play numbers to differ. "SEQ" is displayed on the V.D.U. between REC and the record number when REC SEQ is selected.

To set up record sequence, select the initial record number required, and press REC SEQ to select it.

To record on a number out of sequence when REC SEQ is selected, it must be deselected to allow the required number to be entered from the keyboard.

Although recording on the desk and stalls palettes does not strictly use the memory select record number, any recording done on these panels using the same number will cause the memory select record number to increment after the recording, preventing inadvertant over-recording. REC SEQ will not select unless recording is enabled, and will deselect when it is disabled.

### 5.2.5 TAKE TIME

Take time is illuminated when selected, and causes TAKE, PLUS and MINUS on the RED and GREEN preset stores to use the time recorded with the memory rather than the time currently set on the relevant fade time wheels. It also allows several different fade times to be set up simultaneously in the preset stores. This is explained more fully in section 5.4. If the selected memory has no times recorded with it, the current wheel times are taken as the default values.

### 5.2.6 USE AUTOMOD

USE A-M is illuminated when selected, and causes ALL TRANSFERS from the memory to the system to be modified according to the contents of the automod store. This includes memories and groups called up on any setting panel for local or palette play use, but not memories being transferred to and from disc.

The operation of the automod store is "for socket A, substitute socket B at the level A returned from memory +/- C, or at level C". If socket A is recalled and USE A-M is selected, it is replaced by socket B.

Setting up and displaying the automod store are described in sections 5.5.11 and 5.8.4. Up to 999 entries may be put into the Automod Store, but with large numbers some confusion may arise in socket priorities, since replacing A by B will be equivalent to B having returned from memory. If B is replaced (later in the Automod store) by C, then the nett effect will be to replace A by C.

### 5.2.7 MEMORY SELECT DISPLAY PUSHES.

These are the 4 blue pushes mounted above the memory select keyboard. The bottom of the 4 (LTG) is used to preview lighting memories, and the others to preview PTF, Slide, and Colour Change memories (when fitted). While held pressed, the upper screen display is replaced by a display of the contents of the relevant section of the memory whose number is the current memory select play number. The display push

lights to indicate which sections are available in the selected memory.

The display is headed by the following information:

a) Section heading and memory number.

b) Previous memory number - If the memory number had been changed by a disc SHIFT or RENUMBER operation, its previous memory number is displayed in brackets.

c) Title Blank if not recorded

d) Up fade time " " " " "

e) Down fade time " " " " "

The submaster assignations will be displayed for a multi-part memory. These correspond to the controller each socket would be controlled by if called back using PALETTE PLAY.

If FORMAT LIMIT is not selected, any sockets in the memory that are not currently in the format will be added to the format. If selected, such sockets are displayed dimly, and the V.D.U. format expands to accomodate them while the preview button is held pressed.

## 5.3 RECORDING

### 5.3.1 GENERAL

Lightboard allows the operator to record the current lighting state on stage, or 'blind' states in the preset stores, or just those sockets controlled on setting panels or submasters. In addition, fade times and titles can be added to the memories, and multiple controller memories recorded (for the Palette).

When recording lighting levels, only those sockets that are ON are memorised, with the exception of REC MODS (5.3.8.). This produces compact memories that can be used to define groups of lighting (i.e. when a memory is used as a group, the sockets in the group are those recorded).

The following warnings may be given when record buttons are pressed.

a) HARD WARNING - Recording is not enabled, or there is insufficient room in the memory. Numbers below 1 will produce a hard warning if Houslight Enable is not on. Memory number zero will always produce a hard warning. The stalls record pushes will produce a hard warning if their record number is less than 900 and recording on these numbers is not enabled (see 5.1.4).

   The V.D.U. error message MEMORY FULL may also be reported. If this occurs, some of the memories must be MEMORY CLEARed before recording is possible. They can be saved on disc before being cleared if necessary. If the HARD WARNING sounds, the memory is NOT RECORDED.

b) SOFT WARNING - A memory already exists with this number and containing this information (e.g. lighting, speeds). This serves as a warning to the operator that if he does use this number, he will overrecord a previous memory. If the SOFT WARNING sounds, the memory is NOT RECORDED - to record, press the record button a second time, within 6 seconds of the first attempt. If a longer time interval occurs, the button will once again produce the soft warning - re-press quickly to record.

c) BUTTON FLASHES - If the record button flashes (for about 2 seconds) following the recording, the recording was successful. Note that this is not the length of time that the recording takes (it is completed within a few tens of milliseconds), but only a signal to the operator.

The V.D.U. error message MEMORY ALMOST FULL may be displayed after a successful recording. This is to warn the operator that he is approaching the capacity of the system, and does not indicate

unsuccessful recording.

After a successful recording if AUTODUMP is selected, the memory will be dumped onto disc, and if REC SEQ is selected, the record number will be incremented. Use of the AUTODUMP facility is strongly recommended during plotting or lighting modification sessions (see section 5.9.2.8).

When memories are re-recorded, only the data relevant to the record button pressed is changed, e.g. re-recording using REC STAGE preserves the original title and fade times. Likewise, REC TIME preserves the original lighting levels and title.

### 5.3.2 REC STAGE (PLAYBACK PANEL)

REC STAGE records the current stage lighting state using the MEMORY SELECT RECORD NUMBER. This number will increment after the recording if REC SEQ is selected. The levels recorded will ignore FLASH, FBO and SOLO modifications, i.e. will record those levels displayed on the V.D.U. under STAGE MIMIC.

### 5.3.3 REC STAGE (STALLS)

The button behaves as the playback one, but uses the STALLS RECORD NUMBER displayed on the stalls V.D.U. If this is the same number as the MEMORY SELECT NO., the latter will be incremented if REC SEQ is selected.

### 5.3.4 PRESET RECORD

Each preset store has a record button, that records the current preset lighting state using the MEM SEL REC NO. This number will increment after recording if REC SEQ is selected.

### 5.3.5 RECORD TIME

Each pair of playback fade time wheels have a record button to record the current wheel time (at the bottom of the playback V.D.U. area) using the MEM SEL REC NO. REC TIME does NOT cause the number to

auto-increment.

When working in REC SEQ recording lighting states and times, it is recommended that the time is recorded before the lighting state, since REC TIME does not change the record number.

### 5.3.6 RECORD BUTTONS ON PALETTES

The Stage Record push on the Stalls has already been described (5.3.3). All record buttons mounted on palette use the PALETTE RECORD NUMBER for the palette. If REC SEQ is selected, and the number is the same as the one on the memory select, the latter will increment after a successful recording. If the number was set up under SET REC, this setting panel mode will deselect after a successful recording. Setting panel and submaster record pushes, when used, report on the V.D.U. the number used and record type in the data areas above the setting panel and submasters.

### 5.3.7 SETTING PANEL RECORD

STAGE MODE: (lighting) Records those sockets that are ON on stage (ignoring FLASH, FBO and SOLO), and currently under the control of the relevant setting panel, i.e. V.D.U. displaying * for desk, # for stalls, either flashing or static.

PRESET MODE: (lighting) Records the relevant preset store state, as described in 5.3.4., modified by 5.3.6.

### 5.3.8 SETTING PANEL RECORD MODS

This functions in STAGE MODE only (in preset mode it gives a hard warning). It records sockets that are on stage and controlled by the relevant setting panel, INCLUDING those sockets that are NOT ON (i.e. at level zero, blanked from V.D.U. screen).

The use of the push may be explained as follows:

If a lighting state is faded onto stage, and has to be modified, the modifications can be carried out on the setting panel so that when fully modified, all sockets that have been changed are under control of the setting panel (either directly, or when MASTER is selected).

The modifications can then be recorded using the REC MODS button, which will record all modifications, including those sockets faded to OUT. To re-create the modified scene, the mods memory can be added to the original memory in the preset store, re-creating the modified lighting.

### 5.3.9 SUBMASTER RECORD

Records sockets that are ON on stage, and currently controlled by the relevant submaster. It ignores FBO and SOLO.

### 5.3.10 PALETTE RECORD

PALETTE RECORD records a multi-part memory from the submasters. It is equivalent to pressing all SUBMASTER REC buttons from the left hand end of the submaster panel for all submasters until the last lit TRANSFER button is encountered, and combining the memories so produced into one. A palette memory is split into as many parts (up to 6) as there are submasters fitted and in use. When such a memory is called back on the playback, the various parts are combined as if it was a normal memory. However, when played back using PAL PLAY, the separate parts of the memory split onto different submasters, to enable independent control of the separate parts of the memory. The submasters chosen during the PAL PLAY are always the same as at record time. e.g. If the Transfer buttons on submasters A and C are lit at record time, Palette Play will use submasters A, B, and C (or W, X, and Y on the stalls) although there are no circuits assigned to submaster B.

5.3.11 RECORD TITLE

This is explained in section 5.8.8.4.

5.4 PLAYBACKS

The Lightboard system has two identical playbacks, labelled GREEN and RED. The description that follows relates to either playback - one does not have priority over the other.

The playbacks can be split into 3 logical sections:

a) PRESET STORE - CANCEL
TAKE
PLUS (+)
MINUS (-)
PRESET REC (see 5.3.4)
PRESET PREVIEW

b) FADE TIME CONTROL - TWO WHEELS
FADE CONTROLLER BUTTONS 1-6
ALL FADES
PAUSE
REC TIME (see 5.3.5)
'10 SEC'
MANUAL
INSTANT

c) FADE ACTION PUSHES - CROSSFADE
MOVE UP
MOVE DOWN
RAISE
DIM
PLAYBACK DIM
ALL DIM
REVERSE

d) MISCELLANEOUS - INDEPENDENT

### 5.4.1 FADE CONTROLLERS

Each playback has use of 12 of the 64 fade controllers available on the system (5 more are used on the playback panel, but can not be used by the operator for fades). These fade controllers are organised as six pairs of controllers, and correspond to the 6 lines available on the V.D.U. for playback fades. Each line has an associated up controller and down controller.

By using these fade controllers, it is possible to have six different fades running simultaneously, each with a separate up and down fade time, on each playback. Fades can be started at different times and run simultaneously or a multi-part fade started, each part having a different fade time.

It is important to remember when using multi-speed fades that Lightboard uses a Latest-takes-precedence action, (see 3.4) resulting in individual sockets being controlled only by the last controller to which they were selected. This causes CROSSFADE to cancel all previous fades, since the action of the crossfade removes all sockets from all other fades.

### 5.4.2 FADE TYPES

The fade controllers displayed on the V.D.U. can be in one of four states:

a) NOT USED - the line is blank

b) PRESET - the memories on the controller's line have been set into Preset store, but not yet faded. The line is cyan on blue.

c) LAST - A fade has been started, and may or may not have completed. Controllers in the 'LAST' state are the ones whose fades started the last time an action button was pressed. Note that MOVE UP and MOVE DOWN are sometimes considered as ONE fade action. LAST fades may be reversed by pressing REVERSE. A LAST

fade is indicated on the V.D.U. by '=' between the fade times, and are coloured red on yellow.

d) PREVIOUS - Controllers performing PREVIOUS fades were started before the last fade action button was pressed, and had not completed at the time it was pressed. They are allowed to continue fading (unless CROSSFADE, ALL DIM or STAGE DIM was last pressed, in which case they would have no sockets left on then), but can not be reversed unless they are still running, and a manual reverse fade is used to reverse them. Since they cannot be automatically reversed, their speeds are not required once the fades have completed, and clear from the V.D.U. screen. PREVIOUS fades are indicated by a '-' between the fade times, and are coloured black on yellow.

There may be more than one controller in each of the above 4 states, but never more then 5 pairs selected to preset. They are arranged on the screen in the following order - from top to bottom, PREVIOUS, LAST, PRESET, NOT USED. Each section is arranged in historical order, with oldest fades at the top. This does not mean that the whole screen section is in historical order. If ALL DIM is pressed when there are memories in the preset store, the latter will drop by one line if necessary to allow the LAST fade (All dim) to appear above the preset information.

## 5.4.3 V.D.U. AREA

| Line No. | Contents. |
|---|---|
| 1 | ---------- GREEN PLAYBACK --------- |
| 2 | =UP DOWN REV UP DOWN |
| 3 | 23+24 |
| 4 | 1)104 9 10:40 - 11:30 2 |
| 5 | 2)105+106 F - 0 |
| 6 | 3)107 4 3:00 = 2:50 5 |
| 7 | 4)108+109-109.5 < :20 :30> |
| 8 | |
| 9 | |
| 10 | < :20 :30> |

Controller no...^
Contents section .^^^^^^^^^^^^^
UP-progress (0 to F) .....^
DOWN-progress (F to 0) .....^
Chevrons show wheel control .....^.....^
Speeds .....^.....^
Fade Type .....^

Fig. 1. PLAYBACK V.D.U. AREA.

Line 1 - Heading over playback screen area

Line 2 - On the right are headings over the UP-time and DOWN-time. On the left, the equals signifies LAST, and UP DOWN REV shows that the last fade action was both parts of a MOVE, subsequently reversed. These stay here as a reminder of the last fade, since the fade action buttons go out at the end of the fade.

Line 3 - This is a line of HISTORY. It is the contents section of the previously completed playback action that would otherwise have cleared off the screen, giving the operator one level of history. It is displayed in cyan on black.

Line 4 - A previous fade (from the '-' between the speeds), up time 10 mins 40 secs, Down time 11 mins 30 secs whose up fade has 90% completed, and down fade has 20% left to go.

Line 5 - Another previous fade that has completed - its progress indicators are at F and 0, and since it is a previous fade, its speeds have been cleared. If MOVE was pressed again at this point, it is this line (i.e. 105 + 106) that would copy to line 3. In any event, it will clear from the active area of the screen when the next fade action button is pressed.

Line 6 - The LAST fade to be initiated uses this controller pair. (Note '=' between speed indicating LAST).

Line 7 - Memory 108 has been taken into the preset store, then 109 added in, then 109.5 subtracted, each without 'TAKE TIME'. This was the last thing to be done on the playback, and the wheels are currently controlling these preset speeds, as shown by the chevrons. No fade progress indicators are shown, since the fade has not yet been started.

Line 8 & 9 - Controllers not in use.

Line 10 - this line does not correspond to a useable fade controller, but contains the wheel fade times on the right. These are the times that are recorded when REC TIME is pressed, and are always surrounded by chevrons. When MANUAL is selected, the times between the chevrons are replaced by a message 'MANUAL'. The left hand end of the line, in the 'contents section', is used to allow a fade to be compiled in the preset store when all of the fade controllers are in use. It is referred to as the EMERGENCY CONTROLLER in the remainder of this text.

As an example of the dynamic flexibility of the display, two examples of new fade starts are given, and the resultant changes on the V.D.U. display described:

a) BOTH MOVES PRESSED:

- Line 2, REV is removed
- Line 3, history becomes 105 + 106
- Line 4, remains unaltered
- Line 5, takes the information from line 6, but becomes Previous, i.e. the = is changed to a - .
- Line 6, takes the information from line 7, Fade progress indicators and = appear.
- Line 7 - 9, - Blank

b) CROSSFADE PRESSED (GREEN)

- Line 2, becomes = CROSSFADE UP DOWN
- Line 3, history becomes 107
- Line 4, takes the information from line 7, Fade progress indicators and = appear.
- Lines 5 - 9, Blank.

In addition, all fades displayed on RED playback would have been blanked by pressing GREEN CROSSFADE, provided RED was not selected to INDEPENDENT.

### 5.4.4 INTERACTION BETWEEN PLAYBACKS

The 'contents section' of the playbacks is accurate at the time the memories are compiled in the preset store, but does not change, except to move up the screen, when subsequent fades are started. It serves as a reminder of the method used to put the fade together rather than a definitive 'all sockets in this memory are on this controller'. This is due to the ability of later actions to take sockets from a controller that is already running and redirect them to a new destination at a new speed. When MOVE fades or RAISE or DIM are started, they may take any number between none and all of the sockets from previous fades, and the V.D.U. contents line is not modified.

When CROSSFADE, ALL DIM, or STAGE DIM are pressed, the new fades ALWAYS TAKE ALL of the sockets from the other non-independent playback fades, and these fades are then cleared from the screen, since they are definitely no longer of any use. This applies across both playbacks, thus one of these fades on one playback will cancel all previous and last fades on both playbacks. The Preset store contents are only altered on the playback on which the fade action button is pressed.

#### 5.4.4.1 PLAYBACK INDEPENDENT

Playbacks may be selected to INDEPENDENT to prevent this interaction, in which case only ALL DIM, PARK ALL, or a setting panel selected to USE IND will disturb fades on the playback.

### 5.4.5 PARK ALL

This button relates more to palette functions than playback ones but is described here as it illustrates a concept useful when describing some playback actions.

One of the 64 fade controllers is never used for fading (controller zero) and is called the PARK CONTROLLER. Sockets over which control is no longer required may be PARKED from palette controllers. Their levels on stage are not changed by this process, but they are no longer assigned to a useful controller.

There are buttons on each submaster and playback labelled IND, used to hold sockets on the controllers and stop normal playback fade actions from taking control of these sockets (e.g. to hold orchestra or working lights). The only playback fade action that has access to these sockets is ALL DIM.

PARK ALL deselects all IND pushes fitted to the system, and then parks all sockets under the control of palettes. In this way, any fade action, if preceded by PARK ALL, has access to sockets held on Independent Controllers.

### 5.4.6 PRESET STORE ACTIONS

The Preset Stores contain two pieces of information for each socket - the level at which it came back from the memory and the controller that will control it when a fade starts. The latter is always a controller that is not currently fading, i.e. one in preset mode, and the controller's fade times are updated and displayed on the screen when memories are first transferred to the preset store. When the preset fades have been started, the controllers are no longer in preset mode and the controller assignations in the preset store are cleared. Further implications of this are explained in the section dealing with playback actions.

When TAKE TIME is NOT in use, memories transferred to the preset store are transferred with the fade times currently shown by the wheel speed indicators at the bottom of the screen, and if more than one memory is transferred to the preset store (subsequent ones using PLUS or MINUS), they combine on the same fade controllers. They appear on the screen on the same line, until the line becomes full, when a '+' is put at the end of the line to indicate that more have been selected than it is possible to display.

When TAKE TIME is in use, it is possible to use up to 5 lines (i.e. 5 controller pairs) for the preset store, each with its own separate up and down fade time. The controller times (and wheel times) will be set to the recorded times if any are recorded as part of the memory, otherwise the controller will take the current wheel times. If subsequent memories are transferred using PLUS or MINUS, each appears on a separate fade controller with separate speed.

Up to 5 fade controller pairs may be used in this way. After 5, the preset PLUS and MINUS buttons sound the SOFT WARNING when pressed. This is to ensure that there is always one fade controller available for an ALL DIM or PLAYBACK DIM.

If all fade controllers become occupied before the 5th Preset line is used, further preset actions will compile onto the EMERGENCY CONTROLLER, and will still take the recorded time, but will display horizontally across the screen and otherwise behave as if TAKE TIME was not selected.

If the EMERGENCY CONTROLLER is in use, there are some restrictions about the type of fade that can be done. ALL DIM, PLAYBACK DIM and CROSSFADE can ALWAYS be started since they clear previous fades from the screen to make room for the preset fade lines to move from the emergency controller to a valid controller. The other fade actions (MOVES, RAISE, DIM) can only be started if one or more of the fade controller pairs has completed, and will therefore make room for the emergency controller line.

### 5.4.6.1 PRESET CANCEL

Preset cancel clears all sockets and controller assignations from the preset store, and clears all V.D.U. lines associated with the preset store. It extinguishes all preset buttons on the same playback.

### 5.4.6.2 PRESET TAKE

Preset take initially does the same as preset cancel, and then copies all sockets from the selected memory (using the memory select play number) into the preset store, assigning them to the first available

controller. The push illuminates when pressed, and PLUS and MINUS EXTINGUISH.

5.4.6.3 PRESET PLUS (+)

Preset Plus does a similar function to TAKE, but does not do the initial cancel. Sockets that come back from the memory overlay the preset store, taking precedence over levels and controllers already assigned in the preset store, on a latest-takes-precedence basis. An example follows 5.4.6.4. The preset plus button illuminates when pressed, and Take and Minus extinguish.

5.4.6.4 PRESET MINUS (-)

Preset Minus uses the same memory select play number, but sockets that come back from the memory are put to level zero in the preset store. They are still assigned to the controller, and can thus take part in the remainder dim part of a crossfade at a different speed. Preset Minus illuminates when pressed, and Take and Plus extinguishes.

An example follows:

| Action/mem contents | Socket (level/controller) | | |
|---|---|---|---|
| | 24 | 25 | 26 |
| TAKE: 24/5H, 25/6H | 5H/1 | 6H/1 | - |
| PLUS: 25/4Q, 26/1H | " | 4Q/2 | 1H/1 |
| MINUS: 25/3 | " | 0/3 | " |
| Nett result: level: | 5H | Zero | 1H |
| Controller: | 1 | 3 | 2 |

If TAKE SEQ is selected, PRESET PLUS, MINUS and TAKE cause the MEMORY SELECT PLAY NUMBER to step on to the next lighting memory after the preset actions.

#### 5.4.6.5 PRESET PREVIEW

The PRESET PREVIEW buttons (mounted above PRESET CANCEL) display the contents of the preset store while held pressed. Current stage controller assignations are still displayed as part of the preset display.

### 5.4.7 FADE TIME CONTROL

Fade times are controlled by the pairs of wheels on each playback. The left hand wheel controls the up-time, and the right hand wheel the down-time. By moving the wheels away from the operator, the fade times can be decreased, and vice versa. The range available is 60 minutes to half a second, though times shorter than 1 second will display as 1 second on the screen. The time control has a logarithmic response, requiring about 3 quadrants of wheel movement to cover the entire speed range.

#### 5.4.7.1 STANDARD SPEED PUSH

A small button is provided to the right of the wheels to instantly set them both to 10 seconds, saving some time when setting short fade times.

#### 5.4.7.2 CONTROLLER BUTTONS/ALL FADES

a) The 6 controller buttons each correspond to a line of fade data on the VDU, the first one to the top line, the second to the next, etc. When a button is selected (i.e. lit) the wheels directly control the speed of that fade or set up its speed in the preset store. The controlled speeds are indicated on the VDU by chevrons. When a VDU line is in use, its number (1-6) is indicated at its left hand end, separated from the memory numbers by a ')'.

b) When a preset action is performed, the button corresponding to the last preset entry automatically selects, deselecting the rest.

c) When a playback action is performed, the button(s) corresponding to the last fade(s) started select, deselecting the rest.

d) During fades performed under TAKE SEQ, starting a fade leaves the button corresponding to the last fades lit. At the end of the fade, the buttons corresponding to the next fade automatically select, as if a preset action had been performed.

e) When more than one fade speed is being controlled, the speeds adjust proportionately. A wheel movement that takes one fade time from 5 to 10 seconds will take another set at 10 seconds to approximately 20 seconds.

f) To control different sets of controllers than outlined above, the fade controller buttons may be selected individually or in groups. Their response is always to select when pressed.

i) Pressing one fade controller button will cause it to select and the rest to deselect.

ii) Pressing several fade controller buttons together causes all pressed to select and the rest to deselect.

iii) Pressing one or more fade controller buttons that are already selected cause them to stay selected and the rest to deselect.

iv) If the button pressed does not correspond to a line on the screen (i.e. one that is not currently in use), or corresponds to a line that has neither speed displayed (i.e. a previous fade with both halves finished), the button will not select, and the soft warning will sound while the button is pressed.

v) It is sometimes necessary to deselect specific controller buttons, e.g. when all fade controllers are in use and the wheel speeds have to be set for another action. This may be done by pressing the ones requiring deselection with the footpush held down.

g) The ALL FADES button is used to automatically select all running fades (both last and previous), providing a fast way of gaining access to the speeds of all running fades on that playback. The fade controller buttons corresponding to preset store selections deselect.

h) The INSTANT, PAUSE and MANUAL buttons act on only those fades whose fade controller buttons are selected. This gives the additional advantage that individual fades may be paused or completed instantly, and up to 6 groups of lighting may be separately balanced using MANUAL selectively.

5.4.7.3 PAUSE

Pause is used when it is necessary to interrupt or hold a fade for an indefinite period.

PAUSE interrupts (or allows to continue) all fades that currently have their fade controller buttons lit.

Selecting PAUSE will cause all relevant fades to pause, and deselecting PAUSE will cause all relevant fades to continue. Paused controllers are indicated by a 'P' on the V.D.U. between the 'controlled' chevrons and the fade progress indicators.

PAUSE deselects when a new fade action is started, and at that point, any fades that are paused are considered to have completed, and cleared from the screen.

### 5.4.7.4 INSTANT

INSTANT provides the operator with a means of performing snap lighting changes on stage. If it is being pressed when a fade action is started, that fade action completes immediately.

INSTANT only completes fades with fade controller buttons selected, and will complete all such fades, including paused ones. INSTANT may be used to complete fades even if MANUAL is selected.

### 5.4.7.5 MANUAL

If the operator has a fade that needs careful timing,or one which requires 'riding', he can control the fade manually by selecting MANUAL.

With MANUAL selected, it is still necessary to transfer memories to the Preset store, and press a fade action button to determine the type of fade. Thereafter, the fade will be under operator control, the UP-wheel controlling the sockets fading up, and the DOWN wheel those fading down both assuming a forward fade direction. A wheel sweep of 1 quadrant away from the operator will complete all fades on the playback. When the LAST fades have completed, the selected fade action button will go out, but it is possible to reverse the fades by moving the wheel towards the operator. Alternatively, REVERSE may be pressed, and the wheels once again moved away from the operator to complete the reverse fade. PREVIOUS fades can be reversed by moving the wheels towards the operator, but when the fades complete, the sockets are automatically parked, and the operator looses control of them.

MANUAL will control all fades with fade controller buttons selected, including paused fades.

MANUAL is illuminated when selected. MANUAL can be selected part-way through a fade if desired, and the fade continued manually, then deselected, and the fade completed automatically.

### 5.4.8 FADE ACTIONS

#### 5.4.8.1 ALL DIM

ALL DIM fades all sockets to OUT using the fade time set on the down-wheel. It is equivalent to pressing PARK ALL (since it takes control of all sockets, even those on independent controllers), followed by PLAYBACK DIM. If used with INSTANT, it is equivalent to a DBO, and can be reversed to restore the previous stage lighting state, but not changes that were taking place.

#### 5.4.8.2 PLAYBACK DIM

PLAYBACK DIM fades all sockets not selected to Independent to OUT using the fade time set on the down-wheel. It can be used to fade or cut out all lighting, except sockets specifically held on a palette.

PLAYBACK DIM and ALL DIM both ignore the preset store and leave it undisturbed. Since they remove all sockets from other playback fades and also from non-independent controllers, all previous playback and palette fade information on the V.D.U's (other than above independent submasters or playbacks) is cleared. "PLAYBACK DIM" or "ALL DIM" is written into the contents section of the relevant playback controller V.D.U. line, and only a down fade progress indicator is displayed.

#### 5.4.8.3 CROSSFADE

CROSSFADE also removes all sockets from other non-independent playback fades and palettes. Sockets in the preset store whose preset levels are higher than their stage levels are faded to their preset levels using the fade time set on the relevant up-controller. Similarly, sockets in the preset store whose preset levels are lower than their stage levels are faded to their preset levels using the fade time set on the relevant down-controller. Sockets whose levels are OUT in the preset store, and have no controller assignation (i.e. those that did not come back as part of any memories compiled into the preset store) represent the 'remainder dim' part of the fade, and use the fade time of the down-controller that is lowest on the screen.

In general, CROSSFADE replaces all of the lighting on stage with the new lighting state in the preset store.

If, when CROSSFADE is pressed, none of the V.D.U. lines are in preset mode (i.e. no new selections have been made to the preset store) a new fade is initiated on a new controller, using the speeds currently set on the wheels. 'CROSSFADE' is written into the contents section of the V.D.U. line. Repeat MOVE, RAISE, or DIM fades behave in a similar way.

### 5.4.8.4 MOVE UP

MOVE UP takes control of only those sockets it requires, leaving all other fades running. It fades all sockets whose levels are higher in the preset store than on stage, and are not on independent controllers to their preset level in the time set on the relevant up-controllers. It can be used in conjunction with MOVE DOWN as described in 5.4.8.5.

### 5.4.8.5 MOVE DOWN

Like MOVE UP, MOVE DOWN takes control of only those sockets it requires. It fades all sockets whose levels are lower in the preset store than on stage, (but not those sockets whose preset levels are OUT or sockets on independent controllers), to their preset level, in the time set on the relevant down controllers.

MOVE UP and MOVE DOWN (and RAISE and DIM) do not clear all previous fades in the way previously described. Any fades still running when the fade action button is pressed will continue to run, and become PREVIOUS fades. Any fades that have completed, or have been stopped using PAUSE, will be cleared from the screen and their sockets parked.

MOVE UP and MOVE DOWN differ from other main fades in the following way. ALL DIM, PLAYBACK DIM, RAISE, DIM and CROSSFADE, when pressed, always behave as a new fade, either using any new entries in the preset store or taking a new controller line: they are mutually exclusive (i.e. only one can be selected at a time).

MOVE UP and MOVE DOWN can be selected TOGETHER. If a MOVE UP is started, the MOVE DOWN part of the fade can be started later on the same controllers, even if the MOVE UP has completed. The same applies if MOVE DOWN is pressed before MOVE UP. Each MOVE action is considered as a partial fade action, and PAUSE, INSTANT, and REVERSE will only act on those parts that have been started. The second part of the fade cannot be started following another fade action, or REVERSE, or preset store changes. When any of these occur, the partial fade action is considered complete, and starting its other half will cause a new fade to start. TAKE SEQ is only actioned when both MOVE UP and MOVE DOWN have been started.

If either move is pressed and there is no outstanding partial fade waiting to start and no new preset entries have been made, a new controller is used as described under CROSSFADE.

When doing combined moves (both MOVE UP and MOVE DOWN), it is possible for sockets to escape - consider the following example:

If socket 1 is fading on another controller and its preset level is 50%, a MOVE UP will only take control of it if its level is less than 50%, and a MOVE DOWN will only take control of it if its level is greater than 50%. It is possible that neither of these conditions will be met due to the socket level passing 5 between the computation of the two halves of the move fade.

This may be overcome by utilising the REMAINDER MOVE facility. When the second half of the move is computed, if the move button first pressed is STILL HELD PRESSED, all other sockets that should take part in the combined move will be controlled, and will fade to their destination. They may be on the wrong controller however, since they will be assigned to the second. e.g. If socket 1 moved from 45% to 55% between the MOVE DOWN and MOVE UP, it will be controlled by the

UP controller (provided MOVE DOWN is still held pressed), and will fade DOWN to its preset level of 50%.

In this way it is possible to perform a complete (single button) MOVE fade by ensuring that the second button is pressed before the first is released. REMAINDER MOVE only applies when the two moves are performed as partial sections of the same fade.

5.4.8.6 DIM

DIM takes control of only those sockets it requires. Any sockets that are NOT OUT in the preset store, and are not on an independent controller, are faded to OUT using the fade times set on the relevant down controllers. Fades in progress are not cleared (5.4.8.5). If there is no new preset information, a new controller is used (5.4.8.3).

5.4.8.7 RAISE

RAISE also takes control of only those sockets it requires, and is complementary in function to DIM. Any sockets that are NOT OUT in the preset store, and are not on an independent controller, are faded to FULL using the fade times set on the relevant UP controllers. Fades in progress and unchanged preset situations behave as DIM.

5.4.8.8 REVERSE

REVERSE differs from all other fade action buttons in that it never starts a new fade, and always selects with another fade action button (or two if the last fade was both MOVES). It can be selected once only per fade, and reverses the direction of the last fade controllers. The fade action button(s) that were used for the last fades illuminate with the reverse button. When one reverse fade has completed, it is not possible to initiate further reverse fades until another fade action has been done, and the soft warning will sound if reverse is pressed. During reverse fades, the up-wheel will control the speed of sockets that are fading down and vice versa, i.e. sockets will be controlled by the same controllers as they were during the forward fade. INSTANT and PAUSE work in the same way for

reverse as they do for forward fades. It is not possible to reverse PREVIOUS fades using REVERSE.

### 5.4.8.9 FADE TO BLACKOUT

FADE TO BLACKOUT is an overall system inhibit that allows lighting on stage to be faded to blackout and back to the system level (instantly or manually if required) without disturbing any controller assignations or other fades running on the system. It uses an INHIBIT type fade (see 3.5.c).

When selected, the push lights, and ALL SOCKETS fade to out at the speed set on the green playback down wheel. When the fade has completed, the FBO button flashes.

The fade may be reversed, either during the fade or when it has completed, by re-pressing FBO (NOTE - NOT REVERSE). When a reverse FBO fade has completed (to no inhibit), the FBO button extinguishes.

FADE TO BLACKOUT (or its reverse) can be completed instantly by pressing GREEN PLAYBACK INSTANT, or operated manually (on the GREEN PLAYBACK DOWN WHEEL) if the green playback is selected to MANUAL. Both of these may also alter fades running on the green playback.

## 5.5 SETTING PANEL

### 5.5.1 GENERAL

Each palette fitted to the Lightboard system consists of two sections - the SETTING PANEL and SUBMASTERS. The submasters are described in 5.6.

The Setting Panels fitted to the desk and stalls palettes are indentical. This section describes the desk setting panel, the only operational difference to be rembered is that sockets under the control of the desk setting panel display with a star (*), in yellow, on the upper part of the V.D.U. screeen, and those under control of the stalls setting panel display with a (#), in violet.

The Setting Panel is the section of the Lightboard system used to set up and modify lighting states. It can control Memories, Groups or Sockets, or combinations of all three. It can be used to adjust the lighting currently on stage, or in either preset store, using the keyboard or wheel (stage only) to modify the selected state. It can also be used to control colour changers.

## 5.5.2 V.D.U. DISPLAY

### 5.5.2.1 Upper Screen

When a socket is being controlled on stage by the setting panel, its stage display on the upper part of the V.D.U. screen has a * (or # for stalls) to the right of the socket level, and the colour of the socket display is yellow (or violet for stalls).

If this setting panel indicator is flashing (with reverse video on colour monitors), it means that the socket is directly under the control of the keyboard or wheel. (It is on the 'Setting Panel keyboard controller' - See section 5.5.3.2.)

If this setting panel indicator is not flashing (normal video on colour monitors), the sockets can be controlled by selecting MASTER on the setting panel. ('Setting Panel Master Controller').

Sockets that are called up and controlled on the setting panel can either be parked onto the playback (* vanishes) if CLEAR or PARK are pressed before the next selection, or transferred to the Master Controller (* stops flashing) if the next selection is made without using the above pushes.

### 5.5.2.2 Setting Panel V.D.U. Push

This is the small push mounted to the right of the wheel. When pressed, the upper screen is changed to display only those sockets currently assigned to setting panel controllers, i.e. those with a *. It is used to identify those sockets currently controlled from what may otherwise be a complex display. If MASTER is selected, the display includes those sockets on both the S.P. keyboard and master

controllers. Otherwise, only those on the keyboard controller or under control in the relevant preset store are displayed.

5.5.2.3 STAGE/GREEN/RED Mimic Pushes

These pushes select the upper screen display to show the stage lighting state, or the state in either preset store. The required display is selected by pressing the relevant button, which lights to indicate the source of the upper screen display.

If the operator finds that the upper screen display is distracting,it can be blanked out by deselecting the mimic button currently selected. Alternatively one of the other upper screen selections (AUTOMOD, MEMORY LIST) on the supervisory panel may be selected (see 5.8.4.). The Stalls operator has other display facilities available to him (see section 5.7.5.).

The small V.D.U. pushes by the palette wheels, preset stores and the memory select view pushes always take priority over the normally selected upper screen display. The upper screen returns to the selected display when the local button is released.

5.5.2.4 Full Display

When selected, the socket levels displayed on the upper screen are in full, i.e. with Q,H,T or two digit percentage levels. Full submaster identification (A-D, W-Z) is also displayed.

The information on the upper part of the screen can be simplified by deselecting FULL DISPLAY, which may improve clarity with complex screen displays. When deselected, the socket levels are displayed at a reduced brillance, the second character of the level is suppressed (e.g. 58 or 5T becomes just 5), and submaster identification is not shown.

5.5.2.5 Setting Panel Lower Screen Display

| Line No. | Contents | |
|---|---|---|
| 1 | --- SETTING PANEL -- | |
| 2 | RECORD NO. 12.6 | |
| 3 | | |
| 4 | | |
| 5 | M1+2 | @+100% |
| 6 | M3-S4-5 | @+ 70% |
| 7 | G3+S4 | @- 15% |
| 8 | S6 | @ 4H |
| 9 | S4 | 5T |
| 10 | | |

Fig. 2. SETTING PANEL V.D.U. AREA

The display appears at the bottom of the V.D.U. screen above the palette.

Line 1 : is a heading line and does not change.

Line 2 : This shows the number that will be used when any of the palette RECORD pushes are pressed. (Including STAGE REC on the Stalls palette). It is normally the same number that is displayed above the memory select panel, but can be changed by using the SET REC facility on the setting panel. The line is blank when recording is disabled.

Lines 3-8 : These lines display the sequence of operations used to set up the lighting currently controlled by the setting panel. When new lighting is entered on the keyboard, the previous selections roll up the screen, thus the previous 6 selections are normally visible. In this case, the sequence of operations was:

Line 5 : Memories 1 and 2 were added together and faded to 100%, on either the wheel or keyboard. (Move fade).

Line 6 : Memory 3 excluding sockets 4 and 5 was then faded to 70% on either the wheel or keyboard (Move fade).

Line 7 : A group of lighting made up from the sockets ON in memory number 3 and socket 4 was dimmed by 15% on the wheel or keyboard (Group fade).

Line 8 : Socket 6 was then put at level 4.5. It may have been put to a different level and then adjusted by the wheel.

Line 9 : Socket 4 has been selected but not yet controlled. Its current level is displayed as 5T. Note - if Preset mode was selected, this would be the level currently in the selected preset store.

Line 10: is blank at the present time.

As soon as the operator presses @, or moves the wheel, lines 9 and 10 will change to:

```
9                S4          @ - 15%
10               GROUP
```

Here, the wheel has been moved down 15%, or @ - 1.5 entered on the keyboard. Line 10 shows the type of fade being performed.
If MASTER is selected, Line 10 will display:

```
10           GROUP MASTER    @+10%
```

In this example, the wheel was moved up by 10%, or a keyboard action performed. When MASTER is selected, the levels on lines 9 and 10 track together.

The levels displayed to the right of the Setting Panel V.D.U. lines will either be % changes, or direct level (e.g. 5H).

a) When a Socket (or a combination of sockets) is called up, the level of the latest one (see "Valid Socket No.," section 5.5.3.9) is displayed as a direct level, until the levels of those sockets are controlled.

b) When they are controlled, @ appears on the right of the screen to indicate that a mode change has taken place.

However, if a move fade is being performed, or the wheel moved, or the level adjusted proportionally from its current value on the keyboard using @+ or @-, the sockets controlled will probably be at different levels. In this case, a change in level is indicated, e.g. @+70%.

c) When the mode of fade is GROUP, it is possible to put all the sockets on the group to the same level, by entering it on the keyboard, e.g. @5.5. Since all sockets are now definitely at the same level, a direct level is displayed, and will continue to be displayed even though it is subsequently modified using the wheel or keyboard.

## 5.5.3 SETTING PANEL TERMINOLOGY

The following section explains the terminology used to describe the various functions of the setting panel.

### 5.5.3.1 STAGE/PRESET MODE

The keyboard can be used to control sockets, groups, or memories in either the Stage Lighting ('live'), or in either preset store. Some restrictions apply when used in preset mode, e.g. only the keyboard can be used to set levels. MASTER can not be used. Selections can not be transferred to submasters while in preset mode.

5.5.3.2 FADE CONTROLLERS

Two fade controllers are used by each setting panel selected to Stage Mode. The "Setting Panel keyboard controller" is the one used initially to set up lighting. When further selections are made without parking previous ones, the latter are transferred to the "Setting Panel Master Controller". When MASTER is selected, both of these controllers are mastered by the wheel or keyboard. Submaster TRANSFER uses the lighting on both controllers.

5.5.3.3 SOCKET SELECTION/LEVEL MODE

The setting panel keyboard is normally in one of these two modes. It switches automatically between these modes according to the keyboard buttons the operator presses.

In SOCKET SELECTION MODE, Memories, Groups, or Sockets can be called up and combined. The keyboard mode changes from SOCKET SELECTION to LEVEL mode when the wheel is moved (not preset mode), or when one of the following buttons is pressed: @, REM DIM, FLASH, MASTER, SOLO - i.e. when control of the lighting is required.

In LEVEL MODE, the levels of the selected memories, groups, or sockets can be controlled either on the wheel (not preset mode), or on the keyboard. The keyboard mode changes back from level to socket mode when a new memory, group, or socket is entered (i.e. a number when @ is not alight), or when the following buttons are pressed: MEM, GROUP, SOCKET, CLEAR, NEXT, LAST, PARK, CANCEL. Level mode is indicated by an @ symbol on the V.D.U. towards the right of line 9 (see 5.5.2.5).

5.5.3.4 RECORD NUMBER MODE

This mode allows the operator to set up a record number for the palette that differs from the memory select number. This is essentially a stalls facility, but is also fitted to the desk palette. It does not change the lighting controlled by the setting panel, and may be selected by pressing SET REC. The keyboard then changes the record number (on line 2) rather than any socket

selection or level. It deselects automatically after a successful record, or when SET REC is deselected manually, returning the setting panel to the same state as it was in when SET REC was originally selected.

5.5.3.5 LINE OVERFLOW

When entering large numbers of memories, groups, or sockets, the line (line 9) may become full. When this occurs, it slides left to allow the latest number to always be visible.

5.5.3.6 GROUPS

There are two ways of setting up groups on the setting panel.

If a group of lights is set up by calling up sockets and combining them individually all sockets called up will be controlled.

If the GROUP push is used, the keyboard number is treated as a memory number, and the required memory fetched. The sockets that are part of that memory, and are NOT OFF on stage, are the ones used to make up the group, as if these sockets had been called up individually. This is particularly useful in the following setting sequence:

a) Call up Memory 10 @ Full

b) Modify socket 24 to out since it is not required in the scene.

c) Call up Group 10 and raise the wheel by 10%

The third operation increases the levels on stage of all of the sockets in the memory to above their recorded levels, excluding socket 24 that had been removed from the scene.

5.5.3.7 COMBINING MOVE AND GROUP FADES

Fade controllers control either MOVE or GROUP fades, never a combinations of the two, since the latter would produce unpredictable lighting changes on stage. It is possible to combine memories

(normally move fades) and Groups or sockets (normally group fades) and then control the lighting combinations in 3 ways:

a) Under Socket mode on the setting panel, e.g. M3+S4.

b) By selecting MASTER - the two controllers may have been controlling different types of fade before its selection.

c) By transferring lighting to a submaster which is already controlling lighting.

The following convention has been adopted for this system.

A MOVE fade will result from combining two or more MOVE fades, or calling up a memory or combination of memories, or memories minus sockets or memories minus groups on the setting panel. All sockets then have a destination level, since minus socket or group just means "not including these sockets".

As soon as a group fade is combined with a move fade, or 'plus group' or 'plus socket' is called up on the setting panel, the fade types of the resultant fade will be GROUP, since some sockets exist within it that do not have destination levels.

Whenever two sets of lighting previously on separate fade controllers are controlled on one (e.g. after TRANSFER), or are controlled by one wheel (e.g. after MASTER is selected), the fades are recalculated to compensate for the different master positions of the two fade controllers. After such an operation, sockets on MOVE fades will reach their destination at a slower rate, but will all reach it at the same time, when the master level reaches 100%. Sockets on GROUP fades are considered to have a re-defined balance. All underflows or overflows that would allow them to return to a previously defined balance are lost. For both MOVE and GROUP fades, the master position is reset to zero.

5.5.3.8 FADE DIRECTION

Sockets selected to a GROUP fade all travel in the same direction when the wheel is moved; up when moved away from the operator, and down when moved towards him. The one exception is those sockets inhibited by SOLO.

During MOVE fades, sockets may travel in either direction, but will always go towards their destinations as the wheel is moved away from the operator.

5.5.3.9 VALID SOCKET NUMBER

Some operations on the setting panel (e.g. A-M SET, A-M REP, IDENT) require a socket number with which to work. This is always the latest socket number entered on the keyboard. It is valid only if this socket exists, if socket is selected and if the number is being displayed on line 9 of the V.D.U. setting panel display.

5.5.4 STAGE/GREEN/RED MODE

These three pushes determine whether the setting panel is controlling the current stage lighting state, or the blind states in either preset store. One of the three pushes is always lit, indicationg the current mode. To change mode, press the required button. This causes the setting panel lower screen display to clear, and if changing from STAGE to PRESET mode, also causes all sockets controlled on the setting panel to park. SET REC deselects if it was previously selected, and socket mode is selected.

5.5.5 KEYBOARD OPERATIONS - SOCKET SELECT MODE

5.5.5.1 CLEAR

This clears the keyboard display line (line 9) on the V.D.U., except for a single M/G/S indicator at its left hand end. Any combinations of memories, groups, and sockets that had been combined or called up are parked.

5.5.5.2 MEM/GROUP/SOCKET

- These three pushes are mutually exclusive, and determine whether numbers entered on the keyboard are to be interpreted as memories, groups, or sockets. The selected button illuminates.

If one of these pushes is pressed, and not prefaced by + or -, a CLEAR (5.5.5.1) is automatically done before the mem/group/socket selection changes.

If some lighting has already been called up, the selection can be changed prior to entering the next number, provided it is prefaced by + or -, e.g. to add socket 2 to group 12, press GROUP 1 2 + SOCKET 2. Alternatively to remove a socket from a memory state, press MEM 2 3 - SOCKET 6.

Once the mem/group/socket selection has been made, there is no need to keep re-selecting the required state, e.g. SOCKET 1 2 + 1 4 will display S12+14 and give control of sockets 12 and 14.

If an error is made entering the current number, it can be individually cleared by re-pressing the selected MEM/GROUP/SOCKET push. This will cause it to clear without disturbing earlier selections.

5.5.5.3 0-9, POINT

The numeric part of the keyboard behaves in the same way as the memory select keyboard (5.2.1). POINT will only operate if MEM or GROUP are selected, or if SET REC is lit.

5.5.5.4 PLUS (+), MINUS (-)

These are used to combine memories, groups and sockets before they are controlled.

a) PLUS MEM adds the sockets in the memory to those already awaiting control. If earlier selections on the same line of the V.D.U. would produce a MOVE fade, the new destination levels replace previous ones for common sockets (Latest takes precedence). If the earlier selection would produce a GROUP fade, this push acts in a similar way to PLUS GROUP, but includes those sockets that are OFF on stage in the new group if they are part of the selected memory.

b) PLUS GROUP includes in the group to be controlled those sockets that are part of the selected group, and also NOT OFF. It also ensures that the resulting fade will be a GROUP.

c) PLUS SOCKET includes the selected sockets in the group to be controlled, and ensures that the resulting fade will be a GROUP FADE.

d) MINUS MEM, MINUS GROUP act in the same way, and remove sockets that are part of the selected memories or groups from those that will be controlled.

e) MINUS SOCKET acts in the same way as minus group, but for individually selected sockets.

5.5.5.5 NEXT, LAST

These buttons provide a convenient way of calling up sequences of memories, groups, or sockets. Although clear may have been pressed, or the previous levels controlled, the setting panel always remembers the last number that was entered.

a) If the NEXT or LAST button is used at the start of a line, or in the middle of a line when prefaced by + or -, the next available number is used (either higher or lower) as if it had been entered on the keyboard, e.g. S 1 2 CLEAR NEXT produces S13 on the V.D.U. Similarly, S 1 2 + NEXT produces S12 + 13 on the V.D.U.

b) If a number has already been entered without being followed by + or -, the NEXT and LAST buttons step that number up or down in the same way.

If MEM or GROUP are selected, the number steps through lighting states available in the memory. If SOCKET is selected, it steps through socket numbers fitted to the system. Both roll over at the end of the sequence, e.g. NEXT on socket 400 (where 400 is the highest socket number in the system) changes the number to the lowest in the system.

5.5.5.6 @/WHEEL MOVEMENT

Both pressing @ and moving the wheel (Stage mode only) in socket select mode try to change the mode to level mode, and take control of the selected lighting. If this does not give the operator control of any sockets, a soft warning sounds, and an automatic CLEAR is pressed (5.5.5.1). If this action does result in sockets being controlled, the mode is changed to level mode, and if @ was pressed, it lights at full intensity. At this stage, the operator has already started controlling levels.

5.5.5.7 THRU

THRU may be used to call up sequential SOCKETS or GROUPS. If control of sockets 1 to 5 inclusive is required, enter S 1 THRU 5. (THRU is indicated on the V.D.U. by a chevron >.) It may also be used to delete sequential sockets or groups from a selection, e.g. S 1 THRU 100 - 20 THRU 30 is the same as S 1 THRU 19 + 31 THRU 100. When using THRU with socket numbers, the first socket number in the sequence must be valid.

5.5.6 KEYBOARD OPERATIONS - LEVEL MODE

5.5.6.1 WHEEL CONTROL (STAGE MODE ONLY)

At any time when in level mode, the levels of the controlled sockets can be adjusted using the wheel.

5.5.6.2 KEYBOARD LEVEL ENTRY, @, +, -, NEXT, LAST

Likewise, at any time when in level mode, the levels of the controlled sockets can be adjusted on the keyboard by selecting @, followed by a level from the keyboard.

a) When @ is at full intensity, a whole number level can be entered between 0 - 9 and F (full). If a MOVE fade is being controlled, this is equivalent to setting the master at that level, e.g. @ 5 will display as +50% on the V.D.U., and the lighting will change to the same state as it would if the wheel was moved until the V.D.U. reported 50%. If a GROUP fade is being controlled, all sockets that are part of that group are put at that level, and the V.D.U. reports the level directly, e.g. if sockets 1, 2, and 3 are at levels 4, 5 and 6 respectively, @ 2 would put them all to level 2. This group operation cannot be carried out on the wheel alone, but once it has been done, the sockets can be controlled by the wheel and will all stay at the same intensity.

b) If @ is at full intensity, and the + or - buttons are pressed before the required level, the level entered modifies the existing wheel level for both MOVE and GROUP fades.

e.g. if wheel level is 50%, @ + 2 displays +70%
@ - 1 displays +40%

or for direct group fades, 4H,
@ + 2 displays 6H
@ - 1 displays 3H

c) The @ button extinguishes when the first digit of the level has been entered. To adjust levels to closer than 10%, the POINT key may be used. Pressing POINT causes @ to light at half intensity, and the following digit to be used as the units level digit.

e.g.

| | | | |
|---|---|---|---|
| 50%, | @ + 2.5 | displays | +75% |
| | @ - 1.5 | displays | +35% |
| 4H | @ + 1.5 | displays | 6 |
| Any | @ 6.5 | displays | 6H (GROUP), +65% (MOVE) |

POINT can also be used when @ is at full intensity, to give just a units change. When the units level has been entered, the @ button goes out.

d) + and - can be used when @ is out. When either is pressed under these conditions it automatically presses @ before its action.

i.e. S 1 4 @ 4 @ + 1 @ - .5

could be obtained by pressing S 1 4 @ 4 + 1 - .5.

e) NOTE - The NEXT and LAST pushes do not change socket levels, but select the next socket as described in 5.5.6.3

5.5.6.3 RETURNING TO SOCKET SELECT MODE

When the keyboard returns to SOCKET SELECT mode, the sockets that have been controlled are either parked, or transferred to the master controller. These operations are automatic, as is the return to socket mode, and they are initiated by one of the following:

a) If @ is out and a number 0-9 or point is entered (0-9 only if SOCKET is selected), an automatic transfer is done, and the number used as the first entry in socket mode. This is the normal operational procedure. e.g. Pressing S 2 3 @ 5 4 will display S25@5 on line 8 and S4 on line 9. It transfers socket 23 to the master controller, and enters 4 as the first digit of the next socket number. Thus the clear push need never be used - the procedure is just number/set its level/next number ....etc.

b) CLEAR parks the sockets controlled by the keyboard controller only and returns to socket select mode.

c) MEM/GROUP/SOCKET transfer the sockets to the master controller and returns to socket select mode with either memory, group or socket selected corresponding to the button pressed.

d) NEXT or LAST transfers the previous sockets to the master controller, the keyboard returns to socket select mode and then acts as if the new socket had been keyed in socket select mode (see 5.5.5.5).

5.5.6.4 RESTRICTIONS IN PRESET MODE

a) The wheel can not be used to set preset levels.

b) Flash (5.5.7.3), MASTER and SOLO are not valid in Preset mode.

5.5.7 OTHER SOCKET/LEVEL RELATED PUSHES

5.5.7.1 PARK

This button parks all sockets controlled by the Setting Panel keyboard and Master controllers, and returns the keyboard to socket select mode.

5.5.7.2 RETURN

RETURN instantly moves the controller to position zero. If a combination of sockets is called up and then controlled, RETURN will take them back to the level at which they were called up. With MASTER selected, this applies to both setting panel controllers.

5.5.7.3 FLASH (STAGE MODE ONLY)

FLASH reduces the level of the sockets currently controlled on the setting panel keyboard controller to OUT, or when used with the FOOTPUSH, raises their level to FULL. The effect only occurs while the button is held down, and does not display on the V.D.U. upper

screen mimic. If the keyboard is in socket select mode when FLASH is pressed, it changes automatically to level mode to gain control of any sockets called up. When used with MASTER, it flashes sockets on both setting panel controllers.

5.5.7.4 SET LEVEL

SET LEVEL provides a convenient way of setting a large number of sockets to a preferred level.

To set up the preferred level, call up a socket and adjust it to the required level. Then select SET LEVEL. Thereafter, whenever the @ button is used to change from socket select to level mode, the selected sockets, groups or memories go immediately to the preferred level. The Setting Panel can be in either Stage or Preset mode, or socket select or level mode when SET LEVEL is selected - it always takes the level displayed to the right of line 9 of the setting panel display. If no valid level is displayed it will sound the soft warning. Once the set level has been used, the selected sockets can be further adjusted using the wheel (Stage mode) or the keyboard.

When the set level is no longer required, the use of @ can be returned to its usual function by deselecting SET LEVEL.

5.5.7.5 REM DIM

REM DIM is principally a Stalls facility, but is included on the desk setting panel. It allows a palette operator to do crossfades as well as move (up and down) fades. REM DIM can only be selected in conjunction with a MOVE fade.

To crossfade to a memory on the setting panel, enter the memory number on the keyboard, and use REM DIM to change to level mode. It will select, and the fade calculations will include the REMAINDER DIM part of the crossfade, but not those sockets on Independent palettes, i.e. will fade all sockets not in the selected memory to out. This fade can be performed on the wheel or keyboard.

Once a Move fade has been started, the remainder dim sockets can be included part-way through the fade by pressing REM DIM when they are to be included. A new crossfade is recalculated, and will take a complete wheel sweep to reach 100%.

5.5.7.6 MASTER

MASTER operates in STAGE mode only, and allows the wheel or keyboard to control both the keyboard and master controllers. When selected, the controllers are reset and combined, and fade together. Master can be deselected, control reverting to just the last set of lighting called up.

This can be used to adjust the overall level of a lighting picture once it has been balanced, e.g.

| | |
|---|---|
| S1 + 2 | @6 |
| S3 | @4.5 |
| S4 | @5 |
| Select MASTER | |

The wheel/keyboard now controls all 4 sockets as if they were on group. Deselecting MASTER returns control to socket 4 only.

5.5.7.7 CANCEL

CANCEL reduces the level of all sockets controlled by the setting panel to OFF, then parks them. If the setting panel has been used in preset mode to compile 'blind', the cancel push acts as the preset cancel push.

5.5.8 SET RECORD

As outlined in 5.5.3.4., SET REC allows the operator to set up his own record number for use on the whole palette. When selected, the mem/group/socket button indicators extinguish and SET REC lights. The setting panel keyboard keys 0-9, ., clear, NEXT, and LAST can be used in exactly the same way as the memory select keyboard to change the palette record number. The number is displayed on line 2 of the

setting panel display.

It is not possible to select SET REC unless recording is enabled.

SET REC deselects automatically following a successful record, or when manually deselected, returning the setting panel to the state it was in prior to SET REC selection. Alternatively, pressing MEM, GROUP or SOCKET will deselect it.

### 5.5.9 LAMP SEQUENCE

LAMP SEQUENCE provides a convenient means of checking out all of the sockets used in a performance. When selected, it steps through all sockets IN USE (i.e. in the V.D.U. FORMAT) in numerical order, putting their level to a standard level (normally about 80%) and then returning them to their previous level when the next socket is requested.

To select LAMP SEQUENCE, the button must be pressed with the footpush depressed. It lights to indicate selection, and the lowest numbered socket in use is set to the standard level.

To test each socket in turn, LAMP SEQUENCE is pressed repeatedly without the footpush, until all sockets have been checked.

To deselect LAMP SEQUENCE, it must be pressed with the footpush depressed again.

If the system has more than one setting panel, the lamp sequence buttons on them will work in parallel. Selecting the facility on one setting panel will automatically select it on all others. LAMP SEQ does not use any of the fade controllers, and parks sockets during and after use. The setting panel can still be used for normal lighting, but the IDENT facility is taken over from it by LAMP SEQ (see 5.5.10).

### 5.5.10 IDENT

IDENT allows the operator to mark sockets that need special attention, e.g. have to be held on independent or need re-angling. It uses the valid SOCKET NUMBER (5.5.3.9) as its source.

To identify a socket, it can be called up on the setting panel keyboard and IDENT (!) selected. Thereafter, the socket number will always stay on the V.D.U. screen, with a ! to the right of its level. (Note - *, #, and submaster indications take priority over !). It is not possible to FORMAT CLEAR identified sockets, and whenever the socket is called up on the setting panel keyboard, (i.e. once again becomes the Valid Socket Number), the IDENT push will light to remind the operator that the socket has been identified.

The Identification can be removed individually by keying in the socket and deselecting IDENT, or for all identified sockets by pressing IDENT CLEAR on the supervisory panel.

When LAMP SEQ is selected, IDENT no longer follows the keyboard valid socket number, but the LAMP SEQ number instead. Selection and deselection will still operate.

### 5.5.11 AUTOMOD

The structure and use of the automod store has already been described (5.2.6.). This section describes how sockets may be set into and cleared from the automod store. The setting panel Automod pushes also use the setting panel VALID SOCKET NUMBER as their source.

#### 5.5.11.1 SETTING UP THE AUTOMOD

This is a very straight forward operation:

a) Call up the socket requiring replacement, adjust its level if necessary, and select A-M REP.

b) Search for an alternative socket, and when one has been located, modify its level as necessary. Press A-M SET. The original socket, replacement socket, and levels are saved in the automod store, and A-M REP goes out.

The type of replacement is taken from the level displayed on line 9. If a % level is indicated, the replacement socket will return at the level at which the replaced socket was memorised, +/- the displayed level (e.g. +50% will add 5 points to the level.) If a direct level is displayed, the replacement level is always this direct level.

5.5.11.2 CLEARING THE AUTOMOD STORE

This can be done one socket at a time, by calling up the socket that was replaced and pressing A-M CLR on the setting panel.

The entire automod store can be cleared by pressing A-M CLR on the supervisory panel. This push is protected by a time-out, and will sound the soft warning if the store did not clear. A further push within approx. 6 seconds will clear the entire automod store.

5.5.12 SOLO

The SOLO facility is used to view the effect of a particular set of lighting by itself, without de-assigning the entire stage lighting set up on the console.

To identify lighting in this way, call up the lighting and change to level mode by pressing SOLO. as the lighting is faded up, all other lighting on stage fades to out using an inhibit type fade. The SOLO push can only be selected in STAGE mode, and lights when selected.

Only one setting panel may use SOLO at one time - thus if the stalls operator is using it, it is not available to the desk operator, and will sound the warning when he tries to use it.

WARNING: SOLO should be used with care, since any operation that clears down the setting panel or resets its controller level will also deselect SOLO, and cause the inhibited lighting to immediately return to its system level. Such operations are PARK ALL, S.P. PARK, RETURN, CANCEL, MASTER, REM DIM, TRANSFER, ALL DIM, PLAYBACK DIM, or calling up a new selection on the setting panel.

### 5.5.13 USE IND

USE IND allows the setting panel operator to override independent selections on the rest of the system. When selected, the setting panel will take control of all of the sockets called up, irrespective of whether they are selected to independent palettes.

## 5.6 SUBMASTERS

The Submaster panel enables the operator to balance between groups of lighting, control them from an external audio source, and play back multipart memories. It always controls lighting on stage, never in a preset store. Submaster panels are normally fitted with 4 wheels, labelled A - D on the desk panel and W - Z on the stalls panel. Each wheel has its own fade controller and section on the V.D.U., listing the way its lighting was assembled.

Lighting can be set up on the submasters in two ways - either transferred from the setting panel on the same palette or by using PAL PLAY.

Each submaster controller is capable of performing either MOVE or GROUP fades using the rules for them explained in the setting panel section of this handbook. (5.5.3.7.)

### 5.6.1 V.D.U. DISPLAY

#### 5.6.1.1 UPPER SCREEN DISPLAY

When FULL DISPLAY is selected, sockets controlled by submasters have their submaster identification to the right of the socket level. This indication is removed when FULL DISPLAY is deselected. All sockets under submaster control display in reverse cyan.

#### 5.6.1.2 SUBMASTER V.D.U. PUSH

Each submaster has a small button mounted beside it. When pressed, the upper screen displays only those sockets controlled by that submaster, including those that are OFF, to enable the operator to easily see the sockets he is controlling.

#### 5.6.1.3 LOWER SCREEN DISPLAY

Each submaster has a section of V.D.U. screen above it. There are 3 sections to this display:

a) The top line is a heading line (e.g. -- SUBMASTER A --).

b) The botton line shows the fade type currently active on the submaster (MOVE or GROUP), and the SUBMASTER LEVEL, always a % level, between -100% and +100% (Group), or 0 and +100% (Move).

c) The 8 lines between show the way the lighting under control was built up. When any lighting is transferred from the setting panel, any entries in these lists move up, and entries from the setting panel list are inserted below them. The list is therefore a historical record of the lighting selected, palette plays, and recording that has been performed on the submaster.

### 5.6.2 SUBMASTER CONTROL BUTTONS

The set of buttons mounted above each submaster are the same for all submasters, and are described once only. 4 of the buttons have dual functions. The footpush changes the following functions:

| | | |
|---|---|---|
| INDEPENDENT | to | RECOLLECT |
| TRANSFER | to | GROUP |
| CUT (DOWN) | to | CUT (UP) |
| PARK | to | RETURN |

#### 5.6.2.1 TRANSFER

Transfer causes the lighting currently controlled by the setting panel on the same palette to transfer control to the submaster, in addition to any lighting already controlled by the submaster. Both setting panel keyboard and master controller sockets transfer. The Controllers are reset, and MOVE and GROUP type fades combine as described in 5.5.3.7. A new set of levels is defined for the purposes of RETURN. The Transfer push lights (it may or may not already be alight when pushed), and all previous selections and displays above the setting panel are cleared, since the lighting has been removed from that section of panel.

The TRANSFER button will only work in this way if the setting panel is in STAGE MODE. If not, it gives a soft warning.

If the FOOTPUSH is depressed when TRANSFER is operated, the mode of the submaster is changed to GROUP. No transfer action takes place, and the submaster controller is reset. This is to allow the operator to fade the sockets on the submaster to OFF, even though he may have transferred a memory to the submaster.

#### 5.6.2.2 PARK

PARK parks all sockets controlled by the submaster, i.e. releases the submaster for further operations. The TRANSFER button goes out, and the submaster V.D.U. display is cleared.

5.6.2.3 CUT

Cut enables the operator to perform instant changes on the submaster. Pressing CUT alone causes the current submaster wheel level to decrease by 100% (i.e. equivalent to moving it instantly one quadrant towards the operator. If the footpush is depressed when CUT is operated, a wheel level change of +100% is produced. This can be used to do single or multi-part snap lighting changes, e.g. if memories 1,2, and 3 have to snap on in close succession, transfer them to separate submasters and cut them in individually (with the footpush) when required.

5.6.2.4 RETURN

The RETURN function is initiated by pressing PARK with the footpush held pressed. It instantly moves the submaster wheel level to zero, returning the lighting to its state the last time TRANSFER or PALETTE PLAY were used.

5.6.2.5 SUBMASTER RECORD

See section 5.3.9.

5.6.2.6 MODULATE

When MODULATE is selected, the submaster is connected to an external controller, usually the MODULATION UNIT (see 5.12.), to allow it to be faded in time with a prerecorded or live audio signal, or flashed at a predetermined rate. The amplitude of these modulations can be mastered by the submaster wheel. It is recommended that the submaster wheel is at zero when selecting and deselecting MODULATE. The effect can then be faded in by moving the wheeel up and out again by moving it down. When the MODULATE button is selected, the wheel is used to master the modulation level and the current wheel position remains unchanged, thus if the wheel is at any position other than zero, a jump may occur in the lighting when modulate is selected. The same applies when it is deselected.

Either MOVE or GROUP fades may be controlled by the external

modulation.

5.6.2.7 IND

Separate independent pushes are provided with each submaster, to allow them to be individually selected to independent.

5.6.3 MOMENTARY CUT (A,B,C,D)

The MOMENTARY CUT buttons are fitted to the main desk only, and work in conjunction with Submasters A - D. They are normally fitted under the front shelf cover, to the right hand end of the desk. They enable the operator to quickly operate the submaster CUT facility on several submasters, to provide effects such as lightning flash.

Their action is identical to the submaster CUT buttons with the following difference:

Without the footpush, MOMENTARY CUT produces:
CUT OUT when PRESSED
CUT UP when RELEASED

with the footpush, MOMENTARY CUT produces:
CUT UP when PRESSED
CUT OUT when RELEASED

To produce a lighting effect, select the required sockets to the submasters, press the footpush, and use the momentary cut keyboard to flash the lights up. Do not release the footpush until all momentary cut buttons have been released, or some of the lighting will remain on stage.

5.6.4 SUBMASTER MASTER

The MASTER push on the SUBMASTER panel may be used when all submasters on the panel are to be faded up or down. When selected, all submasters may be faded by moving the right hand submaster wheel, (normally submaster D or Z). The other submasters on the palette will not change the lighting when SUBMASTER MASTER is selected. Group

balance between submasters is not preserved.

### 5.6.5 PALETTE PLAY

PALETTE PLAY enables multi-part memories to be replayed onto the submasters. It uses a memory number from the setting panel, which must be in STAGE MODE for it to operate.

To use PAL PLAY, enter the memory number required (e.g. mem 1 2) on the setting panel keyboard, then press PAL PLAY. Sufficient submasters are automatically parked (starting from the left) to accommodate the memory, and the separate parts of the it are then automatically transferred to the submasters and set up as MOVE fades. The V.D.U. display above each submaster indicates the number of parts in the memory by showing which submasters had fades transferred to them. Once selected, the separate parts on the submasters can be used as if they were transferred using TRANSFER.

## 5.7 ADDITIONAL STALLS FACILITIES

The stalls control incorporates additional facilities to a standard palette. These are described below.

### 5.7.1 STAGE REC

This operates in the same way as the playback STAGE REC (see 5.3.2.and 5.3.3.) but uses the Stalls Palette record number (which may be modified using SET REC).

### 5.7.2 KEYSWITCH

When switched off, this keyswitch disables the entire control and allows the stalls operator to leave it unattended in the auditorium or on stage without having to walk to the desk to disable its facilties. It does NOT switch off the mains supply to the stalls control.

### 5.7.3 WARNINGS

Audible warnings are not fitted to the stalls control, since it may be in use during rehearsals where such warnings would be undesirable. There are two buttons engraved with the warning triangle - the RED one lights to indicate HARD WARNING, and the ORANGE one to indicate SOFT WARNING.

### 5.7.4 ERROR CLEAR

If the SOFT WARNING button is pressed, it performs the same function as the supervisory panel ERROR CLEAR (see 5.8.4.2.) clearing error messages from all V.D.U.'s fitted to the system.

### 5.7.5 DISPLAY PUSHES

There are 3 display pushes, labelled PAL, PLAY and OWN. These allow the stalls operator to view various displays and to have access to all 280 formatted sockets on his one screen.

a) If one of the STALLS STAGE/GREEN/RED MIMIC buttons is selected, the lower screen display will always be that of the stalls palette (submasters W - Z). The upper screen will display the first 140 formatted sockets if PAL or OWN are selected, or the second 140 if PLAY is selected.

b) If NONE of the STALLS STAGE/GREEN/RED MIMIC buttons are selected, three displays are available:

OWN: own lower screen display, with upper screen blank (equivalent to MIMIC OFF)

PAL: an exact copy of the entire desk palette screen

PLAY: an exact copy of the entire playback screen

In this way he can see what the desk operator is doing on the main desk, and view Automod or Memory List if they are selected on the main desk.

## 5.8 SUPERVISORY PANEL

The Supervisory panel is a small panel mounted in the upper section of the desk, containing functions required less frequently than playback or setting functions.

### 5.8.1 INTENSITY AND VOLUME CONTROLS

Two rotary controls are fitted to the panel. One controls the lamp intensity of all illuminated pushbuttons on the playbacks, desk palettes and supervisory panel. The other controls the volume of the hard and soft warnings.

### 5.8.2 FORMAT PUSHES

The V.D.U. format is explained in section 3.3. This section explains in details the use of the format pushes.

#### 5.8.2.1 DISPLAY FORMAT

When DISPLAY FORMAT is not selected, sockets that are OFF on stage are not displayed on the V.D.U. screen when it is displaying the stage lighting. The socket number is normally only displayed when the socket is on, although a space is left for it on the screen. This enhances the readability of V.D.U. display. The only exceptions to this are:-

a) Submaster, setting panel and memory select V.D.U. pushes display the socket numbers of all sockets on the controller/in the memory.

b) Identified sockets will display even though their levels are zero.

If DISPLAY FORMAT is selected, the stage/preset display includes the socket numbers of all sockets that are currently in use, without regard to their levels. It can be used to determine which sockets have been used for a production.

### 5.8.2.2 FORMAT CLEAR

FORMAT CLEAR clears the socket 'in use' bits, removing them from the V.D.U. screen. It will NOT clear any socket that could be brought onto stage without first being called back as a memory or on a setting panel. This is to ensure that sockets on stage are always displayed. Sockets in the following states will not be cleared.

a) Any socket currently assigned to a controller, since the controller could be reversed.

b) Any socket in a preset store.

c) Any identified sockets.

To clear the format completely, ensure that no sockets are Identified, press both preset cancel pushes, and press ALL DIM/INSTANT twice. The format can then be completely cleared.

### 5.8.2.3 FORMAT SET

FORMAT SET uses the thumbwheels on the supervisory panel to include sockets in the format from memories. All sockets in every memory between the numbers set on the START and STOP thumbwheels (inclusive) will be set into the format. The button flashes momentarily during operation, though the flash may not be visible if the format is being set from a small number of memories.

### 5.8.2.4 FORMAT LIMIT

When working in a saturation rig, it is often desireable to prevent the operator from calling up sockets not assigned to the current production. This may be achieved by clearing the format, calling up all sockets to be used by the current production (thus including them in the format), and selecting FORMAT LIMIT. It is then not possible to call up sockets other than those in the format.

5.8.2.5 LARGE FORMAT

When a stalls control is provided and fitted to the desk, this button may be selected to cause any sockets in use beyond 280 to display on the stalls screen. The stalls upper screen becomes a third screen in the desk screen series.

5.8.3 MEMORY CLEAR

Once a memory number has been used to record lighting, speeds or titles in the memory, that number stays in the memory until it is removed using MEMORY CLEAR. Re-Recording the lighting memory as a blackout is not sufficient to remove it from the memory.

To use MEMORY CLEAR, set up the START and STOP THUMBWHEELS to the first and last numbers to be cleared. Turn the interlocking keyswitch and press MEMORY CLEAR. It will illuminate for about 2 seconds after a successful memory clear, in the same way as the record buttons. All numbers between (and including) the thumbwheel settings will be cleared, with the exception that those between 0.1 and 0.9 will not be cleared unless the Houselight Enable key switch is on. To clear just one memory, the STOP thumbwheel should be set to the same number as the start thumbwheel.

To clear the entire memory, it is recommended that the thumbwheels be set to 000.0 and 999.9 with the Houselight Enable key on. This ensures that every number is cleared from the internal memory number tables. (see 5.9.5.5. for use). This operation also clears the Automod store, which is saved as a memory with a special number.

5.8.4 DISPLAY PUSHES

5.8.4.1 DISPLAY RECORDED FORMAT

The REC FORMAT push provides a display, while held pressed, of all sockets used in the range of memory numbers described by the supervisory panel thumbwheels. The format changes for this display only to include only those sockets in the memory. Sockets in the memory and not in the current format display dimly.

5.8.4.2 AUTOMOD DISPLAY

This push (and MEMORY LIST) work in conjunction with the STAGE / GREEN / RED MIMIC pushes on the desk setting panel.

The contents of the AUTOMOD store can be viewed by selecting the button labelled AUTOMOD. The display format is:

122: 145 = 147 @ 50

This means that in automod store entry 122, socket 145 has been automodified to be replaced by socket 147 at level 5. All automodified sockets are displayed in this manner.

5.8.4.3 MEMORY LIST DISPLAY

With MEMORY LIST selected, information about the recorded memories is displayed, starting with the number set on the start thumbwheel on the supervisory panel, including all memories up to the number set on the STOP thumbwheel, or 80 memories later if less (i.e. when the two screens are full).

The titles are displayed in two columns per screen, in the following format:

123.4 (***) THIS IS A TITLE

a) 123.5 is the memory number

b) If the memory has been renumbered or shifted during a disc to memory transfer, its previous memory number will be displayed within the brackets.

c) The title "THIS IS A TITLE" (maximum 20 characters) is displayed to the right.

### 5.8.5 OTHER SUPERVISORY PANEL PUSHES

#### 5.8.5.1 REVERSE V.D.U.'S

Reverse V.D.U.'s is a backup facility to enable the operator to continue working if one monitor or one monitor driver fails. When selected, all displays that would normally go to monitor 1 (Playback) to go to monitor 2 (desk palette) and vice versa. The display reverts to normal when deselected.

If both monitors are working, the effect is to swap the displays between the two screens. If only one screen is in operation, either the playback or palette data can be viewed (along with the higher or lower numbered set of sockets currently in use) by selecting and deselecting REVERSE V.D.U.

#### 5.8.5.2 ERROR CLEAR

When error messages are reported on the V.D.U. they are displayed on the top and bottom lines of every screen and flash. There is sufficient space for up to 4 error messages at one time. The error messages may be cleared once they have been noted by pressing ERROR CLEAR, with the following exceptions:

a) Equipment overheat messages can not be cleared, but will clear automatically when the temperature returns to normal.

b) Program Corrupt messages will not clear unless the corruption is corrected.

c) Certain messages are produced by the disc system and will clear automatically with or without the appropriate operator action (see 5.9).

#### 5.8.5.3 IDENT CLEAR

IDENT CLEAR clears the Ident (!) from all sockets that have been identified by the operator.

### 5.8.5.4 A-M CLEAR

See 5.5.11.2

### 5.8.6 MEMORY BLACKOUT

MEMORY BLACKOUT is a hard-wired inhibit on the memory system output, to allow the system output to be killed during testing or if a serious fault develops on the system. It does not override the backup system output. The MEMORY BLACKOUT push latches mechanically, and lights when selected.

### 5.8.7 CYCLE

CYCLE allows the operator to cycle around a set of memories crossfading or performing move fades from one to the next, and returning to the first when the last has been faded onto stage. The first and last memory numbers to be used are set on the supervisory panel thumbwheels and the cycle initiated by selecting CYCLE.

Cycle works by 'automatically' pressing buttons, in the following sequence:

a) Substitute next cycle play number for the current memory select play number.

b) Press Red preset 'TAKE'.

c) Press Red preset CROSSFADE. (An option to press MOVES is also available.)

d) Find the next number in the memory. If greater than the stop thumbwheel, substitute the start thumbwheel number.

e) Save this number and restore the original memory select play number.

f) When both up and down fades end, go back to a).

It TAKE TIME is selected, the memory times will be used, otherwise the current wheel times will be retained.

The red playback mimics behave in exactly the same way as if the sequence had been performed manually. Pressing INSTANT or PAUSE will also have their normal effect.

The sequence can be terminated by deselecting CYCLE. It will deselect automatically if green playback CROSSFADE, ALL DIM or STAGE DIM are pressed.

### 5.8.8 ALPHANUMERIC KEYBOARD

The ALPHANUMERIC KEYBOARD is mounted under the desk front shelf, together with a keypad controlling its functions. The modes currently fitted are:

OFF
TITLE
PRINT
PLAY
GREEN
RED
MEMORY TO DISC
DISC TO MEMORY SHIFT
DISC TO MEMORY RENUMBER
DISC COPY

OFF, TITLE, PLAY, GREEN and RED are dealt with in this section, the DISC functions in section 5.9, and PRINT in section 5.10. Additional buttons are fitted for future expansion. In addition, 4 control buttons are included, labelled START, RESTART, STOP, and RECORD.

#### 5.8.8.1 ALPHANUMERIC KEYBOARD MODES AND DISPLAY

The mode select keypad is used to select the function of the keyboard, and also to select the display (on the bottom line of the playback screen). The desk mounted keyboard can control any of the functions, whereas the printer keyboard (if fitted) will only control printout.

Most of the functions fitted require the operator to answer questions, e.g. which memory, which disc. The system prompts the operator by asking the relevant questions and expecting a reply on the keyboard. In general, the line on the screen is bright when a reply is expected. Most answers must be terminated by pressing the RETURN key on the keyboard to tell the computer that the last number or character has been entered.

5.8.8.2 CONTROL BUTTONS

The control buttons are used by selected routines e.g. RECORD is used for TITLE, and most of the others for PRINT. Since printout can be operated from a remote printer keyboard as well as from the alphanumeric keyboard in the desk, these functions are duplicated as control characters on the keyboards. Control characters are entered by pressing the CTRL button as if it was a second shift key while the required character is pressed. The characters used are as below: (bracketed characters are used in German versions of the program)

CTRL R (R) = RECORD
CTRL S (S) = START
CTRL C (W) = RESTART (CONTINUE/WEITER)
CTRL A (H) = STOP (ABORT/HALT)

5.8.8.3 OFF

When OFF is selected, the keyboard display line is blank, and the keyboard is ignored.

5.8.8.4 TITLE

When TITLE is selected, memory titles may be viewed and modified. Select TITLE and enter the memory number, followed by RETURN. The line becomes dim, and the current title, speeds, and previous memory number for the selected memory are displayed. To change the title, type in the new title required (20 characters maximum, including spaces). The line will again become bright, and the new title will replace the old one in the display. If a mistake is made, RUBOUT may be pressed to delete the last character entered. This may be repeated

as many times as necessary, until no characters are left in the title, when it is ignored. Once the new title has been entered, it may be:

a) RECORDED by pressing REC (or CTRL R). No warning is given if the memory previously had a title or if recording is not enabled as on other record pushes. The new title is memorised provided the relevant record key is on. After a successful record, the line once again becomes dim, with the new title displayed.

b) discarded by pressing RETURN, in which case the old one is again displayed.

To view and modify another title, press RETURN to cancel the current line display and enter the new memory number when prompted.

#### 5.8.8.5 PLAY / GREEN / RED

With PLAY selected, the title, speeds, and previous memory number of the memory select play number are permanently displayed in the keyboard line. GREEN and RED cause this data to be displayed for the last memory transferred (by TAKE, +, or -) into the relevant preset store.

## 5.9 FLOPPY DISC SYSTEM

The floppy disc system fitted to Lightboard (TCS-2) uses the computer interrupt facility to enable disc transfers and normal lighting to be carried out at the same time. The data is recorded on a computer grade floppy disc, or 'diskette', which consists of a disc of flexible plastic, coated on one side with magnetic oxide, rotating in a plastic envelope. The envelope is lined with a cleaning material that tends to remove small particles and dust from the surface of the disc as it rotates. Two small sense holes are provided, one near the centre of the disc to sense disc revolutions, and the other in the edge of the envelope which, when not covered, prevents the hardware from writing to the disc ('disc safe').

Data is written to the disc on 77 tracks, each organised as 26, 128 byte sectors (8-bit bytes). The disc is soft-sectored, which means that the sector positioning is determined by data already recorded on the pre-initialised disc, rather than by sense holes. The head is in contact with the disc only during read/write operations, ensuring extended disc life.

The software handling the disc is well protected against disc errors. Whenever memories are written to disc, a read after write check is performed on all memories transferred. Each data block is protected by CRC (cyclic redundancy check) bytes, and whenever an error is detected, the software re-tries up to 10 times before assuming that the media is faulty.

Although floppy discs are relatively robust, some precautions must be taken when handling them:

a) Always return to the protective envelope after use.

b) Never touch the exposed disc surfaces.

c) Never bend or fold.

d) Protect from magnetic fields e.g. large motors, loudspeakers.

e) Avoid direct sunlight. The recommended operating and storage conditions are:

10 - 52 Centigrade
8% - 80% R.H.

f) When labelling the disc, use only a soft tipped pen.

g) Use only peel-clean type labels.

h) Always insert the disc FULLY into the drive (label outermost towards handle) before closing the door.

i) Preferably remove the disc from the drive before powering the system on or off.

j) When a show has been saved on disc, remove the label covering the 'disc safe' sense hole to prevent inadvertent over-recording.

k) It is recommended that ONLY ONE SHOW IS SAVED PER DISC, and that a BACKUP COPY IS MADE. Although it is possible to save several typical shows on a disc, the techniques used are rather more complex and should not be attempted unless the operator is thoroughly conversant with disc system operation.

### 5.9.1 DISC FORMATTING

Before a disc can be used in the system, either as a program disc or as a show disc, it must be formatted. Normally, commercially available discs are pre-formatted to the required specification, and do not need further formatting. If a disc produces persistent errors, reformatting may extend the disc life, though all data saved on the disc will be lost during the reformatting process.

The procedure for reformatting a disc is described in the technical manual. The program to do this is a separate program, since there is insufficient computer time available when the lighting program is running to format a disc.

### 5.9.2 DISC PANEL CONTROLS

Disc transfers may be controlled from the disc panel, and also from the alphanumeric keyboard. There are some overriding controls on the disc panel, which are explained in this section.

This section deals with the controls on the MEMORY TRANSFERS section of the panel only.

#### 5.9.2.1 KEYSWITCH

A 3-position TOK4 keyswitch is provided to prevent unauthorised use of the disc system. In the OFF position, no disc transfers are permitted. In the ON position, all but DISC CLEAR are permitted. To perform a DISC CLEAR, the keyswitch must be turned against its spring

to the CLEAR position while the button is pressed.

When the key is turned from OFF to ON, DISC 1 lights, indicating that this disc drive is selected for disc transfers.

5.9.2.2 DISC 1 / DISC 2

If the system is supplied with more than one disc drive, these buttons may be used to change the disc drive to be used for all disc operations except DISC COPY.

5.9.2.3 DISC BUSY

Whenever the disc is performing memory transfers, this button lights. If the transfer is initiated in error, DISC BUSY may be pressed while alight to abort all outstanding disc transfers.

5.9.2.4 REFORMAT

When selected, this button causes all sockets in all memories transferred from disc to memory to be included in the V.D.U. format.

5.9.2.5 READ MEMORY

READ MEMORY dumps all memories from core to disc, including their memory number, speeds, title, lighting section, etc. The new memories are saved on the disc after any others already on the disc, as explained in 5.9.3.

READ MEMORY provides the normal method of saving memories on disc. It illuminates during the transfer, and can only be selected if the disc is ON and NOT BUSY.

5.9.2.6 READ DISC

READ DISC dumps all memories from disc to core, preserving the memory numbers they were originally recorded on. Where multiple copies of a memory exist on disc, only the latest copy remains in memory at the end of the transfer.

READ DISC provides the normal method of reloading memories from disc. It illuminates during the transfer, and can only be selected when the disc is ON and NOT BUSY.

5.9.2.7 DISC CLEAR

DISC CLEAR clears all memories from the disc. To initiate a DISC CLEAR, the disc must be NOT BUSY, and the keyswitch must be turned against its spring while the button is pressed. The button illuminates briefly during the operation.

Newly formatted discs MUST ALWAYS BE DISC CLEARED before being used to save memories.

5.9.2.8 AUTODUMP

AUTODUMP is another way of transferring memories to disc. When selected, all memories recorded (by any RECORD button on the system) are also saved on disc. THIS FACILITY SHOULD ALWAYS BE USED DURING PLOTTING SESSIONS, since it guards against memory failure, and provides a historical record of re-recordings, which may be useful at a later stage in the lighting session. The memories are saved with their original memory numbers, in chronological order on the disc. When read using READ DISC, the latest versions will be left in the memory at the end of the transfer. See 5.9.4 for methods of accessing earlier versions of memories.

Since it takes considerably longer to transfer a memory to disc than to record it in the first place, it is possible (though unlikely) that the recording rate will be too fast for the disc to keep up. The computer will save a number of memories to be dumped when the disc has time, but if this list becomes full, an error message will be reported to warn the operator, and an autodump will be lost.

### 5.9.2.9 DISC DISPLAY / NEXT

When transferring selectively from disc to memory, it is useful to have a list of memories saved on disc. This can be achieved by selecting DISC DISPLAY. It provides an alternative upper screen display selection (replacing STAGE, GREEN, RED, MEMORY LIST, AUTOMOD), containing a list of memories saved on disc, with their KEY number (sequence number on disc), memory number and title.

Since a disc could contain many more memories than the screens can accomodate (maximum disc capacity is about 2000 small memories), a paging system is provided. When first selected, the screens will fill starting from key 1. Press NEXT to view the next page of the disc display.

The disc display updates rather more slowly than other displays, due to the time taken to fetch the data from disc. Whenever the upper screen selection is disturbed (e.g. by pressing a VIEW push), the data has to be re-fetched from the disc to rebuild the original display.

## 5.9.3 DISC STRUCTURE

### 5.9.3.1 INTERLEAVE

The sectors on the disc are interleaved to optimise the transfer speed. This is to allow the processor to service the disc and perform its other (lighting) tasks in the time between disc transfers. Lighting discs use a 1-in-3 interleave (i.e. 1, 4, 7, 10, 13 etc.) whereas program discs use a 1-in-2 interleave (1, 3, 5, 7, 9). Wherever sectors are referred to in the following text, they refer to logical sectors. For a lighting disc, the following table gives the relationship between logical sectors and absolute sectors:

| Logical sector | Track | Absolute sector |
|---|---|---|
| 0 | 1 | 1 |
| 1 | 1 | 4 |
| 2 | 1 | 7 |
| 3 | 1 | 10 |
| | etc. | |

5.9.3.2 DIRECTORY

The first two sectors on the disc contain a directory describing where memories have been saved on the disc. One bit is used to describe each sector boundary, and is set if the boundary coincides with a memory start. All recorded memories start on a sector boundary, but due to their variable length each may occupy more than 1 sector. The directory is used to identify where each memory starts on the disc.

5.9.3.3 MEMORIES

Memories are always saved on the disc in chronological order. Whenever the disc is cleared, the directory is set up to indicate that the first available space is at the start of sector 2 immediately following the directory. Whenever memories are saved on disc, they fill the disc from the first available space. At the end of the transfer, the directory is updated, indicating that the first available space follows the memories just transferred. When several memories are saved on disc at one time (i.e. any transfer other than Autodump), they are saved in numerical order.

5.9.4 TRANSFER PRIORITIES

There are 4 types of action that use the disc, all of which can be active at the same time. The following are the transfer types:

AUTODUMP (initiated by a REC)
PANEL (READ MEM, READ DISC, DISC CLEAR)
KEYBOARD (Alphanumeric keyboard disc functions)
DISC DISPLAY

The rules that govern the priorities are:

a) If a transfer is in progress, it will complete before another pending transfer is started.

b) PANEL transfers can not be selected while another transfer is in

progress.

c) At the end of a transfer, pending transfers are actioned in the following order: AUTODUMP, KEYBOARD, DISPLAY.

### 5.9.5 KEYBOARD TRANSFERS

Selective disc transfers may be initiated from the alphanumeric keyboard by selecting the required function (provided the disc is turned on), and answering the questions asked by typing in the necessary transfer limit numbers, each terminated with RETURN. If an error is made, entry may be restarted by reselecting the function required.

Selecting OFF / TITLE / PRINT / PLAY once a disc transfer has been started from the keyboard will not abort the disc transfer. It will continue, and while in progress, only the currently running function may be reselected, causing its keyboard line to be displayed. At the end of the transfer, the keyboard line clears down and requests further transfers.

#### 5.9.5.1 MEM TO DISC

Selected ranges of memories may be saved on disc.

FIRST MEMORY requests the first (lowest) memory number to be transferred

LAST MEMORY requests the last (highest) memory to be transferred.

If the last memory number is less than or equal to the first, only the first is transferred. If no memories exist within the requested range, MEM TO DISC cancels.

#### 5.9.5.2 DISC TO MEM SHIFT

Selected ranges of memories may be transferred from disc to memory with their memory number shifted. This provides a means of loading more than one show into memory. e.g. If two shows have been memorised

using numbers 1-50, the first may be loaded normally, and the second using "shift 100". The second will then be available on memory numbers 101-150.

FIRST KEY requests the first key (disc sequence) to be loaded.

LAST KEY requests the last key (disc sequence) to be loaded.

SHIFT requests the memory number offset.

Key numbers may be in the range 1 to 9999. The shift number must be a whole (not decimal) memory number in the range 0 to 999. Each memory between the requested keys is read from disc, its number changed by adding the shift number, and saved in memory on this new number. When the sum of the shift number and memory number exceed 999.9, the thousands digit is truncated (900 + 200 becomes 100). By using this technique, a show saved on memories 101-150 may be shifted down to 1-50 by using a shift of 900.

Single memories will be transferred from disc if the last key entered is less than or equal to the first.

To transfer all memories from disc to core with a shift, a key number range of 1-9999 may be requested. The disc panel READ DISC is a special case of this, with a shift of zero.

NOTE: The following 3 notes apply to both DISC TO MEM SHIFT and DISC TO MEM RENUMBER.

a) Whenever a memory number is changed on a disc to memory transfer, the old memory number is saved as part of the memory, and will be displayed (in brackets) by MEMORY PREVIEW, or the alphanumeric keyboard PLAY or TITLE functions.

b) It is possible to shift or renumber a memory to memory number zero. This memory number is not allowed in the system, and the memory will not be saved. An error message "MEMORY 0 LOST" will be displayed.

c) If a memory using a number in the range 0.1 to 0.9 is to be saved BY ANY READ DISC OPERATION, it will only be saved if the system record keyswitch is in the HOUSELIGHTS position. Otherwise it will be discarded and "HOUSELIGHT MEMORY LOST" will be reported.

5.9.5.3 DISC TO MEM RENUMBER

This facility is provided as an aid to changing the order of memories, or to re-space memories when all decimal inserts have been used. It reads memories between the requested keys, and renumbers them in core in the sequence they returned from disc, using whole number memory numbers starting with the first requested.

FIRST KEY requests the first key number to be used.

LAST KEY requests the last key number to be used.

FIRST MEMORY requests the first (whole number) memory number to be used.

To re-space or re-order memories, they must first be saved on disc in the required sequence, and then reloaded using this function.

5.9.5.4 DISC COPY

DISC COPY is available on systems fitted with two disc drives. It does a 1-for-1 copy from one disc drive to the other, and may be used for copying either lighting or program discs.

FROM DISC requests the drive to be copied from (1 or 2).

TO DISC requests the disc to be copied to. Only the opposite to 'from' will be accepted, which acts as a check on the operator.

The speed of the copy will be dependant on the amount of free memory available.

### 5.9.6 DISC SYSTEM ERROR MESSAGES

The following error numbers relate to the disc system: 2, 3, 25 to 33. See section 6 for further details of these error messages.

Some error messages may occur for a short time during the disc transfer. When reading from disc to memory, the memory may fill and require shuffling. During the shuffle, "MEMORY ALMOST FULL" will display, and clear again once sufficient space has been created. Alternatively, if there is insufficient space after a shuffle, "MEMORY FULL" will display and the disc action will abort. If a full memory is saved on disc, there is a chance that when it is reloaded, the memory will become full before the last memory has been read from disc. This may be due to one or more of the following:

a) The memory was not empty before the transfer.

b) The automod store is occupying more space than when the memories were originally saved.

c) A new version of program (which may occupy more memory) has been loaded.

d) To read in memories from disc, a slightly larger space is required than the length of the actual memory. This space may not have been available when the memories were originally saved.

To overcome this, the last memory should be read in after using and clearing the first few memories.

If a memory is rerecorded during a read memory transfer, there is a small chance that an error message will be displayed, due to movement of the memory and linkages in core. This may not indicate an error on disc.

### 5.9.7 DISC CAPACITY AND SPEED

The capacity and speeds quoted here are for a 400 channel system with 'average' size memories (100 memorised sockets, time and title), and with no other major system actions (other than occasional fades) being performed on the system. The read disc time does not include any time necessary to shuffle the memory.

| | | |
|---|---|---|
| READ MEM | 100 memories | 19 seconds |
| READ DISC | 100 memories | 5 seconds |
| DISC CLEAR | | less than 1 second |
| Disc capacity | 986 memories | |

### 5.9.8 PROGRAM LOAD

The disc system can also be used to load program discs containing the lighting program, the hardware test program, or other diagnostic programs. These programs are written on separate discs, which may be loaded by the following procedure:

a) Insert the disc fully into the disc drive with the label outermost and towards the handle. Close the disc drive door.

b) Turn the PROGRAM LOAD KEYSWITCH against its spring and press DISC 1 or DISC 2 alongside this keyswitch (dependant on the drive being used). The key should be held against its spring and the button pressed for about 1 second.

The program will load and automatically start. Reloading the lighting program takes approximately 12 seconds.

c) If the hardware test program was loaded, leave the disc in the drive with the door closed, since the program fetches subtests from the disc.

d) If the lighting program was loaded, remove the disc and store safely.

The lighting program may, when loaded, produce the following

messages:

MEMORY SIZE INCORRECT - ** BLOCKS. The memory size found on the system was not that expected by the program. This may be due to faulty memory, the wrong program, or some memory missing (presumably removed for repair). The number reported (** above) is the number of kilowords found (multiples of 1024, 16 bit words). A system may still function with less than standard memory, although 32K may not be sufficient, depending on the options fitted. The nett effect is that the space for memories will be altered. Original memory data may be lost.

MEMORY CORRUPTED. On program load, the lighting program checks the pointers at the top of memory that define where the linkages and memory limits are. If these are unreasonable (i.e. in the wrong order), this message will be reported, and further recording will be inhibited until a MEMORY CLEAR 0-999.9 with the HOUSELIGHT keyswitch ON is performed. This message may be caused by some memory having been removed, faulty memory, or a new (larger) version of program having been loaded that overlaps a previously almost full memory. GREAT CARE must be taken if memories have to be read before the memory clear is performed. The best course is to clear the memory and reload from disc, but if absolutely essential, it may be possible to rescue some memories.

Consult the technical handbook if any other problems are encountered when loading program discs, and for diagnostic program instructions.

## 5.10 PRINTOUT

A printer may be supplied with the system to enable the operator to print a permanent record of the memories in core. A DECWRITER LA36 is normally supplied, which prints at 30 c.p.s. Faster printers are available as an option, though printing speed is not always important, since the printout can be run at the same time as normal lighting operations, the only requirement being that the memories to be printed must be resident in the computer core.

The machine normally supplied has a typewriter keyboard similar to the one fitted to the control desk. The printer is connected directly to an interface card inside the computer chassis, and can be sited some distance from the computer (e.g. near the control room). The printer is not particularly quiet, and for this reason, siting in the control room is not normally recommended.

The program can work with either pre-printed forms or with plain paper. The paper should be Z-folded for ease of handling. When working with pre-printed forms, the program does not print the socket number when printing in FULL FORMAT, whereas with plain forms the socket numbers are always printed. These options may be specified by the operator when the printout is started, but the format for the pre-printed forms should be specified when the system is ordered.

In the instructions that follow, some details vary between printers - the operators manual for the printer must be consulted to clarify such points as how to switch on, load paper and line up the forms.

### 5.10.1 SWITCH-ON

Before starting a printout, the printer must be switched on and also switched ON-LINE (normally FULL DUPLEX or FDX). In FDX mode, the only characters printed are the ones sent to the printer by the computer. Since the program echoes all operator input on the printer, this serves as a check that what is typed in is what actually reaches the computer. On the LA36, the speed, or BAUD RATE must also be selected, to 30 c.p.s., or 300 BAUD, and CAPS LOCK latched down.

An adequate supply of paper should be loaded into the printer hopper and the paper lined up so that when the computer issues a FORM FEED instruction (or CTRL FORM is pressed on the keyboard in LOCAL mode), the paper moves to position the printer head at the top of the form.

Most systems require more than one page to completely print a memory state, especially in FULL FORMAT. The printed forms will therefore differ from each other, only one in 2 or 3 having the spaces for headings. When this is the case, the initial dialogue should be started on the page preceding the one with heading boxes, since the

computer issues only one FORM FEED after the initial dialogue before it starts printing.

### 5.10.2 CONTROL OF PRINTOUT

Printout can be controlled from either the printer keyboard, or from the Supervisory Panel alphanumeric keyboard. The printer keyboard is always in control of printout. To control it from the alphanumeric keyboard, PRINT must first be selected. The initial dialogue is displayed both on the keyboard line and also on the printer.

The control pushes START, RESTART, and STOP can be used to control the progress of printout, alternatively CTRL codes can be used from either keyboard (see 5.8.8.2).

Some questions asked require a Yes/No answer. To answer 'YES', type YES, or just Y, or anything beginning with Y. If the first character typed is not Y, the answer is taken as NO.

All operator input should be terminated by pressing the RETURN key after the response (e.g. memory number, Yes/No, or title) has been typed in. This signals to the computer that the operator input in complete.

### 5.10.3 PROGRAM START

When the START push is pressed, the following questions will be asked:

#### 5.10.3.1 FULL FORMAT?

If the answer is YES, a space will be allowed on the paper for each socket fitted to the system. The levels will be printed only if above zero in the memory, with their socket number above them unless suppressed. If the paper is pre-printed with socket numbers, the levels will be printed in the spaces allotted to them on the paper. Even memories with small numbers of sockets may occupy several pages of printout paper.

If the answer is NO, only those sockets that are recorded in the memory are printed, adjacent to each other when sockets are adjacent, and with one space when there is a break in the sequence. Socket numbers are always printed in this compressed format.

5.10.3.2 SUPPRESS SOCKETS?

This question is only asked if FULL FORMAT has been requested. The answer to it should be YES if pre-printed forms are being used. Otherwise, answer NO, and socket numbers will be included in the printout.

5.10.3.3 BACKUP LEVELS?

When outputing a voltage to control the dimmers, the computer modifies the transfer characteristic of the dimmer to produce a smooth change in lighting on stage during automatic fades. Due to this modification, the levels displayed on the V.D.U. are not the same as the levels that have to be set up on the pin-patch backup to obtain the same lighting.

If 'YES' is answered to BACKUP LEVELS?, the levels printed out correspond to the PIN-PATCH levels.

If 'NO' is answered, the levels printed out correspond to the V.D.U. levels, and the levels set up on the setting panel.

5.10.4 MEMORY SELECTION DIALOGUE

After the above questions have been answered, or when RESTART or STOP are pressed, or at the end of a printout run, the following questions are asked:

5.10.4.1 SHOW TITLE

The operator can type in up to one line to describe the memories being printed. This line will head each memory printed. At the end of the line, press RETURN.

If LINE FEED is pressed as the first character on the line, any previous title will be preserved, and need not be re-entered.

5.10.4.2 FIRST MEMORY NO?

Type the first memory number to be printed, followed by RETURN.

5.10.4.3 LAST MEMORY NO?

Type the last memory number to be printed, followed by RETURN.

Printout of the memories between (and including) these numbers will commence.

5.10.5 PRINTOUT FORMAT

The printer will always start a new form for each memory. Each one is headed with the following:

a) The name of the theatre can be printed at the top of each form, if specified at time of order.

b) The show title will be printed next, exactly as typed in (see 5.10.4.1).

c) A heading line in the same format as used by the V.D.U. display push on the memory select panel will be printed, including the number, Previous no., title, up fade time and down fade time.

d) The memorised state follows these headings.

5.10.5.1 PALETTE MEMORIES

Palette memories are printed with a letter following each level (A-F) indicating which Submaster the socket will be played on when PAL PLAY is used.

### 5.10.5.2 MODIFIED MEMORIES

If a memory that is being printed is modified, re-recorded, or cleared from the memory, "MEMORY MODIFIED" is printed, and its printout restarts.

## 5.11 BACKUP

A backup system is provided, normally powered from the dimmer mains supply rather than the control system supply. It can be used to control the lighting when special sockets have to be separately controlled independently of the main performance, or when the computer power fails, or when a serious fault occurs on the main system, preventing it from controlling lighting.

The backup system consists of a panel mounted under the desk front shelf, fitted with 10 'group master' fader levers (and 10 Non-dim select buttons if any are fitted to the system), working in conjunction with a pin-matrix. Each socket has ten holes in the matrix, one for each of the group masters.

Any number of sockets may be selected to each group master by inserting a diode-pin in all the relevant holes in the matrix. All sockets thus selected may be controlled by moving the selected group master, or by selecting the non-dim master push if non-dims have been grouped together. Sockets selected to more than one group master combine on a 'highest takes precedence' basis.

The output from the memory control may be reduced to zero by selecting MEMORY BLACKOUT on the supervisory panel.

NOTE that some systems may be fitted with more than 10 backup masters.

## 5.12 MODULATION PANELS

The Modulation panels are mounted separately from the desk, normally in a separate trolley that plugs into the main desk. Several identical modulation panels are normally provided, one for each

submaster fitted to the desk palette. Two stereo audio cassette players are mounted in the trolley to provide an audio source for the modulation control.

The Modulation panel can be used to modulate the lighting controlled by one or more submasters as described in 5.6.2.6. Normally the first modulation channel works in conjunction with the first submaster on either or both of the desk and stalls submaster panels, when the modulation pushes above these submasters are selected, and so on for further modulation channels.

The Modulation panels are divided into three sections.

### 5.12.1 OUTPUT

The output section selects the signal source, modifies its limits, meters it, and sends it to the system when ON is selected. The signal sources that may be selected are:

FLASH - From the FLASH section of the panel.

EXT AUDIO - An audio input connector is provided to enable a signal to be fed into the system. All audio inputs, (i.e. EXT AUD, 2R, 2L, 1R, 1L, are routed via the AUDIO FILTER before reaching the OUTPUT stage).

2R - Cassette drive 2, Right channel.

2L - Cassette drive 2, Left channel.

1R - Cassette drive 1, Right channel.

1L - Cassette drive 1, Left channel.

CTRL - An external control signal, e.g. from a fader lever or "pan-pot" to fade each modulation channel in and out sequentially.

Each of these signal sources, by the time the signal reaches the output panel, produce a signal that is equivalent to a fader lever being moved between 0% and 100%, its position depending on time (FLASH), or the audio signal amplitude. This may be modified using the MAX LEVEL and MIN LEVEL control faders. When the input signal is at 100%, the output signal is the same as the setting on the MAX LEVEL fader. Similarly at 0%, the MIN LEVEL is used. Levels between these limits vary pro-rata, e.g. 50% is half way between the MAX and MIN level. Using these fader levers, the lighting variation can be reduced, or even inverted, e.g. if the MAX is set below the MIN control, a loud noise can be made to reduce the lighting level rather than increase it.

The modified signal from these faders is displayed on the meter, and can be connected to the Lightboard system by selecting ON.

If the METER push is pressed, the meter displays the selected audio input level (after filtering) rather than the output, to allow the audio gain controls to be set to a suitable level. It also connects the selected audio source (before filtering) to a monitor speaker in the trolley.

### 5.12.2 AUDIO

All audio signals, whether external or from the tape cassettes, are filtered by the AUDIO section on each modulation panel. This section includes a logarithmic amplifier, to relate the lighting intensity to perceived loudness, and reduce brightness variations due to the variable tape quality frequently present in audio cassettes.

FREQUENCY SELECTION: A band-pass filter is included to allow any part of the sound source (e.g. just bass or just mid-range) to control the lighting. One of the following centre frequencies can be chosen - 250Hz, 500Hz, 1, 2, 4, and 8 KHz.

BANDWIDTH: The bandwidth of the filter can be varied to effectively exclude (when at MIN) or include (when at MAX) the adjacent frequencies.

THRESHOLD: The threshold control varies the minimum audio level required to produce an output from the audio section. When at MIN, almost all audio signals will change the output level. If the cassette noise becomes a problem, or only loud transients are required to change the lighting, this control can be moved towards MAX, to exclude lower level audio signals.

### 5.12.3 FLASH

The flash section provides a 4-part flash cycle, with separate speed controls for each section. The 4 sections are:

a) Time at level A.

b) Time to fade from level A to level B.

c) Time to level B.

d) Time to fade from level B back to level A.

The levels A and B are normally 0% and 100% respectively, but may be modified by the MAX and MIN LEVEL controls on the OUTPUT section to produce a different range of fade or cut. (They can be modified so that B is less than A if required).

The time taken to do each operation is variable between 0.1 sec. (effectively instant) and 30 seconds. When the ON button on the output section is selected, the cycle is reset to the start of the "Time at level A" part of the cycle. Two examples follow:

a) To fade a socket between levels 2 and 6H, 5 secs. up fade and 10 secs. down fade:

   - Call up the socket at level 0 and transfer it to the A Submaster. Select MODULATION on this submaster.

- On the first modulation channel, set:

  Flash Section: A to 0.1 sec.

  A - B to 5 sec.

  B - 0.1 sec.

  B - A to 10 sec.

  Output Section: Select FLASH

  MAX LEVEL to 6.5

  MIN LEVEL to 2

  Turn the output ON

- When the submaster wheel is faded to 100%, the effect will be faded in.

b) To Flash (Cut) the light between the two levels, proceed as above but set:

  A to the time it is to remain OFF

  A - B to 0.1 sec.

  B to the time it is to remain ON

  B - A to 0.1 sec.

## 5.12.4 TAPE DRIVES

The tape drives use standard Phillips compact audio cassettes, recorded in the conventional stereo format (adjacent tracks). The tape motion is started by inserting the cassette and pushing it home. The central control can be used to fast wind in either direction by

pushing it to the left or right. When pushed in, it ejects the cassette. A pause control is mounted to the right of each drive, and may be used to pause the tape once it has been lined up at the start of a modulation effect, to be re-started on cue.

Separate gain controls are provided on each track. They may be set up by selecting the track and required filter on one of the modulation panels, pressing METER on that panel, and adjusting the gain to prevent the signal exceeding 10 on the meter.

The METER push also connects the selected audio source to an amplifier and loudspeaker mounted in the trolley, whose volume can be adjusted by the control mounted on the speaker panel.

## 5.13 BUTTON MIMIC

The button mimic is an optional facility that can be supplied for installations requiring individual button control of sockets. It consists of an illuminated button per socket and a set of 5 control buttons. The socket buttons may be positioned to represent the layout of sockets in the theatre if required.

### 5.13.1 DISPLAY

The lamp mimics in the button mimic panel display a background 'state' with information about those sockets 'controlled' superimposed on it as flashing mimics.

The 'state' display will include sockets above zero in:

a) The stage state when the STAGE push on the button mimic is selected.

b) The stage state of only those circuits under setting panel control (both keyboard and master controllers) when the S.P. push is selected and the setting panel display pushes are selected to STAGE.

c) The preset state when the S.P. push is selected and the setting panel display pushes are selected to GREEN or RED preset .

When sockets are controlled on the setting panel (keyboard controller only, not master controller), their mimics flash to indicate that they are being controlled. Those that would normally have their mimic illuminated flash off for a short period, and those that would normally have their mimic off flash on for a short period. The flashing is integrated into a 3-cycle flash sequence.

### 5.13.2 CONTROL OF SOCKETS

Sockets may be taken under control of the setting panel by pressing their individual button rather than calling them up on the setting panel keyboard. Their level can then be changed as if they had been called up individually or as part of a group on the keyboard.

a) If SET REC mode is selected, it automatically deselects whenever a button mimic push is pressed.

b) In CIRCUIT mode, pressing a button causes the mode to immediately change to LEVEL mode, giving the operator immediate control over his selections, and selecting the sockets to the setting panel.

c) When in level mode (STAGE or PRESET), pressing a button causes a socket to be selected to or from control, reversing its previous state.

d) When selecting sockets for control, the keyboard controller is 'reset', i.e. its group balance is redefined, the return levels are updated, and the mode is forced to GROUP. The socket in question is transferred to the controller , taking due note of USE IND and INDEPENDENT selections on the system.

e) When deselecting sockets, they are individually parked.

### 5.13.3 PARK

PARK deselects SET REC and then behaves in exactly the same way as CLEAR on the setting panel keyboard. It parks sockets on the keyboard controller only and returns to circuit mode.

### 5.13.4 TRANSFER

TRANSFER deselects SET REC, and then transfers any sockets currently under control of the setting panel keyboard controller to the setting panel master controller (stage mode only). It also shuffles up the setting panel history stack on the V.D.U. to clear the latest line. In preset mode, it acts in the same way as PARK.

### 5.13.5 CANCEL

When controlling sockets on stage, CANCEL reduces their level to zero and parks them i.e. performs the same operation as the setting panel CANCEL push, but on the keyboard controller only. In preset mode, it cancels those sockets controlled only.

### 5.13.6 GENERAL MIMIC RESPONSE

When calling up sockets using the setting panel keyboard, those under control will be indicated (excluding the master controller) once control has been taken. Entering S 1 + 2 + 3 will not cause any mimics to flash until the wheel is moved or @ is pressed. Sockets inhibited by SOLO will not flash, since they are not assigned to the setting panel keyboard controller.

# 6 ERROR MESSAGE SUMMARY

## 6.1 HARD WARNING

Desk - High Pitched bleep.

Stalls - Red warning button.

Normal occurrances:

a) When a RECORD button is pressed, and recording is inhibited. Clears when button is released.

b) When a DISC SYSTEM button is pressed, and the disc key is turned off. Clears when released.

c) When loading the program disc - LTG or HT or when the subtests are being loaded in the hardware test. Clears when program is loaded and running.

d) To draw the operator's attention to an error message, e.g. Temperature sensors detect overheat - clears when temperature reduced.

Indicating faults or serious errors :

a) Accompanying error messages caused by unresolved program problems (see checksum and Trap error messages). Should not normally occur, and can only be cleared by reloading the program.

b) Computer no longer accessing desk, or halted.

## 6.2 SOFT WARNING

Desk - Low pitched note.

Stalls - Orange warning button.

Normal occurrances:

a) Button pressed that was not useable either in current system configuration, or with panel in present mode (e.g. Flash in Preset Mode).

b) With a Record button, to indicate that the memory has already been used. A second press actions the recording.

c) When the setting panel changes from socket to level mode and no sockets are controlled. (The wheel movement produces a fixed length warning).

d) If buttons are pressed too fast for the computer to keep up - slowing down slightly will alleviate the problem. Up to 10 actions will be saved and performed when time is available - usually within 1/2 sec. or less. Further buttons, if still pressed, will be actioned after that.

## 6.3 V.D.U. ERROR MESSAGES

These messages are numbered for ease of reference and fault communication to service agents. The exact wording of the message is given, followed by likely causes of the message, and possible ways to correct the problem. Unless otherwise noted, messages can be cleared by pressing ERROR CLEAR.

1 MEMORY FAULT

An unidentifiable error has occured during a memory operation, e.g. Take, Record, Disc Transfers, Shuffle.

2 MEMORY ALMOST FULL

During a RECORD or READ DISC, the memory became more than (approx.) 90% full. The memory has been saved, but the memory will probably soon become full if many more are saved. During a READ DISC, this message is displayed while the shuffle routine is searching for more space. If it finds sufficient space, the message clears automatically. If not, it is replaced by message

3.

3 MEMORY FULL

There was insufficient space in the memory to save the last state. If reported in response to a record button, the hard warning will sound while the button is held pressed, and the memory will not have been saved. If reported during a READ DISC, the transfer will abort. Some of the memories may have been transfered.

4 PROGRAM CORRUPT

The program checking subroutine found that a section of the fixed program was incorrect. The system may still seem to work, but the fault could cause unpredictable results or complete program failure. The hard warning also sounds, and the message can not be cleared from the screen. To correct this problem, the program must be reloaded.

5 PROGRAM TRAP

The program has met a condition either in its own data or in the hardware that it considers wrong and impossible to recover from. The program has been restarted. This should not change levels on stage, but will park all circuits and stop all fades. The system may still seem to work, but could be unreliable. The program should be reloaded as soon as possible.

6 RACK OVERHEAT

7 DESK OVERHEAT

8 STALLS OVERHEAT

The reported piece of equipment has overheated. The hard warning also sounds. The message can not be cleared using error clear, but will clear automatically (including the hard warn) when the equipment has cooled to operating temperature.

9-16: These are special messages included mainly for debugging use. Some are applicable to normal conditions.

9 U.E. TRAP

Not relevant to normal on-site programs.

10 PARITY TRAP

The computer memory (both program and lighting store) is protected against errors by parity bits. One additional bit is written with each byte to ensure that the number of bits set in each 9-bit byte is odd. Whenever a memory location is read during lighting program operation, the parity is checked, and if it is incorrect it probably means that the memory location is faulty or has been corrupted. When this occurs, the program is restarted and this error message displayed. The error message will clear with error clear, but may reappear when the corrupt location is re-read.

11 MAP TRAP

The lighting program makes extensive use of the memory mapping facility (memory management) fitted to the PDP11. Mapping errors should never occur, but if they do (probably due to a hardware malfunction), the program is restarted and this error reported.

12 RESERVED TRAP

A trap has occured via the Reserved trap at memory address zero. The program restarts.

13 RES. INST. TRAP

A trap has occured via the reserved instruction trap at location 10, caused by the program trying to execute an instruction not in its instruction set. This normally implies a hardware failure. The program restarts.

14 BPT TRAP

A trap has occured via the Breakpoint trap (address 14). The program restarts.

15 IOT TRAP

A trap has occured via the IOT trap (address 20). This is normally caused by rogue interrupts, since all unused interrupt vectors point to an IOT instruction. The program restarts.

16 PF TRAP

Not relevant.

17 EXTENDED POWER FAILURE

The working stores in the channel processors are CMOS RAM with rechargeable battery backup. The batteries are constantly under charge when the system is switched on, and hold enough charge to maintain the RAM for about 2 weeks. This ensures that the system restarts correctly after short power failures or weekend shutdowns. If the system is off for long enough for the batteries to become exhausted, the program will restart on power up with this message, and the power up routine will ensure that the RAM is clear (i.e. preset stores empty, stage levels zero, etc.). Approximately 12 hours run time is necessary to fully charge the batteries, but they will hold sufficient charge to cover short power failures after only a few minutes of charge.

NOTE: Unplugging a channel processor will mean that the next time it is plugged in, this message will be produced on power up. This is to ensure that its RAM is cleared and does not contain indeterminate codes.

18 C.P. POWER DOWN RECOVERY FAILURE

The task of recovering following an extended power failure is partly performed by the channel processors themselves. If they fail to complete this operation, this message will be reported. This is normally caused by their RAM clear routine not completing within a reasonable time, or the Ram Power Fail flag failing to clear.

19 C.P. UNIBUS ERROR

The channel processor is giving unibus errors.

20 C.P. ACCESS ERROR

The access error bit is set in the channel processor status register. This is a hardware malfunction.

21 C.P. ** RUNNING SLOW

The main cycle speed of the system is determined by the channel processors fitted to the system. Periodically they are restarted, they process their channels, and then cause a computer interrupt to tell the processor that they have all completed. If this does not occur within a reasonable time, the interface generates the interrupt instead, and sets a flag indicating that one or more of the channel processors did not complete (signal ECTO). The PDP11 then scans each channel processor to check which one had not completed. ** above represents the one that failed - if more than one failed, the lowest is reported. If 00 is reported, the program failed to find an unfinished channel processor.

22 C.P. ** POWER FAIL

During normal program operation, the computer detected a RAM power fail signal on the indicated channel processor.

NOTE: Both errors 21 and 22 may indicate that some sockets are uncontrollable. The channel processor hardware should be checked

as soon as possible.

23 MEMORY CORRUPTED

When the program is loaded or restarted, the essential memory pointers are checked to ensure that they are reasonable. If a new version of program is loaded that is larger than the previous one, and the memory was almost full, it is possible that the new program will overwrite some of the old memories. If this occurs, this message will be displayed, and recording will be inhibited. This condition will persist until a MEMORY CLEAR 0-999.9 + houselights is performed, which will reset the pointers and clear the message. Memories can still be used before this, but it could well cause the system to crash.

24 MEMORY SIZE INCORRECT - IS ** BLOCKS

The program is told during assembly time the ammount of memory to expect on the system. When loaded or restarted, it checks the ammount actually fitted to the system, and if not the same, this message is reported. The number ** is in units of kilowords (1024, 16 bit words). Most systems will run with 32K or more of memory, but spare memory for lighting states may be rather restricted with 32K of memory.

25 DISC ACTION INTERRUPTED

A disc action was stopped by pressing DISC BUSY or by turning off the keyswitch while the disc was actually working.

26 DISC FULL

There is no more space for memories on the disc. Note that new discs that have not yet been cleared may also report this message.

27 DISC ALMOST FULL

There is less than (approx) 10% of the disc space left. Only reported during disc writing operations.

28 DISC SAFE

An attempt has been made to write to a protected disc. Check that the disc is the one required. If so, cover its write protect hole.

29 NO DISC RESPONSE

If the disc system fails to respond to a command within a reasonable time, the action is terminated and this message reported. A hardware fault is the most likely cause.

30 DISC ERROR *** ****

A hard error (one that persists) has occured on the disc drive. The numbers reported are a 3 digit error register value and a 4 digit logical sector number.

31 AUTODUMP LOST

Recording has been too fast for the disc system and one or more memories that should have been autodumped have not been.

32 MEMORY 0 LOST

During a DISC TO MEM SHIFT or RENUMBER, a memory was to be assigned to number 0. This is not permitted, and the memory has been discarded.

33 HOUSELIGHT MEMORY LOST

During any disc to memory operation, a memory was to be saved on a number between 0.1 - 0.9, but the record keyswitch was not switched to HOUSELIGHTS. The memory has been discarded.

34 A-M FULL

A new entry was not saved in the automod store because the latter is full.