

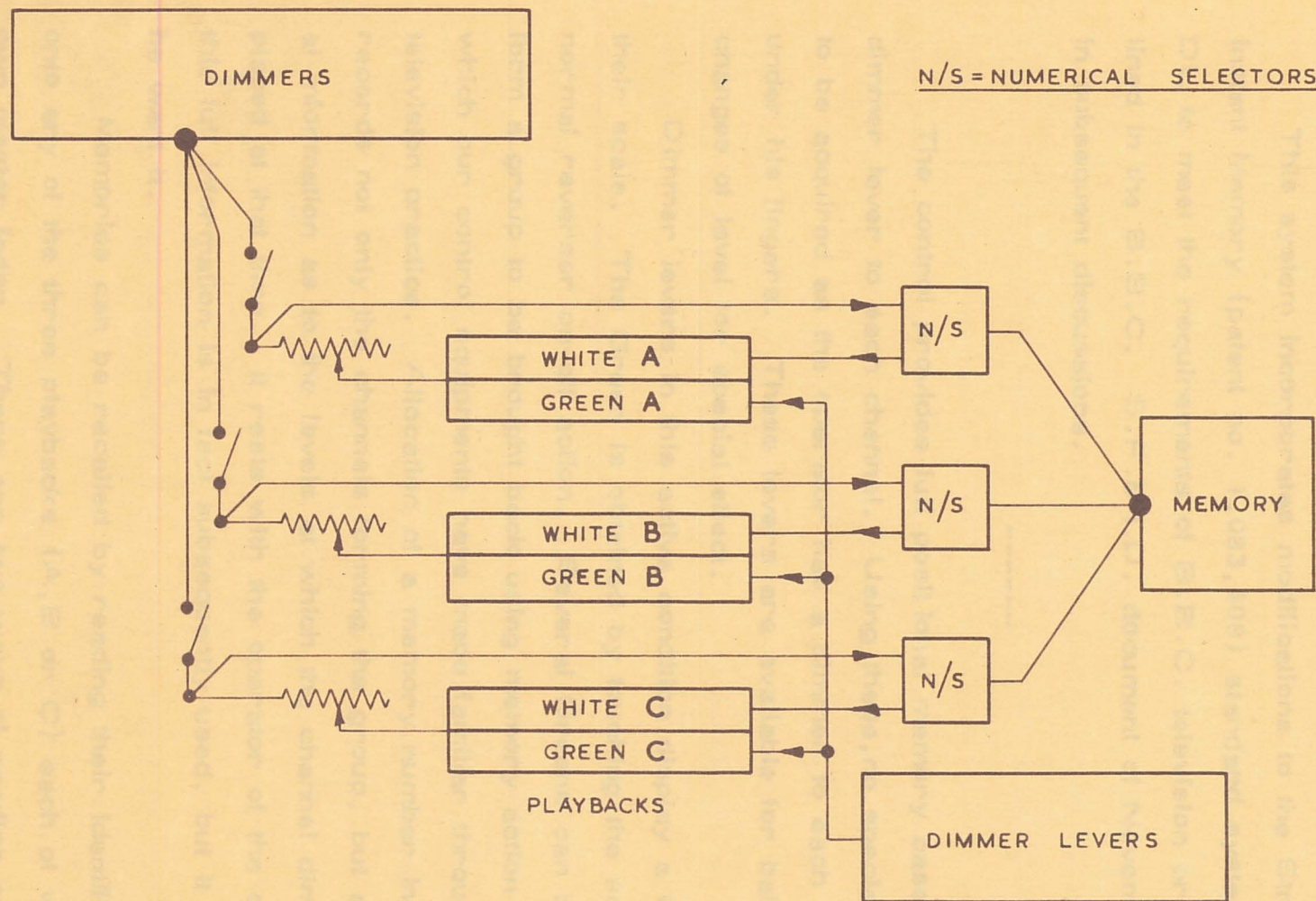
CONTENTS.

SCHEMATIC OF IDM/DL/TV-BBC

Introduction	Page	1
1.1. CONTROL CONSOLE		4
1.2. CHANNEL CONTROL PANEL		"
1.2.1 Physical Layout		"
1.2.2 Channel Dimmer Controls		5
1.2.3 Mode Controls		6
1.2.4 Dial		"
1.3. MASTER CONTROL PANEL		7
1.3.1 A & B Faders		"
1.3.2 C Fader		8
1.3.3 Crossfader		"
1.3.4 Blackouts		"
1.3.5 Content		9
1.3.6 Record		"
1.3.7 White Lock		10
1.3.8 Read Controls		11
1.3.9 Add and Subtract Controls		"
1.3.10 Automatic Programmer		12
1.3.11 Auxiliary Memory Setting Panel		13
2.1. CHANNEL INDICATION & FUNCTION SCHEDULE		15
2.2 - 2.6 Diagrams	Pages	16 - 20
3. OPERATION AS BBC OUTLINE REQUIREMENTS		
	Pages	21 - 27
PHOTOGRAPHS OF IDM/DL EQUIPMENT	Pages	28 - 30
IDM/DL Standard Booklet.		
Type PTM Dimmer Rack Leaflet.		

Strand Electric.

FPB/FRS/BEB. 12.3.68.



SCHEMATIC OF IDM/DL/TV-BBC

PROPOSED VERSION OF STRAND IDM/DL/TV FOR
B.B.C.

INTRODUCTION.

This system incorporates modifications to the Strand Electric Instant Memory (patent no. 1,083,408) standard system IDM/ type DL to meet the requirements of B.B.C. television practice as outlined in the B.B.C. S.F.& I.D. document of November, 1967 and in subsequent discussions.

The control provides full positional memory based on the familiar dimmer lever to each channel. Using these, no special techniques have to be acquired as the operator has a dimmer to each channel literally under his fingers. These levers are available for balancing and changes of level for special effect.

Dimmer levers in this active condition display a Green light in their scale. The Green is obtained by touching the scale to operate normal reverser on-off action. Several Greens can be captured to form a group to be brought back using memory action in the manner which our control equipments have made familiar throughout British television practice. Allocation of a memory number in this case instantly records not only the channels forming the group, but also full positional information as to the levels at which the channel dimmer levers were placed at that time. It rests with the operator of the control whether this full information is in fact subsequently used, but it is there should he want it.

Memories can be recalled by reading their identification numbers onto any of the three playbacks (A,B or C) each of which has its own master fader. There are two ways of reading onto a playback; the first is so that the dimmer levers become active as a group in which case they and the master fader which controls them display Green. The second is to feed full positional information direct to the dimmers and by-pass the levers. The lever scales then act as a mimic by lighting in White to show which channels are being so fed and the master fader also becomes White.

Take over by dimmer levers to allow modification of recorded dimmer levels is provided for and such information is Re-recorded for future use. Levers which have taken over from the full positional memory show Green as well as White and this Green condition is dominant in spite of its being fed from a White master.

As so far described a memory can be Read either as Green to act as a group feed to active levers or as White using full positional information - levers being inactive. It is also a B.B.C. requirement to use a memory to provide simultaneously a combination of active levers for some channels and full positional information for others. It has been suggested that 50% or more of the channels might remain balanced in a lever-active condition right through a production, and full positional memory would only be used on those which have to change level for special effects, for example additive colour mixing on a cyclorama.

To do this the control is operated in the Green condition and the channels requiring full positional control can be designated at any time by touching the dimmer scale in conjunction with the "White Lock" Mode switch. These channel levers then show in addition a Red spot which requires use of scale plus Mode switch to remove. Levers can then be rebalanced etc. and Re-recorded. Whenever any memory in which these channels appear is recalled as Green then the "White Locked" channels will use full positional information and display White plus the Red spot while the normal channels and the master will display Green. Should a memory be recalled as White no distinction is shown in respect of these channels since all will then be displaying White and receiving full positional information.

Modification of these "White Locked" channels is important since the reason for this condition is to enjoy many changes of level and these have to be set up in the first place. The anomaly that the channels which require only one level (the Greens) are easier to change than those which require many, has to be avoided. Accordingly a "Lock Inhibit" push button is provided which causes the "White Locked" channels to change over from the Red plus White display to Green plus Red, and the levers are now active and can be used to give a new set of levels which is Re-recorded. When subsequently called up as Green these return as White plus Red.

into red light window?
Does it change with master?

All on one frame
in use?

In "White Lock" cases where only two or three channels require modification the normal individual scale match modification technique of touching the dimmer scales can be used; such channels still change over to Green plus Red. *White level matches?*

Memories whether Read as Green (with or without White Locks) or as White are called up on the playbacks A, B and C. Thus for example A and B can be used as the incoming and outgoing lighting by alternating from one to the other - the content being indicated by the memory number over the fader and the display at the channel levers. Memories can also be added (both as "Highest" and "Last") or subtracted to make up a multigroup amalgam on a single playback as required. When playbacks are used piled their content can be separated for appraisal or modification and, whenever required, corrections made to a memory before it actually takes over the studio lights. A whole series of memories can be so corrected even if read in the full positional White condition as it is only necessary to keep Green dominant levers selected in respect of those channels. Green is not tripped by White, but has deliberately to be tripped - reverser action - channel by channel or as a whole playback by using a Green Cancel.

Recording and Re-recording is merely a matter of choosing an existing number or a new number to cover a lighting effect. Such Recording is, except when the Cross Fader is in use, limited to the dimmer levels fed from the particular playback over which that control is mounted. Thus Recording can be quite independent of work going on in other parts of the studio. The Recording covers both dimmer lever levels and full positional memory levels when these are combined, the process being concerned with memorising the total output from a playback.

1.2.1. Physical Layout: The system described lends itself to the TC Studio 7 type layout with unit for channel levers to one side and master panel in the centre. Due to there being only one set of levers the panel for 220 instead of 100 channels shows little increase in size. The master panel shows no increase.

PART I

1.1. CONTROL CONSOLE: There are three parts only to be accommodated:

- a) Channel Control panel which includes 220 dimmer levers and is 38 ins wide, $25\frac{1}{4}$ ins high and 8 ins deep.
- b) Master Control panel 18 ins wide, $16\frac{1}{4}$ ins high, and 9 ins deep.
- c) Memory Setting Panel (see 1.3.II)

The above will be arranged to fit BBC cabinet work as has been normal practice hitherto, and the drawings represent one format only. Components can be re-arranged to fit other formats if desired.

The 30 x 30 ins plot panel requested by the BBC is not included in these dimensions nor at this stage is space for BBC communications, but all indicating and signalling lights required to operate and to appraise the state of the control systems have been included, no separate channel mimic or file mimic diagrams being necessary.

The memory action and logic racks (including the tape programmer if this device is required) are sited remote from the control console in any other preferred position.

1.2. CHANNEL CONTROL PANEL: This contains five rows of Strand luminous dimmer levers mounted at $\frac{5}{8}$ ins centres horizontally and $4\frac{1}{2}$ ins vertically. Each row carries fifty levers except the bottom one which has only twenty. The space which is at the end of the panel nearer to the master panel, carries the indicator Dial and Channel Mode Controls. Above each row of dimmers there is a strip carrying dimmer identification numbers. To provide large digits in the tight space, it is suggested that for clarity, only the odd number channels shall be identified. Alternatively only two digits might be used and the three digit numbers identified by their locality on the panel.

1.2.1. Physical Layout: The system described tends itself to the TC Studio 7 type layout with unit for channel levers to one side and master panel in the centre. Due to there being only one set of levers the panel for 220 instead of 100 channels shows little increase in size. The master panel shows no increase.

We are of the opinion that should a central position for the channel controls be considered important, this may be arranged by partly recessing the panel into the table top instead of standing it completely proud. To reduce the width there could be six rows (5 x 40, 1 x 20 - panel area 31 x 30 ins) three above the table and three below. In these circumstances the VCS would have the master panel in front of him and the channel controls to his right. The TM could sit either immediately in front of the latter or to the right alongside the vision operator (for cameras). One man lighting operation involves no change of position for the VCS.

The take-over of an individual channel by the TM does not involve any use of the master panel. If a scale is Green he merely moves the lever, if White or Black he touches its scale to get it into a Green condition (see 1.2.2 below). The fact that the VCS would tend to read the dimmer scale from the side should no longer be a handicap, for in cases where a number of intensity changes were involved, the full memory would be used for exact recall anyway.

1.2.2. Channel Dimmer Controls: There is one per channel each with a scale 0 - 10 in units and halves which can be internally illuminated in Green or White or have a Red Spot added in the centre in such a manner that when two colours are displayed the fact can be clearly seen. Each scale is fitted with a spring which allows the operator to use a deliberate action to make a touch contact. No light in the scale = channel not in use. Green = dimmer lever action, fed from (group) playback A, B or C. White = channel fed from full memory playback A, B or C (dimmer lever inactive). Thus Green signifies full manual control either manually selected or selected by memory groups and White is full memory with no manual control.

The operation and indication of the channel dimmer scales takes account of the probable use at the time and the Mode switches are used only when it is occasionally required to depart from this. Thus touching a dark scale causes it to turn Green i.e. it is selected on any master fader that is "on" i.e. lit Green (except when limited by the "Content" control see 1.3.5 below). If it is already displaying Green it will extinguish the Green (reverser action) thereby de-selecting it from a Green master.

Handwritten note: If control is away from the ON - to will be forced to switch action or panel it.

If the scale is White it adds Green when touched, if the lever matches the recorded level of that dimmer (as at that time fed). This level will appear on the indicator Dial, but in normal practice it will be sufficient to hold the scale depressed and move the dimmer lever until the Green joins the White to show manual take-over has occurred. The dimmer lever is now active and completely dominant, the White display which remains only indicates that it is in fact fed from a White master instead of the usual Green from Green.

What happens when the green off - does it go?

If a Green memory is Read then this replaces the White display altogether, levers becoming active (without the need to match) fed from a Green master. If a White memory is Read then the Greens remain dominant until cancelled or individually tripped.

1.2.3. Mode Controls: These are situated alongside the Dial Indicator and are four in number, three being luminous with reverser action. Of these latter the left-hand one (blue) inhibits the normal channel scale action and causes it to Flash the channel itself to put for identification purposes. This applies whether the channel display is Green, or White. The middle one shows White when "on" and causes the scale touch to trip "Off" any channel displaying White and extinguish the studio light. In the event of a channel being in a Green and White modification condition on a White master, a mode switch is not necessary to achieve the same result the Green being dominant, the reverser action trips both. The third push inhibits the reverser action so that the Dial can be read alone. The fourth provides "White Lock" or Unlock by Fed-spotting (see 1.3.7 below)

1.2.4. Dial: This is vertical moving voltmeter calibrated to correspond to the dimmer scale. It is used to read a recorded level, and in consequence only operates when a channel scale is showing White. Whether the scale is also showing Green is immaterial since it is only concerned with the recorded information. A scale showing Green but no White relies on its lever for indication.

The Dial reveals the state of the particular channel memory as at that time fed by A, B or C, which means that if its master is in an intermediate position the reading is proportionately cut. This is in fact what would be memorised if Record or Re-record were used at that moment.

To discover what has been memorised on the particular file at the moment, the master fader must be at full. In consequence should the operator require to find out memory levels of channels before the studio lights up, he must put the Blackout on for that particular playback. However he does not then need to raise the fader because this shorts it to full automatically, bringing with it the dimmer scale display as well should the fader be at zero. To limit the area of Dial reading to one playback should two or three White playbacks be piled Content (see 1.3.5 below) is used.

1.3. MASTER CONTROL PANEL: This consists of three luminous master faders (A,B,C) which show Green or White. Each master fader can be considered as having a vertical column of associated items. At the very top of each comes a luminous numerical indicator, below this a combined Record and Re-record control and just over the fader twin controls for 'Read'. Under the faders are further controls to each. To the left of the faders are columns of push buttons for numerical call-up with a Record indicator window and controls above.

1.3.1. A & B Faders (Green or White): Each is used to feed a playback into which an already recorded memory (file) has been read. Simple progression can be imagined as calling up numbers alternatively on A and B and either raising one fader and taking out the other or cross-fading between the two, or even punching up numbers "cut fashion" directly onto one or both playbacks. Any recorded memory file can be used either as a group selector whereupon its fader turns Green, the number in the window over it is backed by Green and the appropriate channel dimmer scales display Green ("White Lock" channels excepted - see 1.3.7 below) as the fader is moved off zero, or as a full memory selector calling up dimmer levels when the display throughout will be White. The point at which the display lights up in each case comes before any studio circuits light and will be well defined by feel. A master fader always shows Green unless:-

- a) It is at zero.
- b) The playback has been read as White.
- c) "Content" is being used in conjunction with another fader and playback.

d) Its own Blackout is "on".

Under each fader are momentary contact non-luminous pushes for "+C highest" "+C last" and "-C", a Green cancel for the playback also a luminous reversing push for Blackout.

1.3.2. C Fader (Green or White); This is similar to the A & B faders except that under it there is only a luminous reversing push as above for Blackout. The C fader is required for adding and subtracting memories, but can otherwise be used as a normal third playback. An additional 'BO only' push is also fitted which does not short the fader to full so that it can be used to add the levels of the memory proportionately reduced by an intermediate position of the C fader. (See 1.3.9)

1.3.3. Crossfader: This is situated over the A and B faders, and consists of twin faders mounted horizontally one over the other. The top one is normally kept over the right and is only used to fade out an incomplected crossfade (see 3.4.1). Having if necessary put its lever to the end which corresponds to the master fader already at full, the bottom one is switched on by putting down the tab switch under it. Both crossfaders then light in Amber and the bottom one can be used to fade from the content of A to B or vice versa keeping any common channels steady without dip. If the Crossfader switch is put up it will light the bottom fader in Green and automatically 'et seq' the numbers for recall at each end of the fader as it is moved across, no further call up being necessary on the part of the operator.

1.3.4. Blackouts: These are reversing luminous pushes under each fader. When on they display a warning Amber and blackout the studio as fed from that master. To draw particular attention to this a Blackout extinguishes the colour in the scale of its master fader, but does not interfere with the normal working of the channel scale lights or the indicator window numerical displays. The Blackout has an extra 'full on' function as required in 1.2.4 above. There is an extra 'Blackout only' push under C.

NOTE: 'Blackout' is an expression borrowed from the theatre which may be rather a misnomer, but it conveniently abbreviates to B.O.

Its main function when 'on' is to prevent the output of a particular playback reaching the dimmers thus permitting appraisal, modification and recording of content to take place without 'affecting studio lights'.

1.3.5. Content: There is one switch for this between the A and B playback faders and another between B and C. They are 3 position tab switches working horizontally and are normally kept in the centre position. To limit the display and scale ^{dial only?} touch action and the associated Dial readings at the channel levers to just those fed from a particular fader, the Content switch is pushed towards that fader. Centering the switch restores the complete display and action.

The fact that use of Content also confines the Dial to one playback fader is useful in assessing the relative contribution of two White memories which are piled at the time. An additional guide to the presence of any such commons is given by a brighter display in their scale.

1.3.6. Record (and Numerical Selectors): This section is mainly concerned with Recording once the memory groups have been set up. That initial process is intended to be carried out from the Auxiliary Memory Setting Panel (see 1.3.11 below) or using an Automatic Programmer (see 1.3.10 below). It is still perfectly possible to carry out all necessary memory procedures without resort to either of those auxiliaries.

All recording stores against a file number full positional information in 32 discrete steps in respect of channels in use. It is their method of recall when subsequently Reading the number that determines whether the information is fully used or merely forms a group feed to activate dimmer levers.

Whether a particular operation is considered as Recording or Re-recording is solely a matter of whether the existing number, called to get the effect just now, is going to be re-used or a new file number attached. There are therefore separate Record controls each consisting of a centre stable tab switch working horizontally. When pushed to the left the content fed from that particular playback master fader is recorded against the number in the Record window. When pushed to the right the number used is that in the window over the playback and in consequence this can be regarded as Re-recording.

The number for example 056 in the Record window is selected by touching the numerical selector push buttons which then remain lit. Fresh selection could cancel this by another number before use. The centre stable tab under the Record window is pushed down and the number appears there against a Black ground and the lights in the selector pushes are extinguished. When the number in the window has been recorded it appears against a White ground.

The next number can be called by using the pushes or by pushing the tab switch under the window upwards any number of times to step up sequentially to the 'Next' required number. Once a sequence has been started, the push selectors are only required to break sequence. Each time a new number which has not been recorded appears in the window, it shows against a Black ground; recording turns this White. An interlock prevents recording when a number in the Record window shows White. This reduces the risk of cancelling inadvertently a previous recording. Should one try to use an interlocked number the window turns Red. If the number is really wanted then it can be selected afresh by using the push buttons.

The number in the Record window is shared by the Auxiliary Memory Setting Panel and is in fact the only thing they have in common. The indicator is therefore preferably kept going using the 'Next' process since it shows at a glance to what extent the memory bank has been drawn upon. For example if the Record indicator shows the number 100 there would still be a balance of 150 further memories which could be used.

1.3.7. White Lock: It may be decided that certain channels will only be used in the White full memory condition. This decision is probably made at the time of balancing when in fact all channels in that file have been recalled as Green. To ensure return only as full memory from then on whenever they form part of a recalled memory, the appropriate channel scales are touched along with the Mode switch which adds a Red Spot indication. These channels are then said to be "White Locked". They can be restored to the normal working only by individually tripping in conjunction with the mode switch. But a momentary contact 'Inhibit' push is also provided to avoid any inconvenience in rehearsal balancing, i.e. it trips temporarily all "White Locks" until next cue is Recalled.

1.3.8. "Read" Controls: There are indicator windows over the A, B and C faders and a pair of centre stable tab switches to each, working vertically. The left of the pair is Green and if pushed down will take the number set on the numerical selector and put it on a Green ground in the window, at the same time causing the fader to turn Green, and the individual channel controls concerned to turn Green (subject to fader off zero). The channels now in playback are being used to activate their individual dimmer levers. Should the right-hand tab switch (White) be pushed down, White is displayed throughout and the recorded levels of the memory are used, the dimmer levers themselves being disconnected in respect of those channels. However some White recorded levels can also be fed and displayed when using Green Read if those channels have been "White Locked" as in 1.3.7 above, but a Red Spot will appear at the same time in the centre of their scales to remind the operator which they are.

Should either of the pair of tab switches be pushed up, it will notch up the 'Next' number to that in the window, and turn its background black thereby indicating that the display in the fader and dimmer channels no longer corresponds to that number. Notching up can be used to jump several numbers before actually recalling by pushing the tab down. To go back or otherwise break sequence the number is selected on the numerical push buttons. (see Record 1.3.6).

What happens if Green is pushed up?
Recalling a Green number as a White will immediately duplicate the Green display in White, but the Green remains completely dominant unless Green Cancel for that playback is used. *White is now W. Green is now G?* A Green condition can be recalled on one playback with a White on another, and if the two faders are at full the results are piled, the highest taking effect. The same would result in the case of common channels on two different memories being piled.

1.3.9. Add and Subtract Controls: Playback C is used to recall the memory which is required to add to another for common control from one playback or which it is required to subtract from a combination already so made up. The memory on C is added to either playback A or B using the '+C' controls under them. A series of numbers can be called on C and added.

Should the C fader be other than at full, the content added will be proportionately reduced. When addition takes place to, for example, playback B its indicator window shows the last number added to form the composite memory now in use. If more permanent use is going to be made of the combination it should be given a memory number. There are two Add pushes in each case, the top one adds 'Highest' in the case of any channels common to memories and the bottom one adds 'Last'. A series of memories can only be added from C if the fader they are being added to is at full. The transfer to the indicator will not happen unless this is so. However when such addition is done with the Blackout 'on' the fader is automatically shorted to full anyway. As however it may be required sometimes to add a memory proportionally cut from C, an extra blackout known as 'BO only' is provided in that case.

Any memory which is called up onto the C playback to be added to another takes on the condition (Green or White) of the playback to which it is added. Thus if the B playback carries a White memory, additional memories will become white also even if called on C as Green. However there is a distinction which could be useful namely that the Green levels which are added to the White are those of the dimmer levers, whereas if a White is added to White, it is recorded levels which are combined. To subtract a memory the number is called up White on C. The Subtract push under the playback to be subtracted from is pressed. The actual channels are determined by the memory on C, but the levels are determined by the combination from which subtraction is to take place, because the levels of commons may differ from the levels recorded in the actual memory file used to Subtract. An automatic Re-record takes place instantly and the window over C displays 000 on the White ground.

If it is proposed to use the levels under 000 in their own right they can be given a number and Recorded. Subtraction without a jump can take place from a fader at an intermediate position provided the C fader is placed at approximately the same level.

1.3.10. Automatic Programmer: Although memories can be set up by touching the dimmer scales, allocating the number and Recording it is proposed that computer tape should be adopted.

A Datologue punch attachment is fitted to an electric typewriter, and the groups typed out. For example: '(001) S S S - - - S S S S' would cover one cue programme for the first ten channels. Feeding is sequential so that Memory 001 is not typed, but could be printed on the sheet as a guide to the typist: likewise if desired the channel numbers could be printed as a guide. The punched tape is then put in the programmer in the dimmer room or wherever it may be situated. The switchboard is automatically set up, 60 groups per minute. Such programming would include the instruction to record at level 7 or any other common level that might be required. Such an arrangement would make proper use of the existing computer equipment. Memories so set can always be instantly modified and further ones set at the control console without using the programming tape. Programming tape can be re-used in respect of productions such as a panel game which would use a repeat or largely repeat layout.

1.3.11. Auxiliary Memory Setting Panel: If it is considered necessary to avoid conflict in setting up memories during two man operation an auxiliary panel can be provided. We understand numerical call up is considered undesirable, in consequence this item provides a separate luminous reverser action push button per channel. The actual format can be subject to discussion, one format is shown on our drawing, but because space is at a premium, we suggest you may like to adopt a limited application of our shift principle. (Patent No. 918,527). Shift would be one hundred at a time. Thus the first selection would be 1 to 100, the second 101 to 200 and the third 201 to 220. The effect of shift is equivalent to flipping over the pages of a book, any selection remains until cancelled. The memory (file) number selection pushes to start a sequence are common to both.

The pushes light in Amber to show that they do not operate the main control in any way and that Recording is quite independent. To provide an actual recording level on which to form the groups, a single dimmer lever is provided which could be set to 7 or whatever starting level is used on the channel levers. Whether this level was ever in fact re-used would be at the option of the operator.

A Record window will duplicate the number on the main panel and a Record and Next centre stable tab switch would be provided. A Read Amber push to assist the memory setting process is provided, also a cancel push.

The memory setting panel is purely an auxiliary and could be in a secondary position or made to swing out or to push away when not particularly required, occasional memory setting can still take place from the master panel and channel controls.

Panel	Light	Master	Light
Black	-	-	off
Green	Green	Content	Active
Green	"	"	"
Black	-	-	off
Green	-	Green Read	Active
Green+Red	Green+Red	White Lock	Active
Green+Red	-	-	"
Green	Green	White Lock	"
Green	-	-	"
Green+White	-	White Read	Active
White	-	Green Cancel	Inactive
White	Dial	(No Match)	"
Green+White	Green+White	(Match)	Active
Green+White	-	-	"
Black	-	-	off
White+Red	-	Green Read	Inactive
White	Dial	(No Match)	"
Green+Red	Green+Red	(Match)	Active
White+Red	-	Green Read	Inactive
Green+Red	-	(White lock)	"
White+Red	-	Lock Inhibit	Active
White+Red	-	Green Read	Inactive
Green	Green	(White lock)	"
White	-	White Lock	Active
White	Black	White Read	Inactive
White+Red	-	White Trip	-
White+Red	-	Green Read	Inactive
Black	Black	(White lock)	"
Any Colour	No Change	White Trip	-
		Flash	No change
			Any
			Flash to off

Diagrams 2.2 to 2.7 which follow show typical displays.

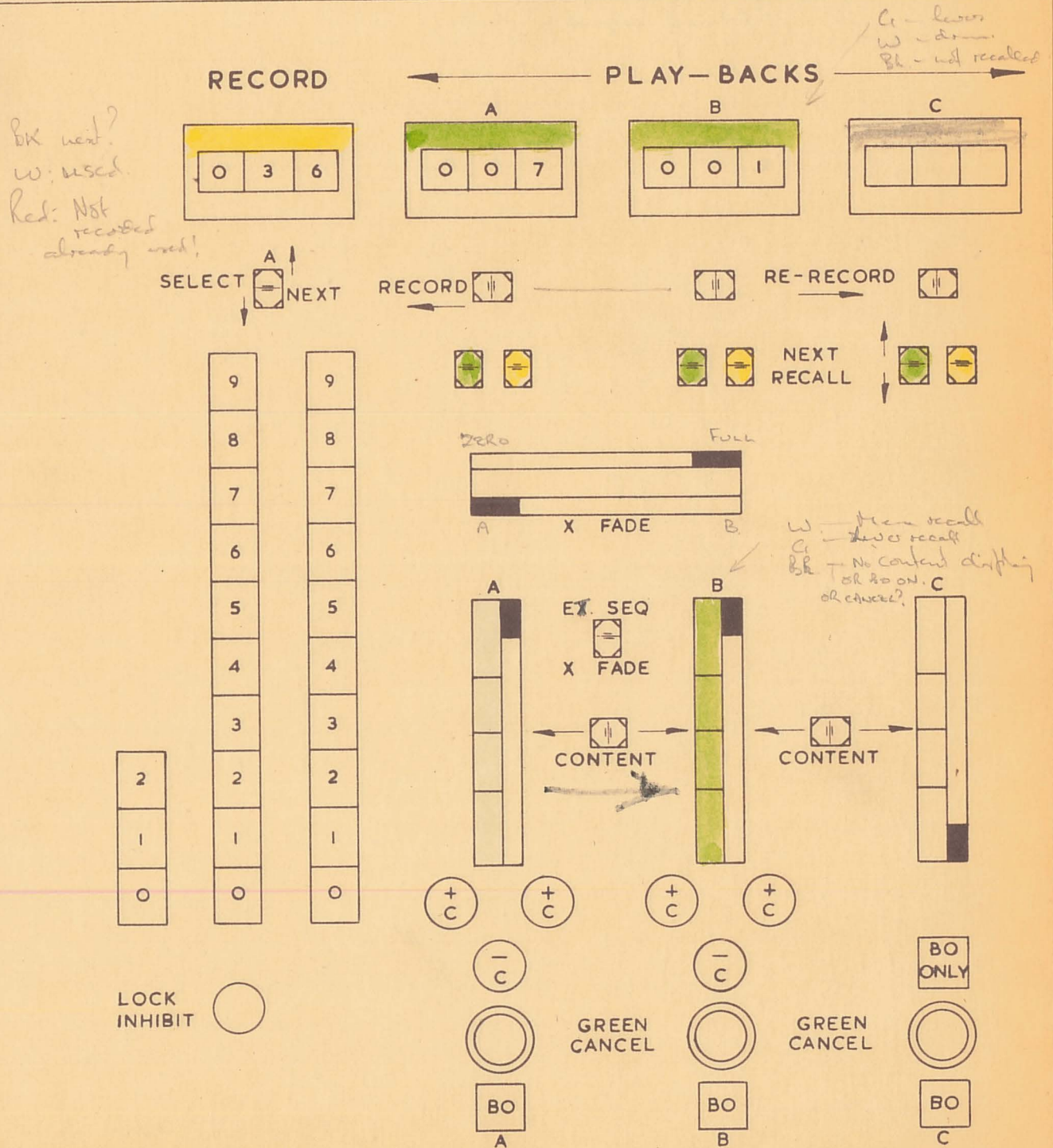
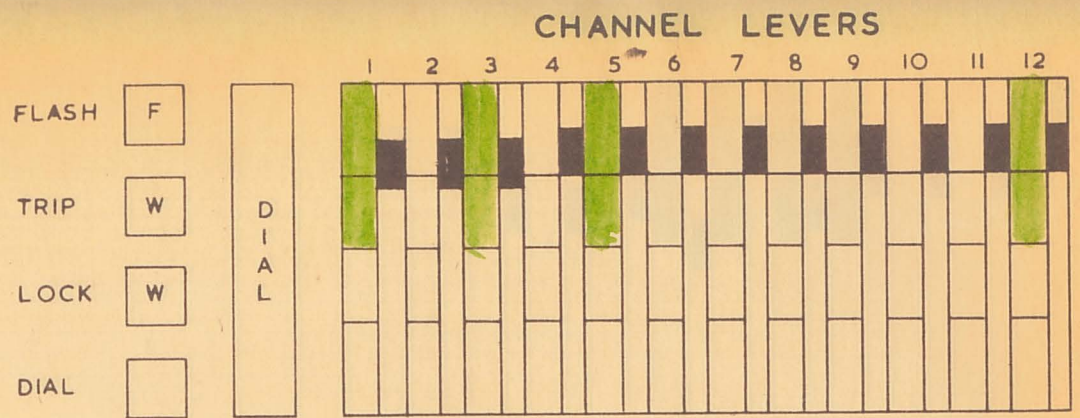
PART 2.

2.1. CHANNEL SCALE INDICATIONS AND FUNCTION SCHEDULE (Single Playback).

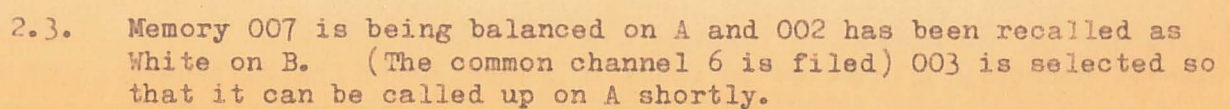
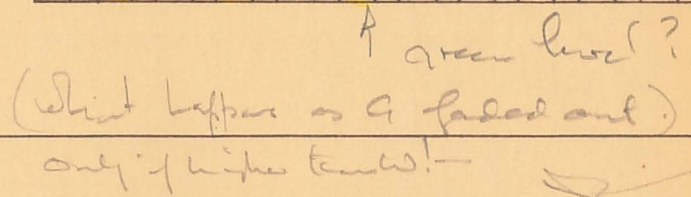
Unless otherwise indicated response in column two assumes simple reverser action operated by touching the dimmer scale when working line by line down the page. The right-hand column assumes of course that the dimmers and one master fader are set to give some sort of light producing level.

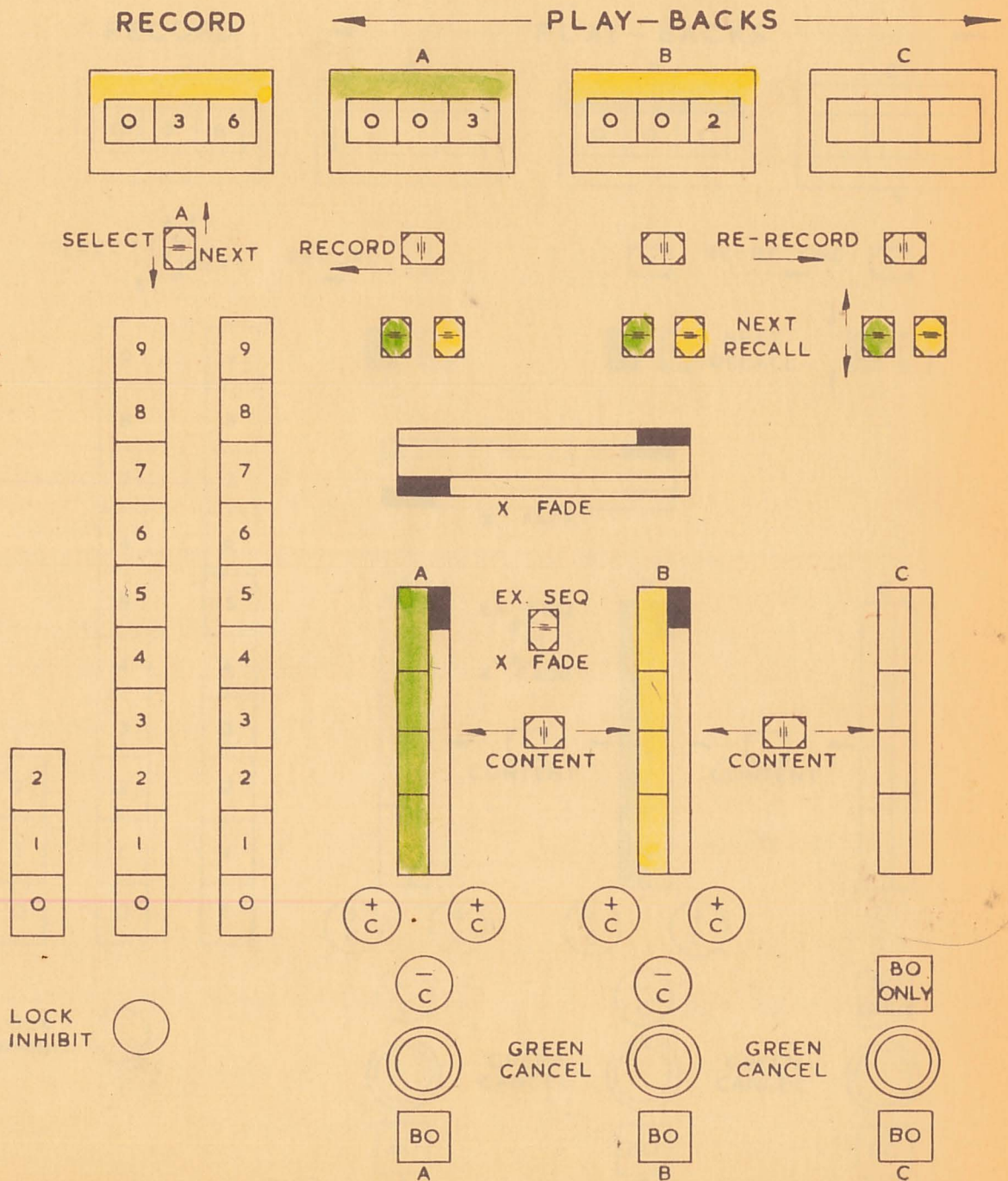
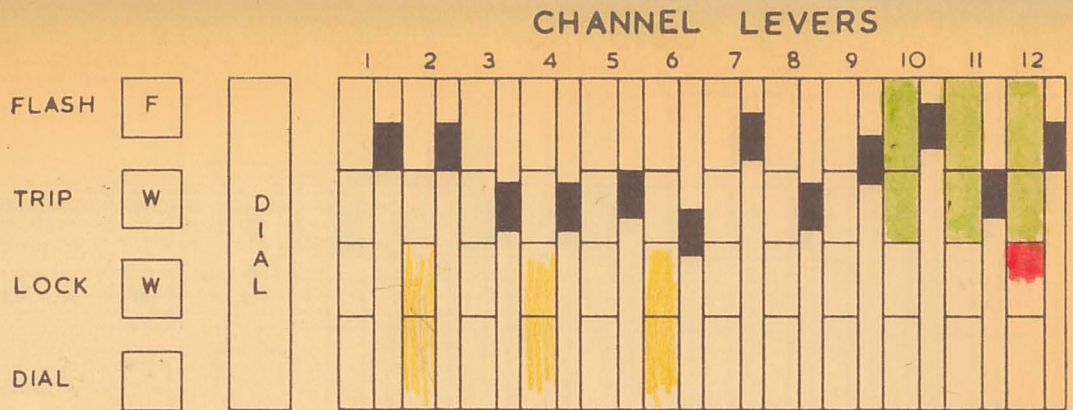
<u>CHANNEL SCALE LAMP.</u>		<u>FUNCTION.</u>		<u>STUDIO.</u>	
<u>Now</u>	<u>On Touch</u>	<u>Using</u>	<u>Lever</u>	<u>Master</u>	<u>Light</u>
Black	-	-	-	-	off
	Green	Content	Active	Green	on
Green	"		"	"	"
	Black	-	-	-	off
Green	-	Green Read	Active	Green	on
	Green+Red	White Lock	Active	"	on
Green+Red	-	-	"	"	"
	Green	White Lock	"	"	"
Green	-	-	"	"	"
Green+White	-	White Read	Active	White	on
White		Green Cancel	Inactive	"	"
	Dial	(No Match)	"	"	"
	Green+White	(Match)	Active	"	"
Green+White		-	"	"	"
	Black	-	-	-	off
White+Red	-	Green Read (White lock)	Inactive	Green	on
	Dial	(No Match)	"	"	"
	Green+Red	(Match)	Active	"	"
White +Red	-	Green Read (White lock)	Inactive	Green	on
Green+Red	-	Lock Inhibit	Active	"	"
White+Red	-	Green Read (White lock)	Inactive	Green	on
	Green	White Lock	Active	Green	on
White		White Read	Inactive	White	on
	Black	White Trip	-	"	off
White+Red	-	Green Read (White lock)	Inactive	Green	on
	Black	White Trip	-	-	off
Any Colour	No Change	Flash	No change	Any	Flash to off

Diagrams 2.2 to 2.7 which follow show typical displays.



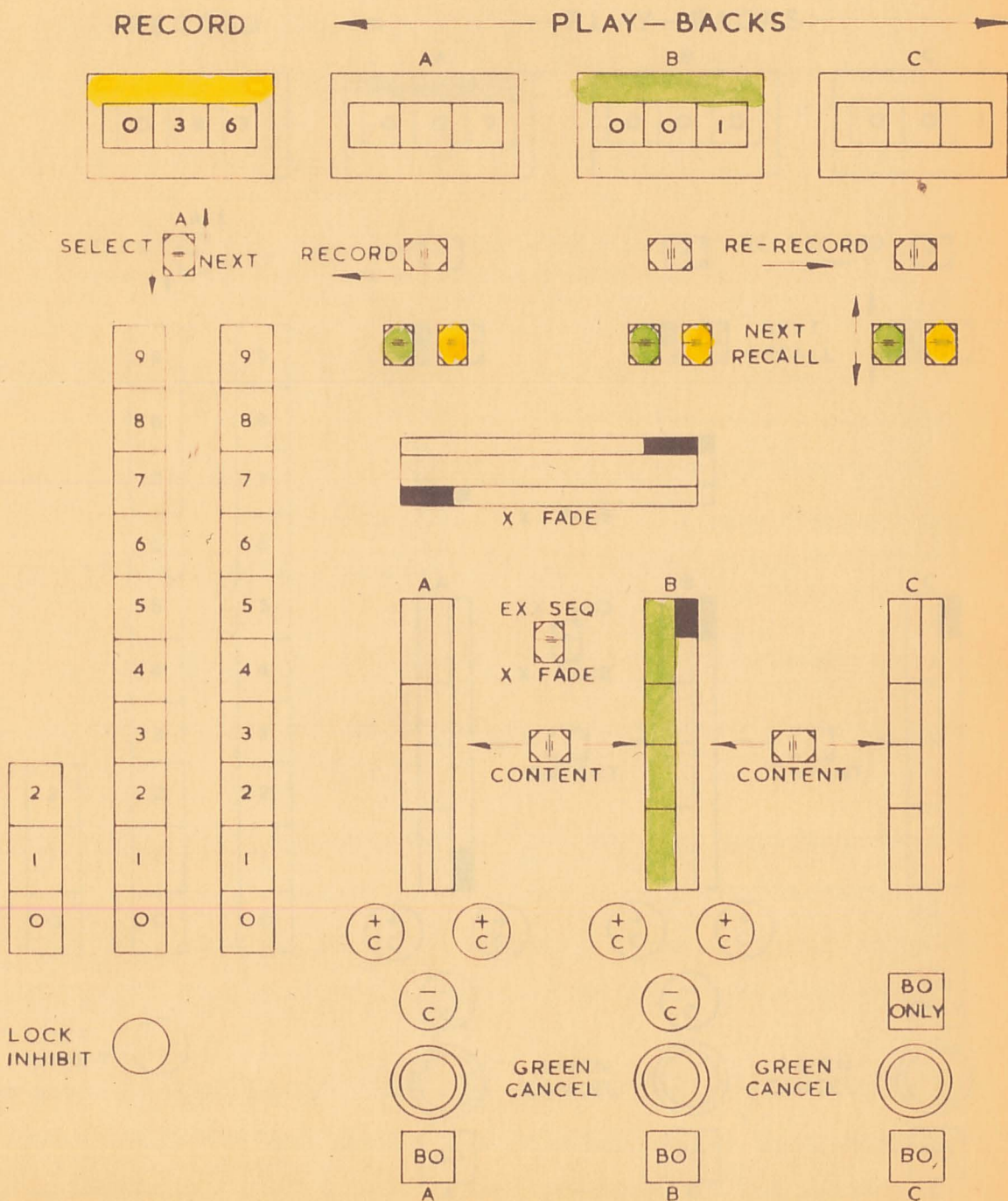
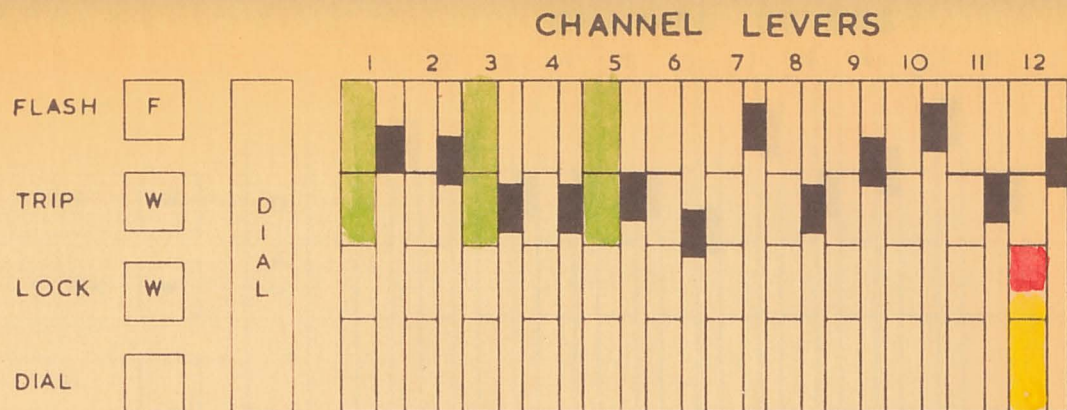
2.2. 36 memories have been recorded. 007 on A is holding lights in one part of the studio but "Content" is restricting display to 001 on B which is being balanced.



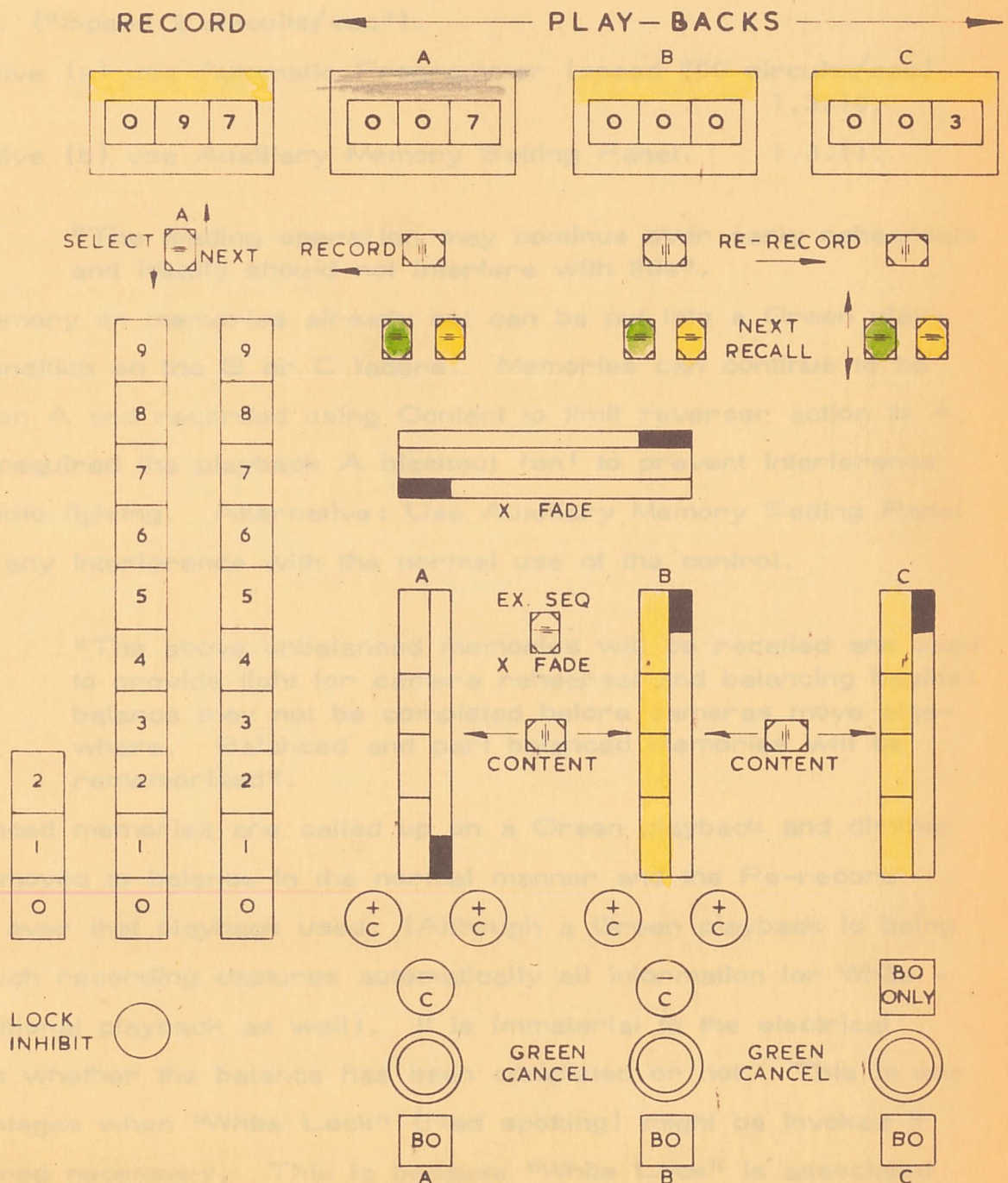
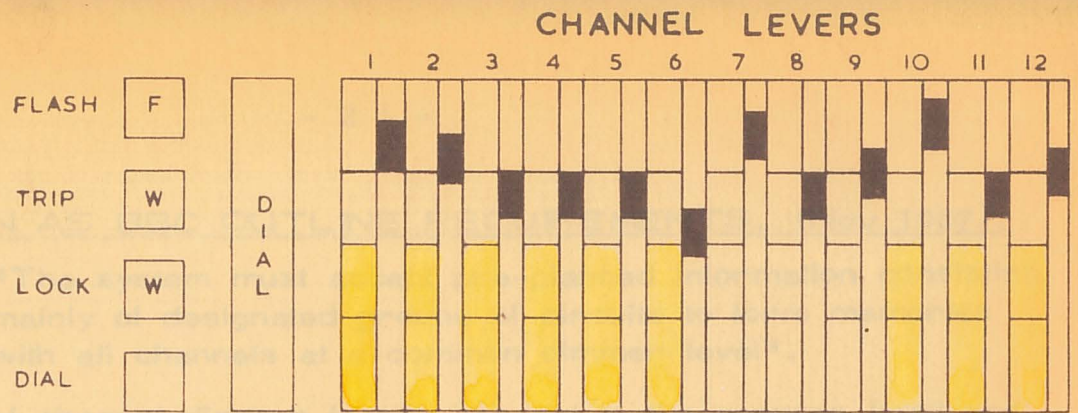


2.4. 003 is being balanced on A and channel 12 common on 001 has been "White Locked" (red spot) to allow it to take up a second level. B is holding the lights in the studio.

Handwritten note: Increase light levels?



2.5. 001 has been read on B as Green. "White Locked" channel 12 shows White plus Red Spot.



2.6. 007 has been called up on A as White but fader is at zero so there is no display yet. 003 on C White is being subtracted as a fade from compound effect 000 on B White. Ninety-seven memories have been recorded.

What was B?

PART 3.

OPERATION AS BBC OUTLINE REQUIREMENTS. (Nov 1967).

- 3.1.1. "The system must accept pre-planned information consisting mainly of designated groups of circuits to form memories with all channels at a common dimmer level".

The individual channel dimmer levers are set to the common level and Green playback master A to full; the scales are then touched (reverser action) to give a Green indication of those to be memorised.

Allocate number using Numerical Selector (or Record 'Next') and Record. ("Speed 2 circuits/sec").

Alternative (a) use Automatic Programmer (speed 200 circuits/sec)
1.3.10.

Alternative (b) use Auxiliary Memory Setting Panel. 1.3.11.

- 3.1.2. "The loading operation may continue over early rehearsals and ideally should not interfere with this".

Any memory or memories already set can be put into a Green playback condition on the B or C faders. Memories can continue to be set up on A and recorded using Content to limit reverser action to A, with if required the playback A blackout 'on' to prevent interference with studio lighting. Alternative: Use Auxiliary Memory Setting Panel without any interference with the normal use of the control.

- 3.2.1. "The above unbalanced memories will be recalled and used to provide light for camera rehearsal and balancing begins: balance may not be completed before cameras move elsewhere. Balanced and part balanced memories will be remembered".

Unbalanced memories are called up on a Green playback and dimmer levers moved to balance in the normal manner and the Re-record control over that playback used. (Although a Green playback is being used such recording captures automatically all information for White - full positional playback as well). It is immaterial to the electrical process whether the balance has been completed or not. This is one of the stages when "White Lock" (Red spotting) might be invoked if considered necessary. This is because "White Lock" is associated with obtaining more than one level from channels used in combination with others on the same memory which should have levers active (to 'ride' for example).

The decision that more than one level is necessary may take place during balance or as a result of some lighting cue subsequently devised during rehearsal, but since all recording covered positional information, there will be no need for retrospective correction of memories already set. As regards future recording "White Lock Inhibit" allows temporary mass freeing of levers to obtain fresh levels, or individual channel change-over to Red plus Green may take place using matching technique.

3.2.2. "Once a balance has been obtained (A1) and memorised it should be possible to use it in combination with another area or areas which may not yet be fully balanced (B). When the other areas are balanced (B1) it should be possible to re-memorise these without including (A1) so that groups retain their identity for later manipulation".

A balanced memory (A1) above can be used in White (or Green if the levers are preferred) on, for example, the A playback and the unbalanced (B) in Green on the B playback. When balanced (B1) Re-record on B would be used thus leaving A1 strictly alone. Playback C is available for a third area (C1?) but where more than two memories were required at a time, it would be logical to use the Add drill since any numbers could be combined and held for the time being. Any memory used in the White condition to form part of such a combination can always be transferred therefrom to Playback C using Subtract (-C) should it have been modified and the need to Re-record arise. Being a White memory, it would have been Green modified and the Re-record always includes both Greens and Whites as a playback.

3.2.3. "A range of logical processes, e.g. Add Highest; Add Last; Subtract; Subtract complement, should be available to allow balanced and unbalanced memories to be manipulated to rearrange their component parts as new memories with the minimum labour. These processes should be available for cued instantaneous changes".

System IDM/DL as described herein provides "Add Highest" or "Add Last" at will when memories are combined. To add a memory to another memory whether as a cue or not it is called up on C. Assuming the existing memory is on playback B, for example, the one to be added is called up on playback C and the Add push (+C) under B is pressed.

The B indicator goes to the number last added. Further memories can be added in the same way or the process reversed at any time by using the Subtract push (see below). The total content of an added playback can be transferred to any master or temporarily tripped and restored if the combination is given a number, and Recorded as a permanent memory for subsequent use.

To Subtract a particular memory it is called up on playback C and at the same time tripped from the playback on which it was previously combined by using the Subtract push (-C) under it. If that were, for example, playback B then B would therefore represent the Subtract complement. The other playback A could hold lighting quite independently of these processes. To subtract a memory as a cue the C fader has to be operated appropriately. For a cut it would be at zero, for a fade it would be at full and subsequently taken to zero. The memory on C is used to identify the channels to be subtracted, but to avoid sudden change the channels levels are automatically matched to those they hold on B (in this case). This combination may therefore be a bastard one and in consequence 000 appears in the window over C. This can be used to read the combination if required or a new number given or it can be ignored.

- 3.2.4. "A means of comparing memories during or before use is desirable to show clearly channels differing in dimmer level or selection state".

The lamp display appears at the channel levers immediately a memory is called up provided the fader is clear of zero. If the Blackout is 'on', this has in effect moved the lever so the display appears. To facilitate picking out channels which are common to two memories and if necessary comparing their dimmer levels, the Green or White display in those cases is brighter than when channels are fed from one memory only. To separate the display on a particular master fader from that on its fellows, the Content tab adjacent to the fader concerned is pushed towards it. This cuts temporarily the display and Dial reading (but not the studio lights) of the other two playbacks. To find exact dimmer levels of a White memory actually in use, the Dial mode switch is pressed in conjunction with the dimmer scale in order to inhibit any reverser action.

To do this before use the appropriate Blackout would be put on so that the master fader could be at full. There is no need actually to move the fader as the Blackout 'shorts' to full automatically. B.O. is on the output of each playback only so does not switch off commons in studio.

- 3.3.1. "Control of individual channels should always be instantly available without 'jump' or undue dependence on master controls".

In a Green memory condition the channel levers are always active when the master is up. In a White memory condition channels can be connected instantly to Green dominant levers active by touching the scale if the lever matches the level at the time. If it does not the memory level will read on the Dial* and movement of the lever to that position will effect the change-over to Green manual. To return to White the memory is recalled having Re-recorded first if the modification is to be a permanent feature of that memory. Re-calling White does not trip the Green which remains dominant, in case that modification is required in more than one memory. Green cancel on the particular playback is used for the purpose or the individual scale reverser action to trip a few rather than all Greens if required.

- 3.3.2. "Overriding control during a master fade should be immediately available".

Should it be required to override a channel during a fade the scale of its dimmer lever is pressed while the White master fader is taken down, or up, then as the level passes that of the held lever automatically the Green takes command using any Green playback which is at, or is put to, full as supply.

- 3.4.1. "Gradual changes from one memorised lighting balance to another should be available with the operator having as much freedom as possible to control the fade profiles. Non-dip 'same time' cross fades are essential. Faded 'Add' and 'Subtract' cues are considered important as is the option to stop a fade when partially completed and continue smoothly with the following cue".

* The dial mode switch is not required in this case.

When using the separate master faders to each playback, the operator has complete freedom in the fade profiles. It is customary to alternate between A and B for this purpose. When common levels in the outgoing and incoming memories are required to be held without dip, either a complete lap change is done on the two faders, or the Cross Fader is matched to the fader at that time full on and switched in. Playback C is used to give faded 'Add' and 'Subtract' cues. Either '+C' push being pressed after raising the C fader in the first case and the '-C' before taking it down in the second case. Alternatively all the three playbacks can be kept in play and their content Added and Subtracted at will. Any fade can be stopped at any time, and the following cue carried out by calling up the "Next" cue number on a vacant playback - the fader being at full or zero depending whether a cut or fade is in question. There are only three playbacks so the manual action to advance one fader and withdraw the other two is simple. The more the full memory White condition is called up for use once balance has been achieved, the simpler it becomes since channel levers can be ignored. To get rid of an incomplete crossfade, the top of the two horizontal cross-faders is moved from normal position on the right across to the left, before switching it off. Playback C would in this case be used for the incoming cue.

- 3.4.2. "Proportional dim to a sub group should be available with the option to memorise the result. Fade changes may not be rehearsed in the order eventually used, hence effects should not be necessarily dependent on formulating and memorising the total effect at each instant. Memories ready for fading into use should be available for last minute checks and corrections".

When any memory is used on playback C for Adding or Subtracting, it can be regarded as a sub-group and in consequence any number of these can be formed, corresponding to the colour groups of the cyclorama for example. If the C fader is at an intermediate position then a proportionate dim is included. Any memory number can be allocated to the Added or Subtracted combination and Recorded. Whether in fact a single memory is used in the White condition to provide a total effect is left to the option of the operator. It is not an essential requirement to produce any effect.

It may however provide a simple and sure means of repeating exactly a complex lighting balance or picture. Means for checking and correcting memories was described in 3.2.4 above.

- 3.5. "Split rehearsals should be possible with the Producer requiring lights for camera rehearsal and the Lighting TM working in another part of the studio to set luminaires or balance lighting. It is desirable that the majority of control functions should be available to Producer for cue rehearsal and that making up and alteration of memories should be independent for the two rehearsals".

The setting up or alteration of memories requires only one playback or the Auxiliary Memory Setting Panel, in consequence either two playbacks or three playbacks are available at the same time for rehearsal, and there will be no interference. If lights in the studio always have their origin in memory groups, then the control system retains its complete flexibility. Lights can be Green called up (with or without White Lock) on one playback for balancing, and the other playbacks used for cue rehearsal etc. The dimmer scale reverser action still remains for individual modification or luminaire setting or memory setting. It is recommended that even the most interim make-shift is given a memory number and put on a playback.

- 6.1. "An approximate idea of the state of every channel should be obtainable at a glance. Precise indication of individual dimmer level must be obtainable on demand for plotting. If positional control levers are used, indication to show when the dimmer output differs from the control lever output is desirable".

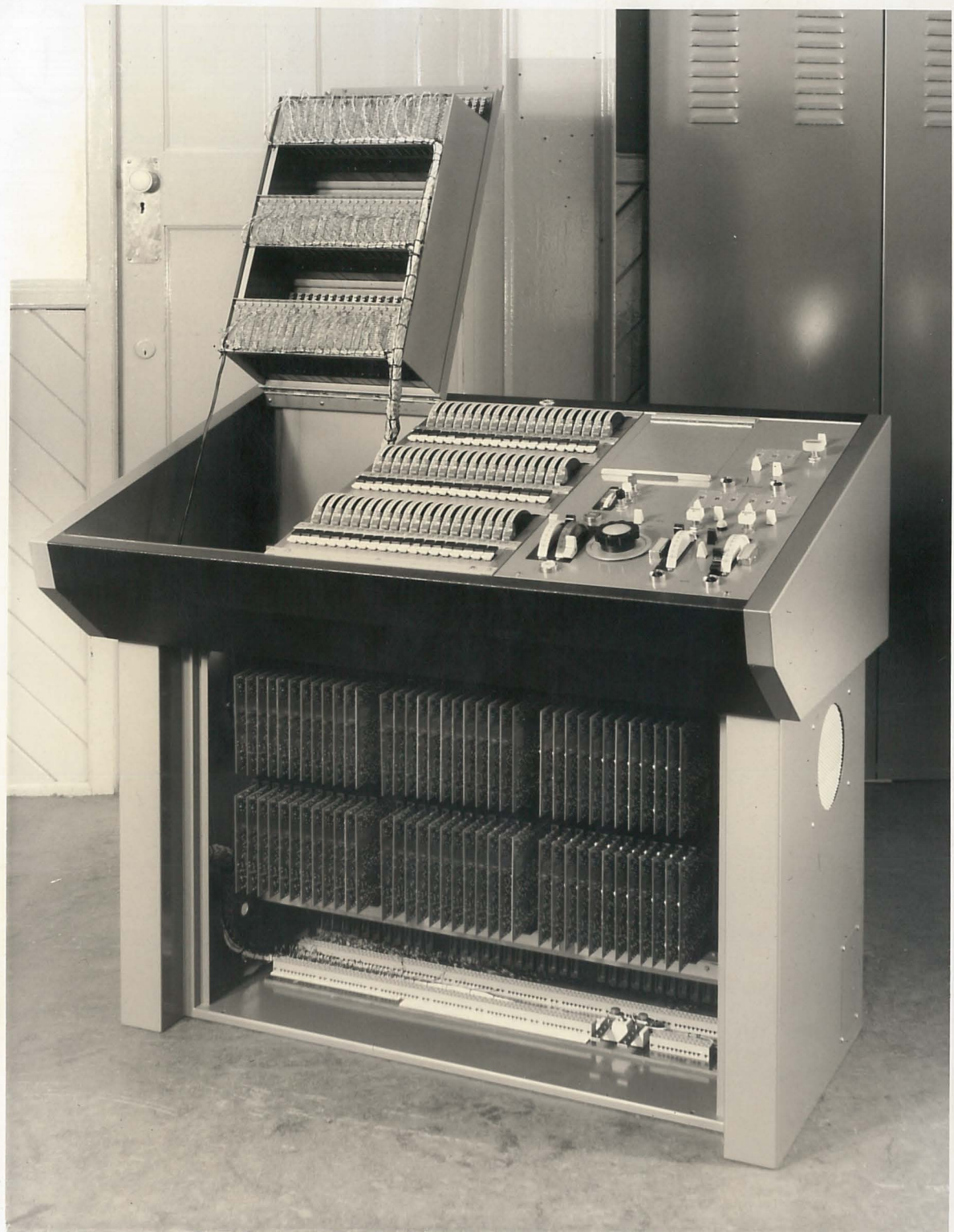
The scales of the positional control levers indicate by internal illumination in White instead of Green when dimmer output differs from that of the lever. When scales are Green the exact state of each dimmer is shown by the lever alongside, subject of course to the normal proviso that the master fader concerned is at full. When showing White the scale can be pressed to give a precise indication on the Dial of the state of the dimmers as at that time fed via a playback from the positional memory; using Content piled White information can be separated. With the 250 memories of IDM/DL we think that the temptation to plot in the normal sense should be resisted, the positional information always accessible from the Dial will nevertheless be useful on occasion.

- 6.2. "All master controls should indicate if their function has changed from normal and whether operation will be safe or not. Indication of 'Next' memory content should be available, as should the difference between incoming lighting and the present lighting".

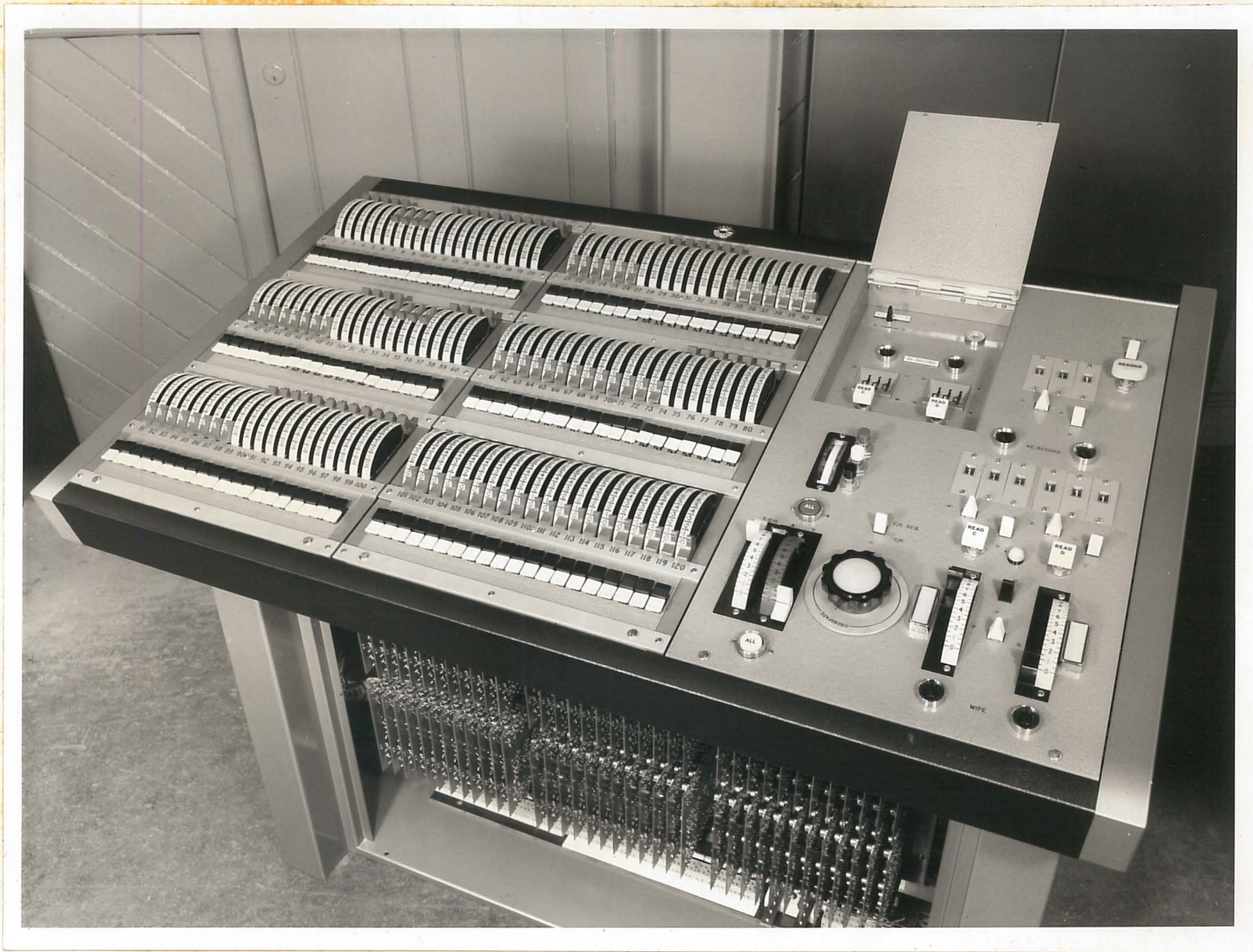
The playback masters are internally illuminated in Green or White to show when they function only as memory group feed to the channel dimmer levers or as a full memory positional playback. This light is extinguished while the Blackout is 'on' thereby indicating that the fader is safe. The indicator remains to show what memory is connected to that fader although not at that moment to the studio lights. Repeaters for these fader indications could be provided on the channel control panel if desired. A ready indication of next memory content is obtained by moving the fader to and fro off zero, thereby flashing the content display at channel scales. The Content control itself can also be used. The extra 'BO only' push under C does not trip its fader light because it is in the Record sense still active. All important controls have luminous indication. Actual reading of dimmers levels was described in 3.2.4 above.



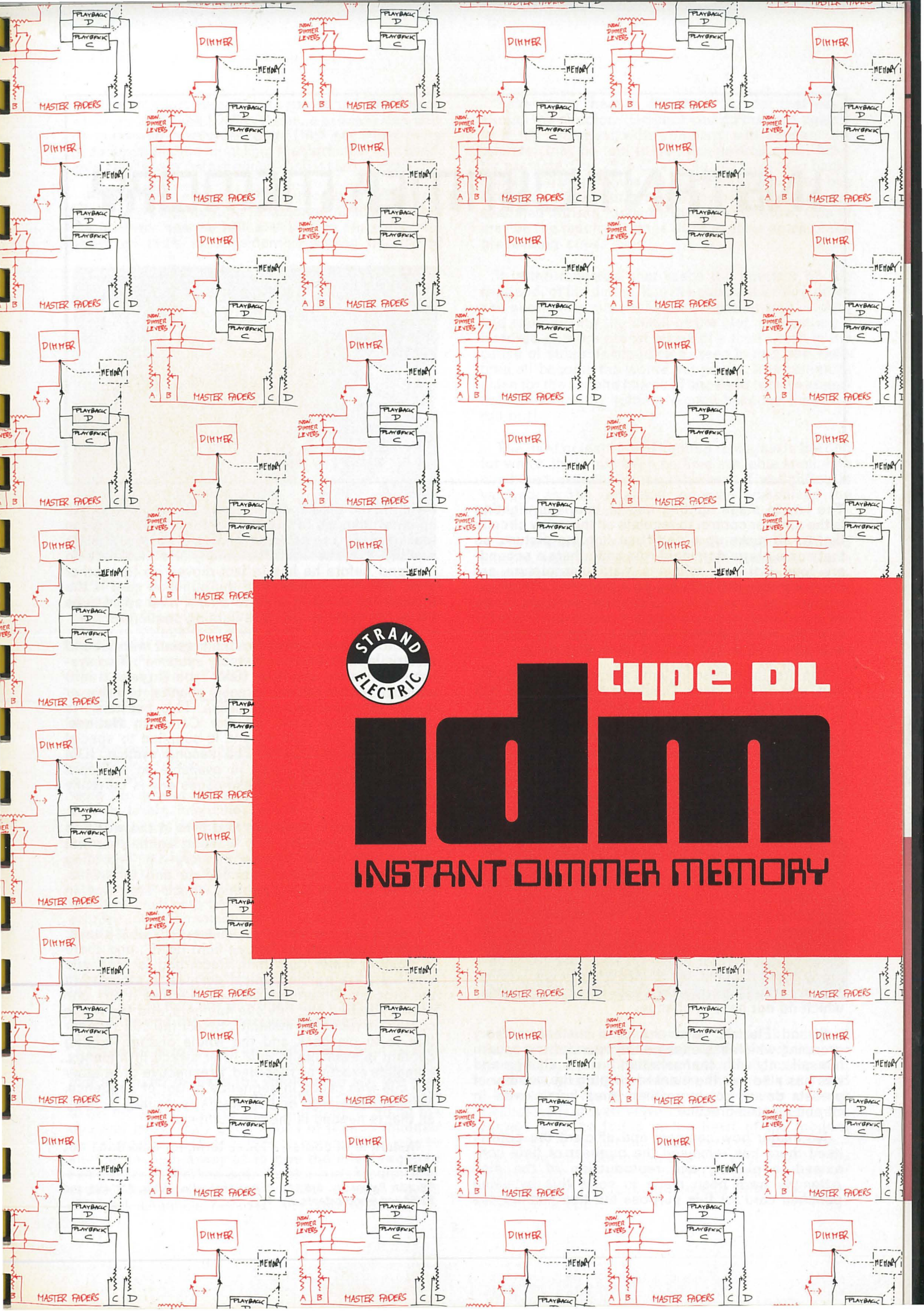
Standard IDM/DL 220 channel memory and address logic with enclosed drum
under. looking across below.



Standard IDM/DL channel console opened to show access to dimmer unit edge connector wiring above and backing stores below.



Standard IDM/DL 120 channel console showing special controls such as tape punch and reader recessed to be concealed by lid in normal operation.



type DL

idm

INSTANT DIMMER MEMORY

INSTANT DIMMER MEMORY

The key to stage lighting and to television lighting is the dimmer control to regulate all the many circuits that go to make up a particular lighting picture, so that some play a dominant role and others a secondary role. Not only within a particular picture are dimmers essential but also as a means of effecting a change from one picture to another; perhaps slowly as in a sunset or instantly as in a switch cue where for example many dimmers have to change level to accompany the lighting up of a chandelier.

The first incandescent lamp stage lighting installation, that of the Savoy Theatre, London, in 1881 had dimmers, eight of them to be exact, and the world's first regular public high definition television service in the world, the B.B.C. at Alexandra Palace in 1936, had thirty dimmers in each of the two studios.

Nowadays it is commonplace to install at least a hundred dimmers in a theatre or studio and installations of two hundred or more are quite usual. Strand Electric have been in the forefront of the development of the modern lighting control and it is they who have pioneered the British school of lighting control.

The distinctive features of such a control are compactness and simplicity. The multi-preset systems characteristic of American lighting controls with their miniature levers numbered in thousands on the one hand and the elaborate mechanics of the German servo preset control desks on the other hand have always been avoided. Much of the work in such multi-preset controls is concerned with repeating channels which do not have to change.

Strand Electric have employed instant memory grouping which has enabled the operator to concern himself only with channels that have to change and this has also had the merit of keeping the number of presets down; not more than three being usual in Strand Electric practice.

No matter how compact and efficient the control itself there has remained the bugbear of time consumed in plotting and reproduction of the plot. Attempts have been made to solve this by using punched card for this purpose but this method has

been proved time and time again to be too slow. All lighting changes in the final event are timed to the movement of the actor and he can move with such rapidity that the machine simply has not time to respond before he has in fact moved on to another area. Another weakness of the punched card is the difficulty in skipping back to a card read some cues earlier, in order to repeat a lighting sequence.

None of these difficulties is present with Strand Electric Instant Dimmer Memory systems*. Two systems are made, the first, IDM Type R (page 3 left) employs rocker tablets to each channel to raise or lower dimmers electronically. This system is currently being made for the Canadian National Theatre complex, Ottawa and is supplied to special order and specification. The second system, IDM Type DL (page 3 right) is available in standard models, is described in these pages and is currently on show.

Strand Electric were the first firm in the world to introduce a complete fully working lighting control system with instant dimmer memory—i.e., recording of all intensity levels, intermediate and otherwise, that go to make up a lighting effect. This was in December, 1965.

Instant Dimmer Memory means exactly what it says: "instant response, as fast as light itself", and there is nothing faster than that. Recording is magnetic and there are no mechanical devices to slow down the process. Determine the lighting, give it any one of two hundred and fifty cue numbers, and the whole content is recorded instantly. Select the cue number that is to playback and the whole of that lighting content is available to fade in or switch in instantly, complete exactly as recorded, irrespective of whether the cue was called in sequence or out of sequence. Skipping forwards or backwards is equally simple: all that is needed is the cue number.

Instant is of course a loose term, for time does not

*British Patent No. 918,527. Patent applications Nos. 27314/65 and 20462 and world patents.

stand still, but it is legitimate to use the expression when, as in Strand IDM systems, a process can only be measured in microseconds (10^{-6} sec.) and there is no lapse of time in making the particular cue available to playback; all are equally and instantly available.

Precise and comprehensive recording and playback means that lighting is no longer limited to what the operator has the skill and time to carry out, and above all there is considerable saving in time at



rehearsal. A lighting control is tested to the full at rehearsal, and Strand System IDM is designed to cope with these conditions of strain, speed, and indecision in comparison with which the rest is simple. Absence of delay and the ability to modify—to change one's mind—these are the two great requirements. It is speed plus the need to skip backwards and forwards as rapidly as memory itself that spell the doom of punched card, adjustable plattens, tape, and all the rest.

Consider for a moment the various techniques of the lighting rehearsal. The first is of the all too rare type where the lighting designer has done his homework and arrives with a plot with even some tentative dimmer levels (intensities) written in. As the ultimate judgement is visual, the original plot gets pulled about and a new set of dimmer levels results. The second form of lighting rehearsal is the common one. In this the director, with or without a lighting designer, sits down, calls for this and that lighting channel, qualifies each with doses of up-a-little and/or down-a-little, until the moment arrives when he calls "OK, that is Cue X. Plot it."

Using an orthodox lighting control the operator would now be faced with checking the positions of the dimmer levers for a hundred or more channels to make sure they are all written down properly. This takes time and the director gets impatient.

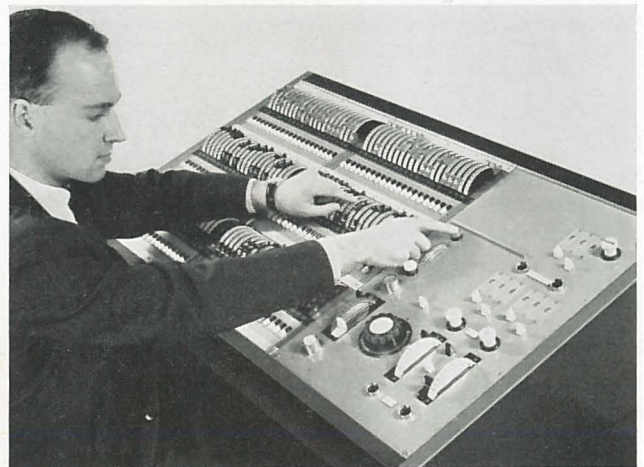
When all is ready, or as nearly ready as it is ever likely to be, the next cue is arrived at in the same way, and so on, for perhaps the whole of an act. We now have to run through from one lighting cue to another to get the actual process of changing right. So far the operator has merely got a series of figures (dimmer levels) against each cue; how he can get from one to another in such a way as to give the effect required has yet to be worked out. As the run-through proceeds, modifications are made: dimmer levels changed, channels removed and new ones put in.

Before long there is disaster. "No, not that way," shouts the director. "Go back and do that cue again." In a full rehearsal with company and scenery the operator may be told to go back several cues, from, for example, Cue 25 to Cue 17. In any case "Go back" usually heralds a crisis, for, so far as the operator has been able to plan or practise anything, it has always assumed moving forwards through the show. Cue 17 may be the result of things done in all or some of the preceding cues.

It is the rehearsal that keeps the operator on his toes and, of his duties, it is the constant writing down and scratching out on the plot, together with reading and reproducing the detail of the plot, and setting a hundred or more preset levers at a time which is the cause of strain. Inaccuracies creep in and, the more tired all become the worse things get. It is commonplace for the second halves of shows to receive superficial attention to lighting simply because time has run out!

The third or last type of lighting rehearsal is the one for which there has been no time available at all. It is combined with the dress rehearsal. The lighting is vamped as the rehearsal, or even sometimes the show itself, proceeds.

It is to solve the problems just outlined that Strand Electric have designed their IDM Systems. Completely flexible rehearsal operation with precise subsequent reproduction to follow is offered. Except for the running order of cues and the master control timings, the operator writes nothing down and subsequently neither reads nor sets his individual dimmer channels. All this is done automatically for him, as instantly as thought itself, yet at all times the operator can take over, modify, and re-memorise; he remains in command.



The need has been known at Strand, builders of many of the world's largest lighting controls, for many years, but until now technological development could not provide the answer. Punched cards and their relatives are too slow and clumsy, so also are mechanically driven slave control desks. Today the answer is to be found in the heart of the modern computer. It cannot tell you what you want to do—that is the job of the artist, and his requirements may appear quite irrational. Strand IDM Systems can tell you and your switchboard exactly what you did—irrational or not.

PRINCIPAL FEATURES

Instant Dimmer Memory giving thirty-two discrete steps in respect of each dimmer for two hundred and fifty presets.

Instant availability for playback of the two hundred and fifty presets in any order, sequentially or skipping forwards or backwards at will.

Full set of normal Strand dimmer controls one per channel, to set lighting and, in consequence, a control console familiar to any lighting operator. Such new techniques as have to be learnt can be picked up in a matter of minutes.

The fact that lighting effects were conceived using standard dimmer levers facilitates preparation of lighting plots for transfer or touring a production to theatres where orthodox switchboards are installed.

Visual display of channels in playback at the dimmer control levers.

Modification of any or all channels can take place at any time and the result be instantly re-recorded or discarded. When desired, previously recorded lighting and that proposed for re-recording can be compared by switching over from one to the other before coming to a decision.

Visual indication of dimmer check positions no matter whether the dimmers are under control from the console levers, from either playback, or from any combination of all three and no matter at what intermediate positions the master faders feeding these may be.

The information obtained visually (i.e., the actual levels at the dimmers which are producing the particular lighting effect) is what the Memory instantly records and what will be produced when the particular playback master on which that lighting cue has been recalled is put to full on.

Dimmer controls can always be operated directly to carry out lighting cues without using the Instant

Dimmer Memory equipment, should it be considered desirable.

Control consoles are remarkably compact. A single desk type unit with a top panel area of only 44 inches wide × 26 inches back to front can house 120 dimmer channels and all associated controls and masters. For 180 channels the width is increased to 57 inches. Larger numbers of dimmer channels, for example 240, are housed in an ergonomic floor standing wing unit 36 in. × 27 in. × 48 in. high with a small desk to house the masters. This could also accommodate any ancillary equipment such as colour filter change, communications, etc.

Rehearsal Desk: The control can be so constructed that the part of the desk containing the dimmer levers can be unplugged. It can then be used in the rehearsal position, next to the producer, by the lighting designer to work out his lighting, or for second-thoughts at a run-through. Alternatively this can be a separate desk as at the National Theatre (Old Vic, London) and Glyndbourne Opera House. It is still possible to record or re-record such results arrived at there. Similarly if a Z wing for operation of lighting from the stage area is also installed recording will take this into account.

A standard punched tape machine and readout unit for automatic subsequent programming of productions in repertoire can be supplied. This extra equipment is by no means *essential* to repertoire playing if the operational procedures below are adopted. It is important to note that the Instant magnetic recording of System IDM/DL itself is permanent and will only be erased when re-recording. The purpose of punched tape is solely for convenient re-programming.

Any existing Strand Thyristor (controlled rectifier) dimmer installation, and possibly some of those of other manufacturers, can have System IDM/DL instant dimmer memory control added to it.

DETAILED DESCRIPTION

Strand System IDM type DL control desk consists of two parts; a complete set of individual channel controls, and the master faders complete with the dimmer memory controls. For models of up to 180 channels, the two parts will usually be combined on the one console unit. Above this number, a master desk and a wing unit may be preferred.

(1) **Channel Dimmer Controls:** There is one Strand luminous dimmer lever per channel. Each of these has a scale 0 to 10, in units and halves, mounted at $\frac{5}{8}$ in. centres and internally illuminated in white and in red by two lamps. Each lamp fully lights the scale in its own colour, but when both are on the two separate indications can be clearly discerned. Lamps are of the long life type and the colour is integral in the lever unit. Each dimmer scale is also fitted with a spring allowing it to be depressed at will to operate a micro switch.

(2) **Channel Selectors:** Under each dimmer lever is a pair of black and white push buttons which are used to group up, black to the A master and white to the B master. With both depressed, the channel is connected as a Common to both masters. Both pushes can also be tripped to keep that channel lever off.

(3) **Master Faders:** There are four (linear type) identified from left to right as A, B, C and D.

- A. Black knob, red scale (Black Selected Channels)
- B. White knob, red scale (White Selected Channels)
- C. Black knob, white scale (Playback C)
- D. Black knob, white scale (Playback D)

(4) **Crossfader:** Rotary fader with moving dial and arrow indication; turned anti-clockwise it indicates as C and clockwise as D. A tab switch over this control is put down to transfer control from the separately operated C and D Faders to give an integrated crossfade from one playback to the other. The crossfader can be fitted with an adjustable automatic speed control as an extra where, as in opera, frequent slow working justifies it.

(5) **Transfer Controls:** Control normally assumes use of the Instant Dimmer Memory system (see below) and Master Faders C and D; to render the Channel Controls (above) or Master Faders A and B operational, the following transfer controls are used.

ALL TRANSFER shielded Red push to change over from Faders C & D to A & B and light all Channel Controls in red.

ALL TRIP shielded White push to trip all channels back to C and D and cancel red display.

INDIV TRANSFER Red push used when touching dimmer scales to transfer Channels individually (see also DIAL below).

INDIV TRIP White push used when touching dimmer scales to trip Channels individually.

- (6) **Dial:** This is a master indicator calibrated 0 to 10 to correspond with the Channel Dimmer scales. Each time an individual dimmer scale is depressed a reading is given on this dial of the actual state at each dimmer no matter what part or parts of the system may be controlling it.

- (7) **White display off:** When either playback is used, any channel which is not at zero will give a white indication in the channel dimmer lever the moment the Master Fader (C or D) itself leaves zero. To restrict display, when necessary, to one playback although both may be in use, the tab switch between C and D faders is put over towards the one to be retained; the centre position gives both.

INSTANT DIMMER MEMORY CONTROLS:

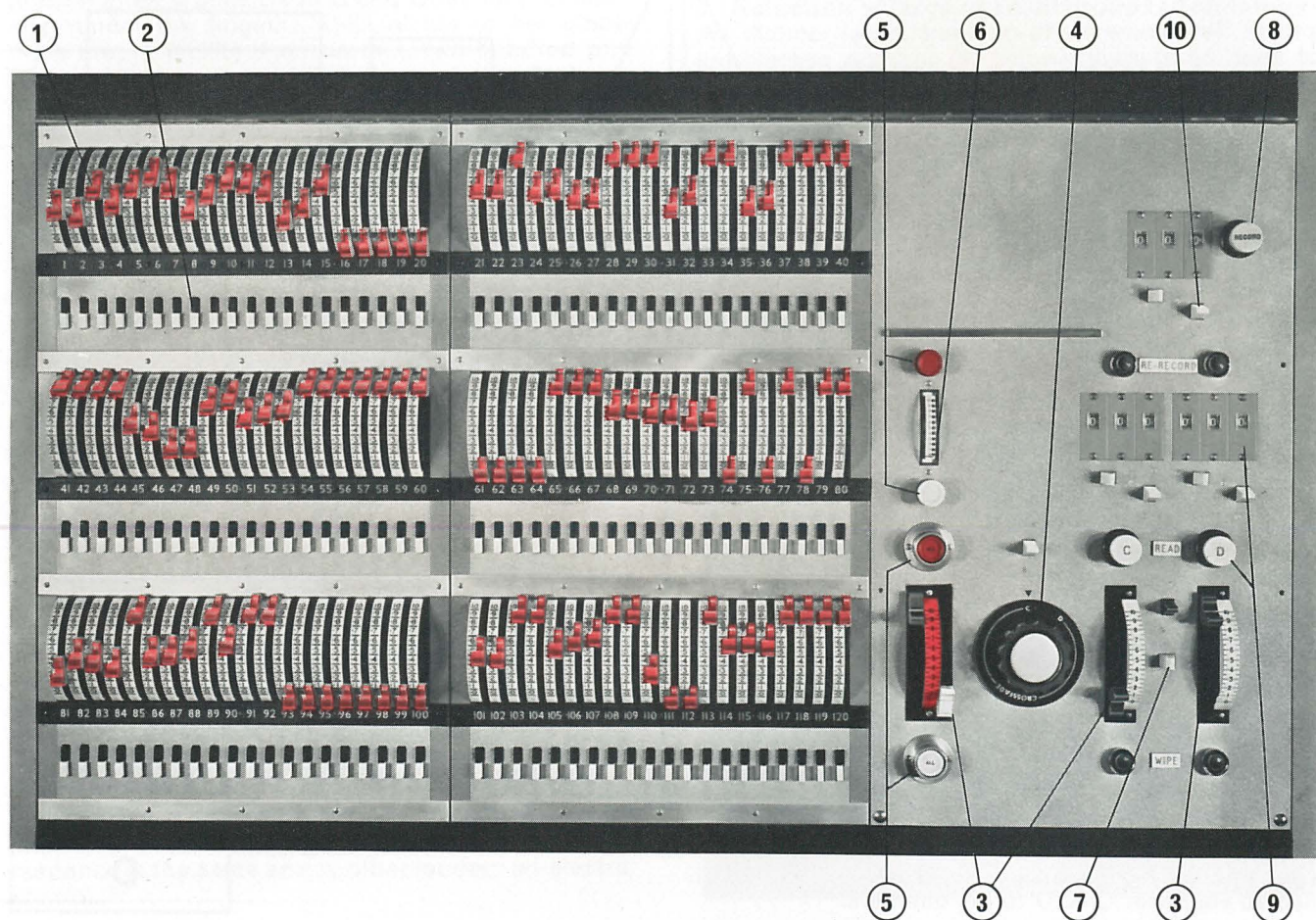
- (8) **Record:** There is one luminous push and a numerical selector. The push shows an amber warning light when transfer (see above) to the channel controls implies an unrecorded state. The light is

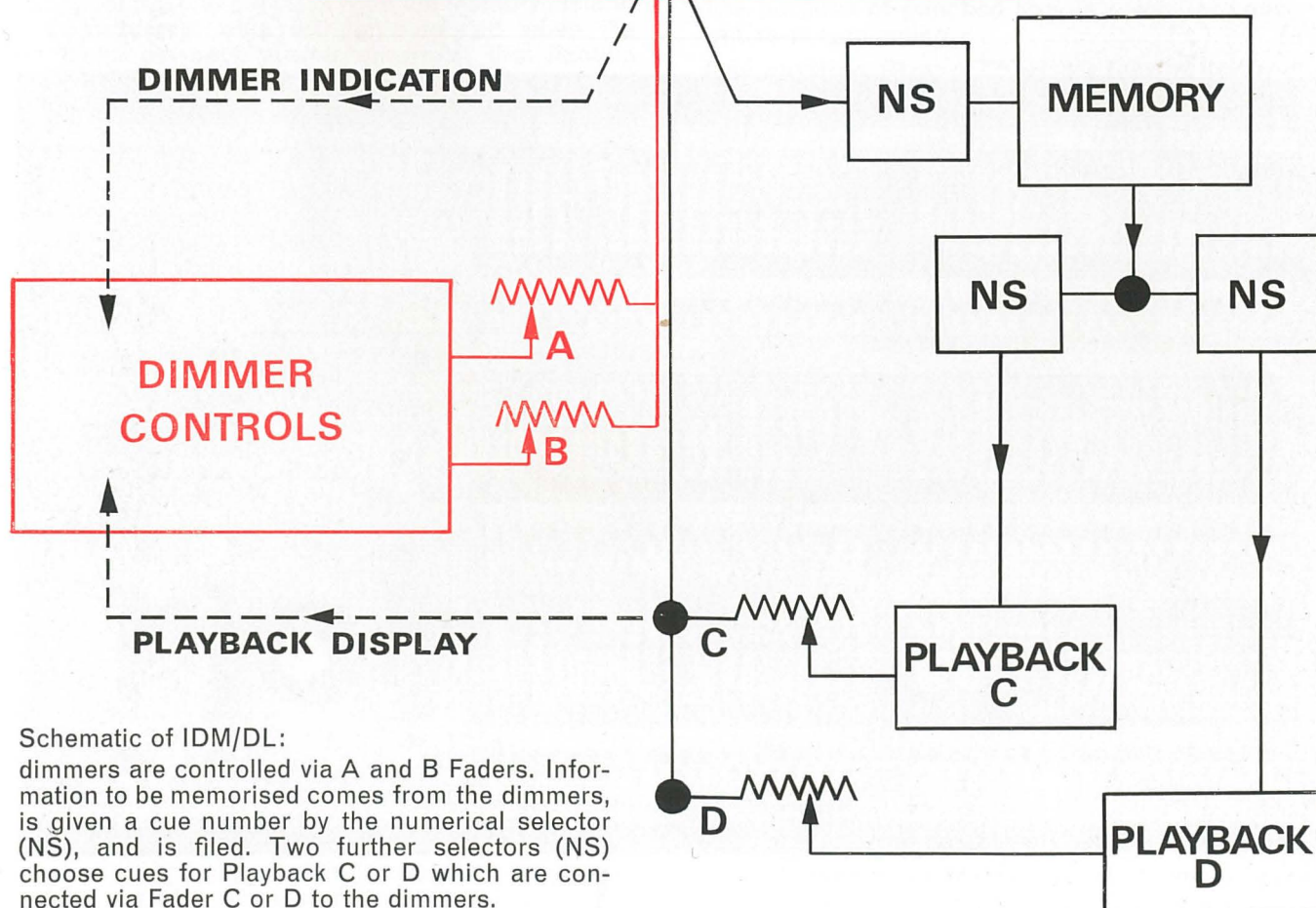
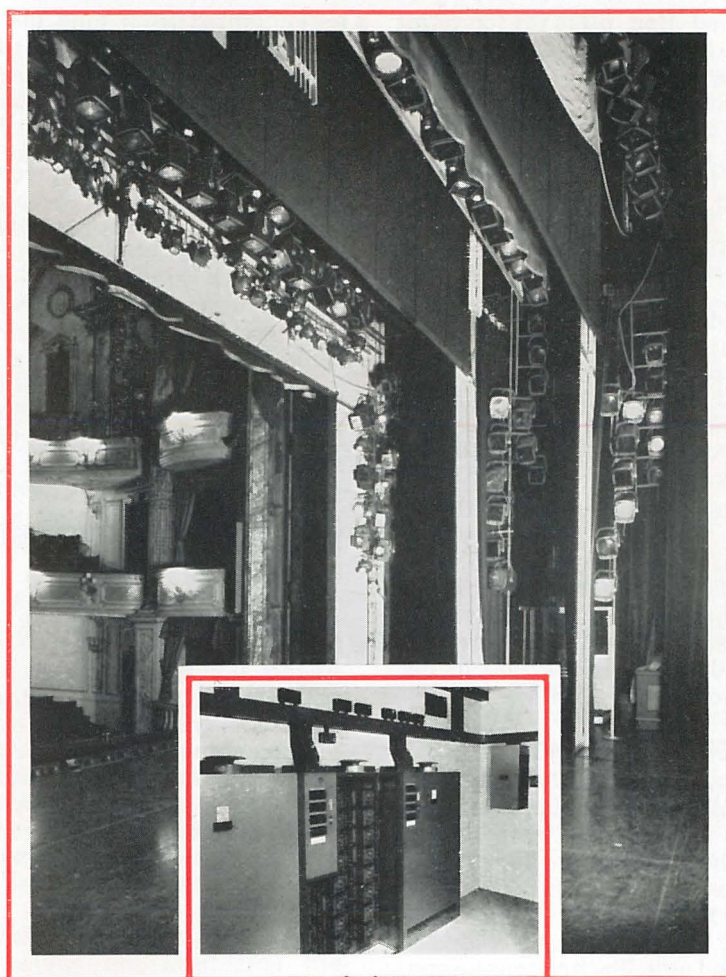
extinguished each time the push is depressed and restored each time transfer takes place. Selection of a new record number also displays the warning light. Any recording is permanent and may be used any number of times; only further recording using the same file number will erase it.

- (9) **Playback:** There are two complete playback systems associated with the C and D Master Faders. Each has a numerical selector, a READ push and a WIPE push. The READ pushes are luminous and each shows white after being depressed. This light is extinguished whenever a new numerical selection is made on that playback or the playback is cancelled by its WIPE push. Numerical selection does not trip the playback; the light is extinguished merely to show that the particular number selected is not that in the playback at the time. The READ and WIPE pushes are just above and below the C or D fader to which they belong. Above each READ push in turn are the Numerical Selectors.

- (10) **Numerical Selectors:** There are three, one for Record and two for the Playbacks, and all are identical. Either of the two for the Playbacks can also be used for recording if either of the RE-RECORD pushes above them are used. This will be convenient when making a modification to an effect just read, for it avoids calling that number again.

The numerical selectors are externally operated from two tab switches immediately under.





Schematic of IDM/DL:
 dimmers are controlled via A and B Faders. Information to be memorised comes from the dimmers, is given a cue number by the numerical selector (NS), and is filed. Two further selectors (NS) choose cues for Playback C or D which are connected via Fader C or D to the dimmers.

Operating the STRAND IDM/DL

These notes are intended as suggestions only, and the operator will discover with pleasure the true versatility of system IDM/DL as familiarity grows.

It is worthwhile bearing in mind that although system IDM/DL will record exactly the content of a very large number of lighting effects, thus making it a "multi-multi" preset, it does not follow that each cue should necessarily be carried out in this way. After all, in any show with a lighting plot worthy of the name, the operator will have to be on duty to carry out the actual selection of the cue numbers and time the changes to accord with the tempo of the playing at that performance. Attendance is also necessary to cover accidents such as a particularly critical spotlight being knocked out of position or its lamp having failed.

This being so, it is surely not the role of the Instant Dimmer Memory to record everything for automated reproduction: but rather to assist the operator by removing the drudgery of writing down, while the producer waits impatiently, large numbers of complex levels at rehearsals, often only to rub them out when asked to do something different when that cue comes round again. Also there is the laborious task of reading the plots and setting up and resetting the presets, once the lighting has been established, each time the show is put on. Accuracy, too, is often imperilled for it seems a law of theatre that the more complex cues always bunch together one on top of the other with scarcely a moment between them!

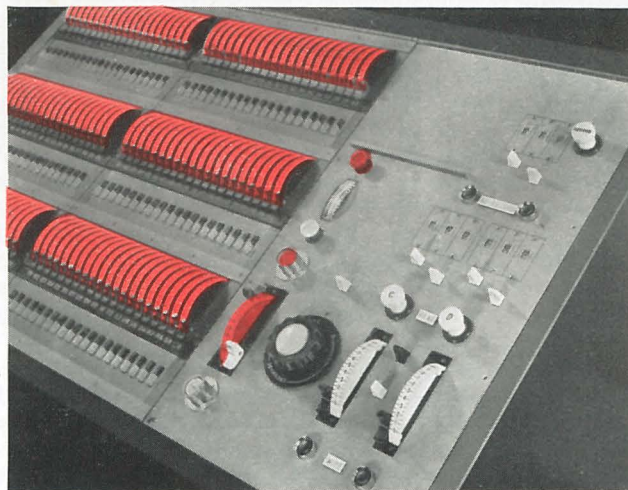
The true and very remarkable utility of the Strand IDM/DL becomes apparent if the operator sees the control as one preset (or Rehearsal System) of orthodox dimmer levers complete with push buttons to form three groups (A or B and Common) immediately under the fingers; while at his or her elbow there are, in facility if not in fact, two hundred and fifty auto-setting and auto-plotting presets which can be made ready for use from the C and D masters instantly by merely calling up their identity numbers.

Either or both the A and B masters can be used on their own without even switching on the Instant Dimmer Memory equipment. Alternatively, once the lighting is memorised, the cue numbers can be called first on the C master then on the D master to be cut or faded in and out at any pace required—all work taking place in the memory system. However, the best line of approach is to keep the two forms of control in play together and use the A, B, C, or D masters to perform those functions for which each may be particularly suited. No matter how confused the means, any lighting effect once decided upon can immediately be recorded to be brought back simply by raising one playback fader to full.

Operations not requiring use of Instant Dimmer Memory

Items (1) to (6) only require the dimmer racks switched on. Put Master A at Full, B, C, and D at Zero. Press the ALL TRANSFER red push and all dimmer channel scales will light up in red. Raise FOH inhibitor to full, if there is one. Push all the black group pushes in. (Any hard straight edge can be used to do many at a time, if preferred.)

1. To raise and lower lights individually: Use individual dimmer levers in the normal manner; their response is the same as any other modern all-electric control.

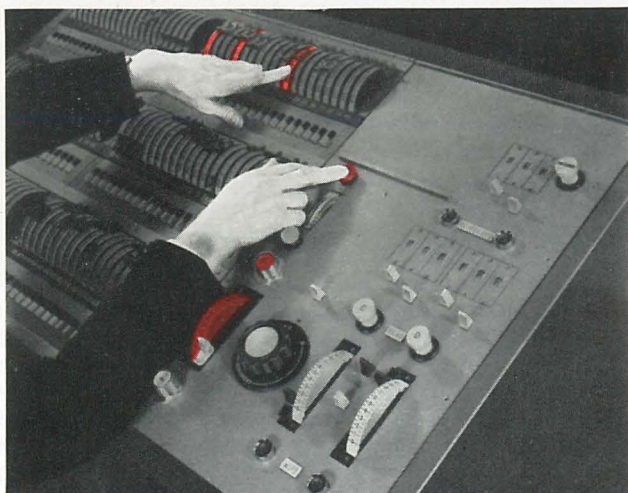


2. To fade in or out all lighting: Use Master A in conjunction with individual dimmer levers in the normal manner. Masters are all-electric and do not move the individual levers.

3. To form two groups under individual control: Press the white push buttons for the channels to form the second group. Use Masters A and B separately or in combination as required. Transfer of individual channels from the A master to the B or vice-versa does not involve any flicker if the masters are near enough in line at the time.

4. To crossfade two groups and keep a third unchanged: Press both black and white pushes down simultaneously in the case of channels which are not to change. In this case always raise one fader to full before taking down the other.

5. Selection of large or small groups of channels: As dimmer levers have no effect when their scales are blacked out (see (6) below), there is no need to push dimmer levers down to zero when not in use. Thus all levers can be precisely set to the levels at which they will ultimately be used, and two groups formed on the push buttons; but, if only a few channels are required, INDIV TRANSFER will be used to select them. If very many channels are needed, then the ALL TRANSFER can be used, and the few not required de-selected by using INDIV TRIP. Use of this facility makes it possible for cues involving a few channels to be immediately followed by cues with large numbers or vice-versa—the time-consuming accurate setting of dimmers having been done beforehand.

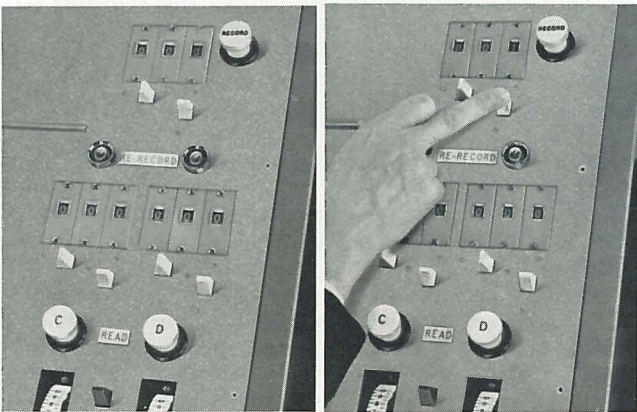


6. To blackout: For DBO press the ALL TRIP. To blackout channels individually, hold INDIV TRIP push down and touch dimmer scales of channels concerned. The red internal illumination of these scales will be extinguished as well. To restore all light, use ALL TRANSFER. To restore individually, hold INDIV TRANSFER push down and touch dimmer scales as appropriate. To give a partial blackout leaving some channels on, group up on the A and B masters and bang the appropriate one down on cue. Under these circumstances the red selection and indication will not be lost. There is also a normal DBO switch between C and D faders should one wish to use it. Push down to sustain and push up to flash.

Operations using Instant Dimmer Memory

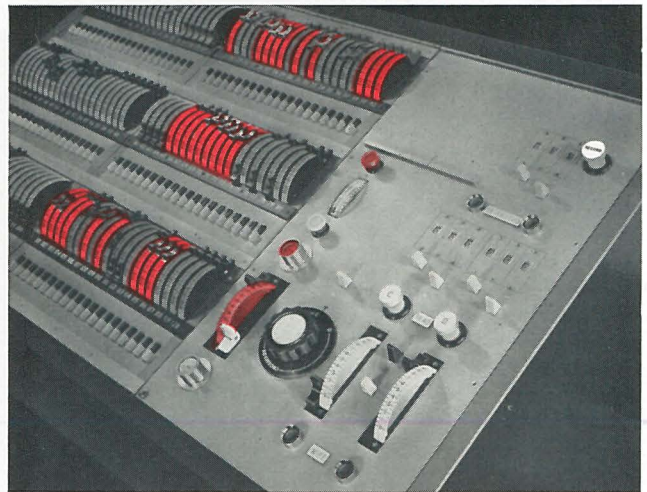
For the remainder of these instructions the Instant Dimmer Memory is assumed to be switched on, ready for action.

The expression RECORD is used to describe the process of filing the contents of a cue in the Memory. It should not, however, be confused with the familiar process of tape recording, being instead an instant process happening as fast as the operator can press and release the push button.



Note on use of numerical selectors: Under each selector are two sprung centre miniature tab switches. The right hand one operates vertically and it is pushed up once to obtain the next number to the one already displayed in that indicator (e.g., 7 will follow 6, or 100 will follow 99). As cues will more often than not alternate between the C master and the D master, it will be necessary to give two quick flicks to shift the number on two digits at a time. When the tab is held down, the indicator will set to zeros. The left hand tab works horizontally, and when pushed to the right gives the next digit in the tens column, or to the left the next in the hundreds column, in each case leaving the other columns unchanged.

7. To set and record (thin) lighting effects of few channels: Use INDIV TRANSFER, touching each dimmer scale to cause it to turn red as it is brought into use: then any channel displaying red can be taken "up a little" or "down a little" until instructed to plot. Set the required cue number in the Record indicator window and press the RECORD push, whereupon its internal amber lamp will be extinguished. The cue has merely been recorded, but actual control still lies with the desk levers which continue to display red. The amber light in the RECORD push was in fact brought on the moment either the INDIV TRANSFER or the ALL TRANSFER push was pressed, as a warning that an unrecorded state exists. Subsequent selection of a new number



brings back the lamp warning in RECORD each time.

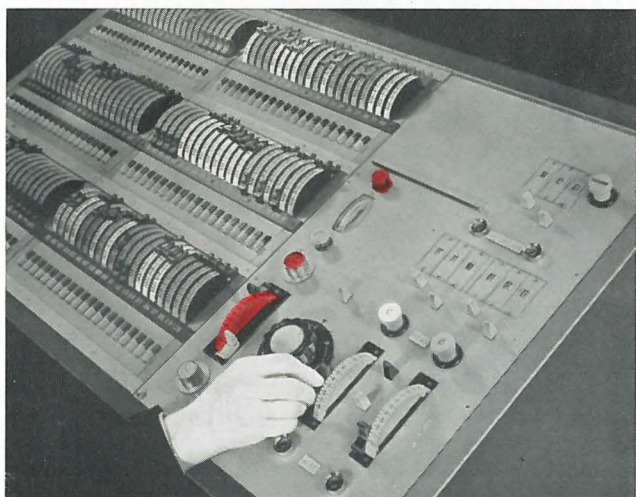
8. To set and record (thick) lighting effects of many channels: Use the ALL TRANSFER push and remove unwanted channels either by pushing their dimmer levers to zero or by using the INDIV TRIP. When the lighting effect is correct, allocate cue number and record as before.

9. To set and record a series of cues involving a progressive fade on one group of channels while others change to individual levels: Form two groups using the black and white pushes and reduce one on the master as appropriate. This kind of thing might be needed in a sunset or dawn series where the sky progressively changes as a whole during which combinations of channels representing the switching in or out of artificial lighting have to alter. Each time the required lighting effect is achieved, allocate numbers and record.

10. To make up and record lighting effects by combining large blocks or choruses of light, rather than individual channels: Certain lighting effects may be composed, as for example in ballet, by adding together large numbers of individual channels working together as groups. Thus it may be a question of adding all the blue battens (strip-lights) to all the stage-left blue booms and to all the stage-right blue booms plus the stage-right pink booms as well. This example involves four groups, which it is obviously better to play one against the other as four blocks on masters, rather than as perhaps fifty or sixty individual channels. The procedure involves use of memory playback and is described in 15, 16 & 17 below.



11. To playback a cue: At the beginning of a playback series both the C and D faders are put to zero; subsequently, for most cues, one will be raised to full, then the other taken out. Press the ALL TRIP push and all the dimmer scales lose their red display, thereby indicating that their levers are no longer in control. Select the required cue number on the numerical selector for the C Master and press the READ push which will then light up instantly to indicate that the particular cue number shown is "ready" in the playback. Raise the C fader to full at the speed required. Immediately the fader leaves zero, the scales in the dimmer levers display in white which individual channels, now being fed from the playback, are in any state other than zero (i.e., in check or at full).

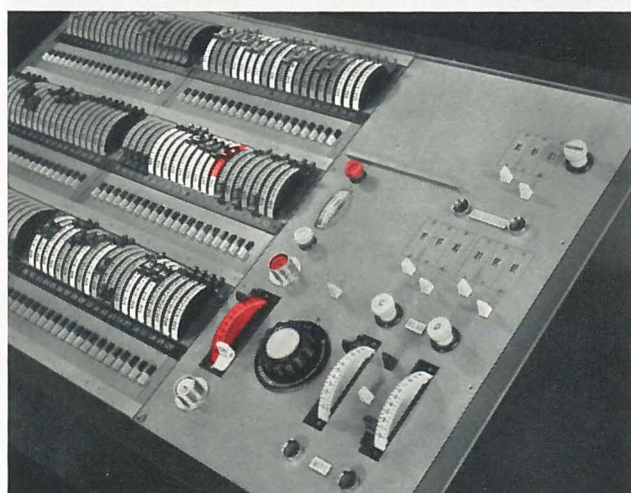
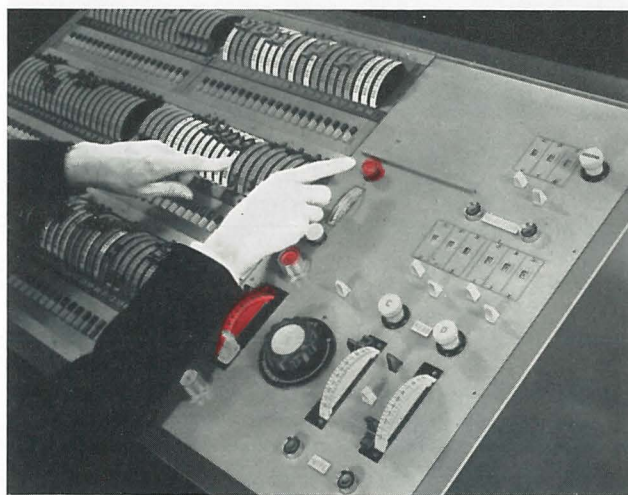


12. To change to another cue: Select the required number in the D Master Indicator, READ and raise the D fader to full, then take out the previous lighting using the C fader. A new number can now be selected on C and the reverse process adopted. It will be noticed that each time a new number is selected the lamp in the READ push under it is extinguished. This is to show that the particular number now showing is not the one in that playback. The file is, so to speak, ready, but has not yet replaced its predecessor in the playback; to carry this out, READ must be pressed. When the READ push is pressed, it removes the previous cue from the playback and substitutes the new one. If it should be desired to clear the old cue from a playback without substituting a new one, the WIPE push below the C or D fader is used. The proviso that the incoming fader must be raised to full before the outgoing is taken down only applies if there are channels common to both cues. But see also (19) below.

13. To modify a channel or channels when the playbacks are in use: It will be required from time to time, especially of course during rehearsal, to modify channels "up a little" or "down a little" or even take them right out, although they are now fed from playback and not from the dimmer levers. First the dimmer level in the playback should be discovered by pressing the channel dimmer scale and reading its position on the specially calibrated indicator dial. The lever is approximated to this position and the individual transfer push pressed; the scale light changes from white to red, indicating that the channel is under control from the desk. It is only necessary to approximate the level, because the purpose of the operation is to alter it anyway, and an exact record

of it still exists until re-recorded. It is, however, important to ensure that either the A or B fader is at full to ensure a supply to the individual channel lever. In practice, therefore, during rehearsal with playback one of these is kept at full. This channel, and others if required, can be modified to give a new effect, which can be compared with the old by using the TRANSFER and TRIP pushes appropriately. The new effect can then be recorded under a new number by using the RECORD push, or under the old number by using a RE-RECORD push. These latter pushes also extinguish the amber light in the RECORD push, which warned of an unrecorded state the moment transfer took place.

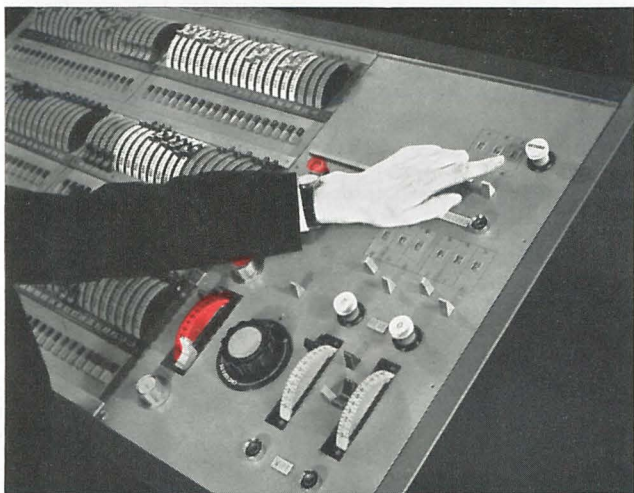
Although the new lighting has been recorded for recall as one effect, it is still held by a combination of playback and dimmer levers which shows as a mixture of some levers displaying white and some red. The cue should be re-read, so that the dimmers already displaying red will also show white and the reds can be tripped, if desired, and control returned completely to playback. However, it may be that the same modification has to appear in several cues, in which case the partial transfer can be retained at the desk and re-recorded into all such cues until no longer required.



14. To pile two cues: Select the two cues required and read as above, but use both C and D faders in any relationship required. Under these circumstances, the white lamp display in the dimmer lever scales comes from two piled sources. Should it be necessary to know what each is doing, the display of one can be extinguished for the time being by pushing the tab between the two faders towards the other.

This has no effect on the lighting under control at the time.

15. To amalgamate the content of two cues and record as a third: Proceed as in (14) above, and when the C and D faders are in the relationship required (both at full, or one at full and the other at a quarter, for example), allocate a new number and Record. The faders can be at any position; what is in fact recorded is the state of the dimmers at the time. This routine provides a means of recording a proportional cut on one fader or any mixture of the two.



16. To make up and record lighting effects by combining groups or choruses of light, rather than individual channels: Record each group separately, preferably giving them a series of numbers at the high end of the memory store. In this way there will be no interference when the time comes to record the show cues in the normal way. The procedure follows that in (15) above. A pair of groups is combined and recorded as a third; then another group is called up and combined with the result and so on. Due to the Instant Memory action this process is in fact much faster than would appear at first sight. In this way any number of groups in any proportion can be added together and recorded as a cue to be brought in under one number using one master. At any time individual channels can be modified or trimmed using the transfer to the dimmer levers in the usual way. The individual groups should be kept in being on their memories as this could be useful, as in (17) below.

17. To remove or modify a group in a lighting effect made up (as in 16) of several which were then memorised as one: The lighting effect will be on one playback and the group in question should be called up on the other playback. The indicator switch between the C and D Faders is pushed over towards this latter, thereby extinguishing the indication of all except that group. Using INDIVIDUAL TRANSFER, the channels forming the group can be matched over to the dimmer levers and taken out or modified using the A Fader, the result being re-recorded under a single cue number, as usual, for subsequent performance. (For television work where this taking out of groups is very common, extra circuitry can be added to do it automatically.)

18. To preview the content of an incoming playback before it takes effect as lighting: Raise Master Fader from zero sufficiently to allow its micro switch to operate (at about the first half division). Use White Display Off switch to restrict indication

to the playback in question.

19. To Crossfade two cues: Under these circumstances, one of the C and D faders will be at full and the other at zero. The crossfader knob should be placed to bring either C or D under the arrow to match the fader which is at full. The crossfader* can now be switched in and an integrated crossfade will take place in which channels at levels common to both playbacks will remain steady without the overlap needed when this is done as previously described on the C and D faders. It is important to set the C and D faders with the correct one at full, as shown under the arrow, and the other at zero before switching the crossfader out of circuit.

20. Follow on cues affecting several groups: This type of cue, which is sometimes described as processional, would on orthodox controls be grouped up on several submasters. Then, first this group, then that makes its entry and proceeds at different speeds, as far as the dexterity of the operator allows, ultimately to arrive at some grand concluding effect. Bearing in mind that there are four masters, A and B, C and D, on system IDM/DL, it is easy to read down two of the more complex groups on C and D, and set two of the lesser groups by hand on the dimmer levers for A and B without much trouble. Progress is then as usual, with some manual play on the individual levers thrown in, if required.

That is one method; another, more logical and far more precise, is to split the processional cue into separate pictures at each entry. This method could not be adopted on orthodox controls because of the limited number of presets, but with 250 instant presets, instead of just 3 (or at the most 10) manual ones, the operator can afford to use half a dozen or so for a follow on cue. Procedure is to record exactly the state of light just before the first entry, second entry, third entry, and so on. The relative levels so recorded will automatically determine which channels creep, which channels have to overtake, and which channels cease to move at all. Once recorded, all the operator has to do is to read down the cue numbers and concentrate on the timing of his crossfader between each cue. No complicated operation, giving this master a push, then that or keeping an eye on several motorised masters, being necessary.

21. Slow changes with switch cues intervening: The commonest examples are sunsets or dawns, in which, as the general light slowly increases or reduces, various practical fittings are switched in or out together with the spots representing their lighting. There may be several such cues. Using system IDM/DL they can be precisely and simply performed by a variant of the second method outlined in (20) above. In this case, instead of each picture representing an entry in a progressive dimmer change, there are particular moments when the identical lighting is recorded as a second cue but with the channels representing the lighting from the fitting added. Thus a gradual fade takes place on the crossfader and is completed just before the switch cue itself is read on the fader next due to come in. Whichever it is, either C or D, it is put to full, but has no effect. However, at the moment of the switch cue, the crossfader is cut out, thereby giving an immediate switch over to the cue with the added lights. Many variants can be used: for example, if two

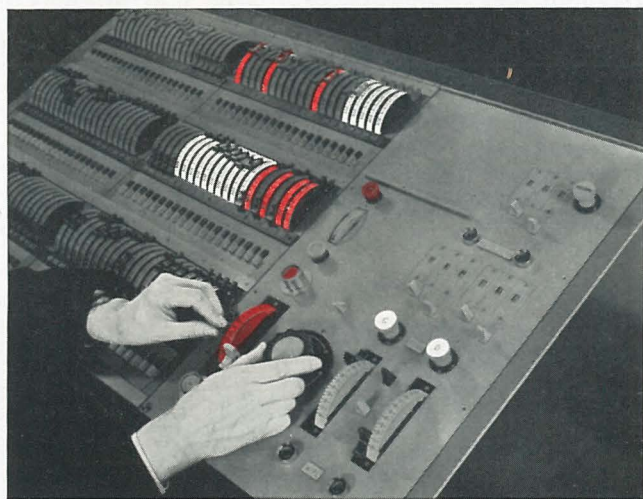
*This crossfader can be provided with an auto-timing regulator to cover slow speeds as in opera.

switch cues follow quickly one on the other after the fade period, then the next cue will be recorded to include the additional lights representing the second practical fitting. The necessary "cut" to give the switching effect is given by pressing the READ push of the incoming playback at the same time as pressing the WIPE on the outgoing one. Alternatively the two faders can be banged in and out. If, however, a further fade has to take place before this happens, the first fitting lights are repeated on the intervening cue but the background lights are reduced before recording it. A further cue is then recorded with the second fitting's lights added.

For some reason or other, the very precision of these methods seem to breed mistrust. In questioning them it is implied that the actor may dart over, flip the prop switch on and jump clear before the operator has completely finished the fade which precedes the switch cue. A hasty cut in under these circumstances could also affect the background. The proper solution is to keep an eye on the action and hurry the fade if necessary.

However, if there are still qualms, the A and B masters can be used for the fittings lights, the desk levers being set by hand accordingly. The sunset continues slowly crossfading from memory to memory, but certain channels are transferred to the desk levers and grouped to A and B, which are simply banged in or out when their turn comes.

It might not even be necessary to plot these manually set levels, since they could be recorded as one cue number and read on a playback during the interval which preceded the scene. Dial readings are then taken of the individual channels displaying white and the dimmer levers set to correspond ready for their entry later on.



22. Other lighting effects suggesting the use of all four masters: By using the TRANSFER push it is, as has been shown, possible to have some channels (displaying red) functioning from their levers via masters A and B, while others displaying white are on masters C and D and are receiving their instructions as to levels from the playbacks. If a memory file which is read into a playback contains some of the transferred channels, then the dimmer scales will (unless INDIV TRIP is used) display both white and red lights. There are a number of uses for this. For example, the dimmer levers could always be used to raise the levels above those set on the particular playback. Another use is as markers for some nimble manual picking out of dimmer levers, the particular playback master being just

touched in and will not represent light except at the dimmer scales. Experience in operating the original IDM system for over a year has shown that there are still certain things that are better carried out with the fingers on individual dimmer levers. System IDM/DL allows the operator to take advantage of whichever facility suits his purpose at the time. It should be repeated once again, however, that no matter how complex the state of the control, with all four masters at various positions, some channels on playback, some on dimmer levers, and some on both, if the producer likes the lighting that results, it can be given a number and instantly recorded for recall thereafter by bringing one fader only to full.

23. Go back to cue "X": Select the number required, press READ and then raise the fader to full.

24. Manual Repertoire Programming: A handy way of manual programming assumes the use of a standard magnetic tape dictation machine, for example those by Grundig or Philips. In this case the operator recalls each memory and then uses the touch contact on the dimmer scales to identify the exact dimmer levels. As this is done he dictates them to the machine. This is required only in respect of channels whose scales light up; the remainder being at zero do not need to be plotted.

In reverse, to programme the control the operator becomes the stenographer so to speak and sets the lever for each file as dictated and then records. The backspace and stop control normal to such dictation machines greatly facilitates this process and in some leaves the hands completely free to set the lighting control. Assuming a plot of, for example, one hundred complicated cues on a control of 120 channels the two processes take roughly one hour each. In effect this form of programming involves operating the cues before the show and at the pace they demand rather than the pace the production demands.

25. Automatic Programming: requires addition of a standard 8-hole computer tape machine. Such a machine will automatically make a permanent record from the magnetic memory. A library of productions each consisting of punched tape can thereby be built up. To re-programme the magnetic memory the particular tape spool is selected, put in the machine and set to work. The process takes approximately half an hour for one hundred cues on 120 channels but is completely automatic and needs no supervision. Special arrangements can be supplied but it is suggested that the automatic programmer should store each production as so many cues but not carry the cue address. In other words the cue numbers would be omitted. The reason for this is that it is extremely unlikely that productions will consist of 250 cues, indeed some may be of less than fifty. It may, therefore, be desirable to programme the magnetic memory to put the fifty cues of production A on numbers 1 to 50 and the hundred cues of production B on 51 to 150 and the twenty cues of production C on 151 to 170 and so forth. Another time it may be convenient for a particular production to be in another part of the magnetic memory. This obviously applies to ballet where each ballet would be stored complete but the actual presentation will be made up of various ballets in different relationships. Obviously if each one contained its address we should have the automatic use of memories from number one onwards each time with, in consequence, much unnecessary re-programming.

SPECIFICATION

Instant Lighting Control to consist of 120, 180 or 240 channels* each with its own individual control. Provision for any or all to take over regulation of dimmer intensity manually from zero to full.

Channels under manual control to display as red in dimmer control. Grouping push buttons for manual controls to be subject to masters A or B or both or neither.

Instant Dimmer Memory of 250 cues with numerical selector and Record push taking its information from actual state at the dimmers at the time of each lighting cue.

Instant Recall of all memories via two Playback systems each with Numerical Selector, Read and Re-record pushes. Channels under playback at positions other than zero to display as white in dimmer controls. Provision to determine exact intensity level of channels under playback.

Provision for Instant Modification of any or all channels in playback and for re-recording when required.

Master fader to be provided for each of the two groups of manual controls. Master fader for each of the two playbacks plus a Crossfader. (Optional extras:— Inhibitor master for stage lighting channels front of the house tabs; automatic timing device for very slow crossfades; automatic programming equipment for repertoire; automatic withdrawal of individual memory group content).

The whole control to be suitable for operation in conjunction with all-electric dimmers as specified.

**The most economic multiples.*



The Strand Electric & Engineering Co. Ltd.,
29 King Street, Covent Garden,
London, W.C.2.
Tel: 01-836 4444

AUSTRALIA
Strand Electric (Australia) Pty. Ltd.,
212 Graham Street,
Port Melbourne, Victoria. Tel: 64-1267

CANADA
Strand Electric Limited,
261 Davenport Road,
Toronto, Ontario. Tel: 925 5108

GERMANY
Strand Electric-Hessenbruch G.m.b.H.,
Siemensstrasse 21,
63 Giessen/Lahn. Tel: 0641-76435

U.S.A.
Strand Electric Incorporated
3201 North Highway 100
Minneapolis, Minnesota 55422
Tel: 612.533.1597



THYRISTOR DIMMERS



Type PTM Dimmers & Racks

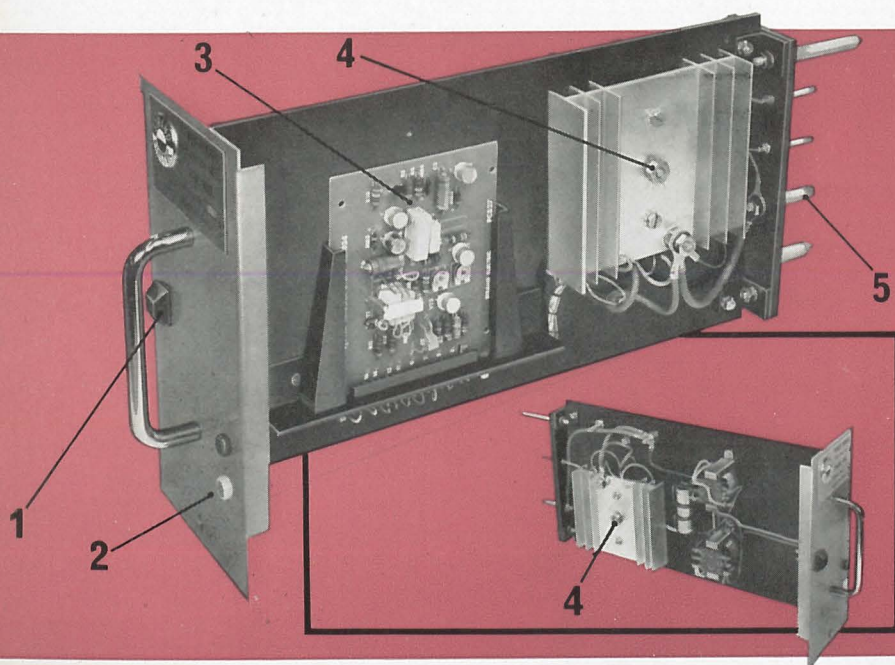
5000W; 2500W maximum.
200/250v 50Hz.

These plug-in dimmer modules and associated racks meet the requirements of broadcast television studios, opera houses and large repertoire theatres where large dimmer capacities and the highest standards of filtering and accessibility are demanded.

Each rack contains the supply distribution, circuit protection and a total of twenty type PTM 5000W and/or 2500W maximum Thyristor dimmer modules and their associated filter network. Racks do not require rear access and can be sited back to back.

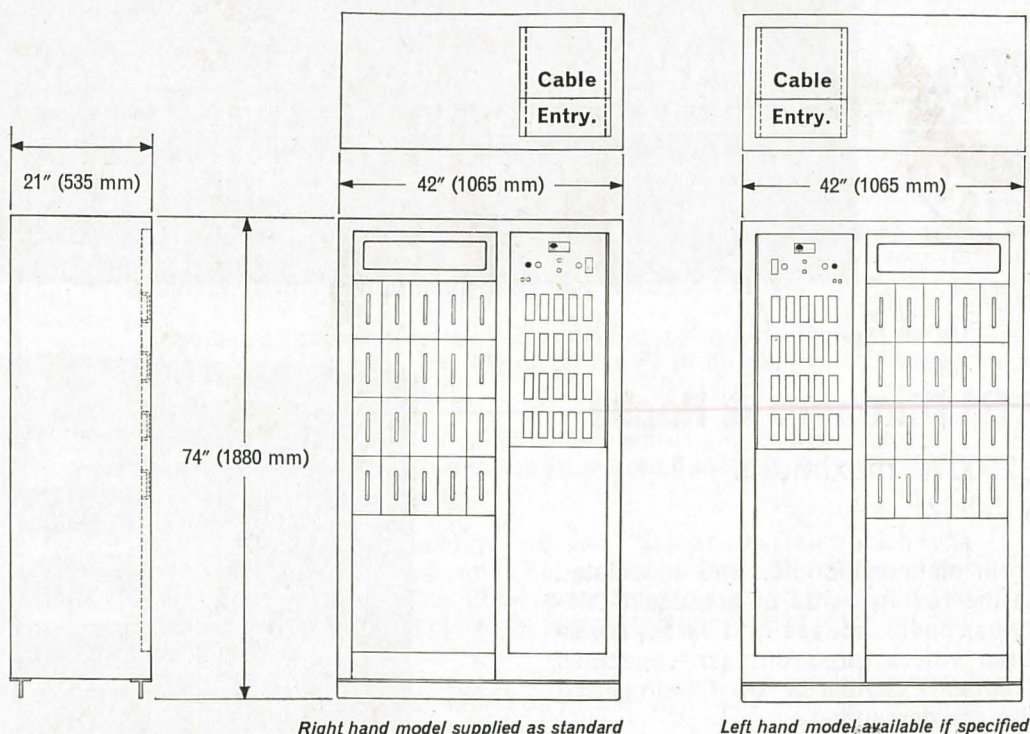
The light weight dimmer module has plug-in power and control connections. The tungsten filament lamp load is wholly regulated by a pair of Thyristors which in turn are controlled by a plug-in printed circuit trigger unit.

The series-connected filter network is mounted separately, below the dimmer modules, and limits the rise time of the output waveform to not less than 1 milli-second at the 90° point in the power cycle.



1. Pilot lamp for fused-supply indication.
2. Test points for rapid monitoring of control signal and AC output voltage.
3. Plug-in printed circuit trigger unit.
4. The pair of Thyristors mounted on generous heat sinks either side of the chassis.
5. Multi-contact pins for all power and control connections; also rigid guide pins at top and bottom.

Similar equipment is available for 110/120V 60Hz supplies.



TYPE PTM.25/50 DIMMER RACK WEIGHT 620lb. (281 Kilos) including 20 dimmers

SPECIFICATION

DIMMER RACKS

Each dimmer rack shall be for a 3-phase 4-wire 50Hz supply and shall accommodate a total of twenty type PTM.50 5000-watt maximum and/or type PTM.25 2500-watt maximum 200/250 volt Thyristor dimmer modules. Each dimmer channel shall include a 25 amp. maximum filter network mounted in the base of the rack. The dimmer channels shall be connected in phase sequence unless otherwise specified. The free-standing rack shall be totally enclosed and constructed of preformed box sections and pressings finished two tone hammer grey. The face plates of the dimmer modules and also the fuse panel shall be contained within the principal framework. The rack shall have two compartments; the larger one for the dimmer modules with their associated filters below, and the other compartment for supply distribution, all external connections, and the channel fuse protection. Rear covers shall be fitted to these compartments but all components and connections shall be accessible from the front to permit racks to be sited back to back, or back against a wall. The connection compartment, with removable plates at the top and the bottom to facilitate cable entry, shall be on the right-hand side of each rack unless left-hand specified at time of order.

Each rack shall be factory wired for 5000-watt dimmers in all positions with all external connections brought to pressure pad terminals in the compartment behind the hinged fuse panel. To suit certain wiring systems an earth/ground terminal shall be provided for each channel. A shrouded-contact fuse shall be provided for each dimmer channel and the fuse-bridge fitted with a quick-acting HRC fuse to give full load fault protection.

The total heat dissipated by the dimmers shall not exceed 2% of either the maximum supply capacity or the maximum load capacity, whichever is the smaller. Each rack shall be fitted with internal ventilation equipment to disperse this heat, but, if necessary external means should be provided to ensure that the ambient temperature does not exceed 95°F (35°C). Red and green pilot lights shall indicate whether the safe internal temperature is being maintained.

DIMMER MODULES

Each dimmer shall be a self-contained plug-in unit on a rack mounting sliding chassis fitted with a face plate and a handle. The dimmer module shall not weight more than 5½lb. (2.5 kilos) and shall be removable from the front by withdrawing a single, captive retaining screw. The chassis shall be fitted with rigid guide pins and self-aligning multi-

contact pins for all power and control connections to the rack. The control connections shall make after, but open before, the power connections. The face plate shall contain a colour-coded voltage and maximum load rating label, a pilot lamp to indicate the operative status of the dimmer and test points to permit the control signal and output voltage to be monitored.

The regulation of the tungsten filament lamp load shall be wholly by a pair of Thyristors (controlled rectifiers) and these shall be of a type which will allow the full tungsten surge current to flow. The output shall be AC with a waveform which is completely symmetrical with respect to the zero voltage and current. The maximum output of the dimmer channel (including filter) shall not be less than 99% of the supply voltage.

The output voltage to any load between the minimum of 60-watt and the maximum rating of the dimmer shall follow the control signal in less than ½ second without oscillation or any other form of transient disturbance. A 60-watt lamp load shall have the same dimming curve characteristics as the maximum load rating and the addition of load to a partially loaded dimmer shall not alter these characteristics. Each dimmer shall generate its own control circuit power and synchronizing supplies for the plug-in printed circuit trigger unit which shall include trimming adjustments for full-on and blackout. The control signal input shall be completely isolated from the load circuit and the signal shall not need to be related to the phase of the load circuit. The control signal shall not exceed 24V 2mA and there shall be no limitation on the length of the control cable. Unless otherwise specified the plug-in trigger unit shall operate from a control voltage excursion from technical earth reference for zero light to -15V for full light and shall provide S curve dimming characteristics. The dimming curve characteristics of dimmers with equal loads and with equal control signals shall be matched within 2% of the supply voltage.

FILTERING

Each dimmer channel shall include a series-connected inductive filter network to reduce the rise time of the output waveform to not less than 1 milli-second at the 90° conduction point in the power cycle at full load. The noise power, defined as all harmonics in the load waveform between 200Hz and 16kHz, shall be reduced by 15dB (a factor of 33 to 1) compared with an unfiltered channel at full load. This value of noise power shall not be exceeded when the channel loading is varied.

DATA SHEET

No.

Date:

ES/110/P.
C.V.

3933

Ground: Green Gilt marker — 2m more marker JP
Wide Right saddle

1550

137

515

150

120

165

3200

786

6 $\frac{3}{4}$

7 $\frac{1}{4}$

x5

19 $\frac{1}{8}$

W.

G.

W+G

R+W+G

level. — 1-3

level. — 1-3

W marker
1-3 G markers

21 $\frac{5}{8}$

2 $\frac{5}{8}$

content — if not to JP marker will change be hidden

Scale Sw. — works at numbers that are up. — None?

G. marker only stars reflected.

2 G marker. — Remove both to enlarge

W marker only — can be work if OFF

if ON

W+G marker.

2 W+G

High/Low markers.

Or mean G marker!

FLASH saving

CHANGE indicated.