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1. OBJECTIVE

This equipment proposal is based on a required IDM system performance requirement outlined in a draft paper by F.P.B. dated 24.4.68.

The principal objective is to produce a system which functionally satisfies this performance and to be completed before June 30th 1969.

The operating controls are based on the use of rockers (time controls) as opposed to slides (position controls) and the system is described IDM/R MK.11.

Appendix C shows that it is intended to design and manufacture a demonstration model first, followed soon after by a pre-production first model. The latter to be completed by June 30th 1969, and later installed in the Royal Shakespeare Theatre, Stratford. The installation completion date is scheduled for September 30th 1969.

The demonstration model will be 20 channel 50 cue and the pre-production model 250 channel 250 cue. This development could be an opportune time to integrate the memory and console logic in a more economical way than hitherto. However, this approach would involve some redesign of the memory unit and although this may make economical sense the consideration must remain secondary to the principal objective which is:-

to produce a system which functionally satisfies the required performance as per original and subsequently updated F.P.B. 24th April 1968, and to be completed by June 30th 1969. The demonstration model must be made available for display to customer as soon as possible. March 15th is the date being aimed for.

As work proceeds this Equipment Specification will be regularly updated and distributed to serve as a detailed guide to what is being done.

2. GENERAL DESCRIPTION

Each channel will have a separate control and indicator in the form of a rocker. Individual operation of rockers makes it possible to raise some (any number) of channels whilst lowering any number of the others. The centre push of each rocker gives "dial" and subject to mode switches, other conditions like Flash, Auto Mod. etc.

The basic operation depends on two independent masters which do not change their identity. The Red master is always Red and the Green master always Green. Both masters have identical facilities, add, subtract, remainder, dim, etc. (The demonstration model will be limited to a single master).

Each of the two masters consist of a rocker exactly similar to a channel rocker. A voltmeter is fitted in each master circuit to show the progress of change from 0 to 10. Two ranges of speed are provided by means of a switch and the actual speed is selected on a slider. A crossfade is effected by pressing rem. dim. and the top of the rocker simultaneously.

Recording is carried out by either picking up the Record number or the Re-record number. Record will memorize ALL the stage lighting and Re-record only that lighting due to that particular master.

Auto mod. facility is to be included.

2.1. Master Control

This description is of a single master only. The other will be an exact and independent duplicate.

The next required cue is selected by "NEXT" P.B. which selects the next cue number in sequence or by "RECALL" P.B. which selects the cue indicator on the push button selector. This cue is then input by pressing "READ". After the cue has been read, the new pattern is input by pressing the rocker. Pressing the top part of the rocker will cause it to be ADDED TO and pressing the lower half will cause it to be SUBTRACTED FROM the existing lighting. The adding and subtracting will be carried out only while the rocker is being pressed and stop when it is released - this process may be repeated until the cue is fully input or it may be discontinued at any intermediate level.

The first operation of the rocker after "read" will determine if the operation is to be ADD or SUBTRACT. The important difference being that the contents of STORE B will be changed for the latter (see 3.5.2.). However, after this transfer has or has not been made the upper and lower half of the rocker will raise or lower the level of the B store.

To this extent "add" and "subtract" may be alternated between to give the effects of "raise" and "lower".

The RATE at which the adding or subtracting takes place is determined by two separate controls consisting of a slider and a switch, the latter selecting one of two different rates. When the switch is in the fast position the slider may be positioned to select a rate between 2 seconds (min.) and 20 seconds (max.) and in the slow position between 20 seconds (min.) and 3 minutes (max.).

The centre button on the rocker will cause REM. DIM. and the lamp under the p.b. will illuminate for the duration of REM. DIM - automatically extinguishing when the operation is complete. If REM. DIM. has been preceded by READ then the channels will go to black but if the REM. DIM. is preceded by ADD the rem. dim. channels will only go to store B levels. The rate of lowering will again be as selected on the rate slider/switch combination, but once the button is pressed the rem. dim. operation will continue until fully completed, unlike the add/subtract facilities which are only "go" when the rocker is depressed.

The top lamp of the master rockers will light when store A is other than zero (and also when the level is at other than zero). The bottom lamp will light when store B is other than zero (and the level of store B other than zero). Two lamps thus remind the operator that the stage lighting represents more than one memory. On subtracting, the top lamp will remain on whilst there is still something left in the playback (i.e. store A).

A vertical scale meter ("dial") alongside the rate scale selector monitors the rate of progress of incoming cue. The dial resets to zero at the time something is read and reverses polarity should the bottom of the Master rocker be used to subtract. It will then either raise as the incoming cue is brought in or quickly reverse and commence to lower if subtract is initiated on touching the bottom of the rocker. In either case the meter polarity is locked until re-reading.

2.2. Channel Control

Each channel has a rocker which may be used for initial setting or amending an existing memory.

The rockers are used in conjunction with a twin fader unit, two switches, a four position and a three position, and a channel meter.

As in the case of the master rockers the two "rock" positions are ADD for the upper part and SUBTRACT for the lower part - for that particular channel. All channels will have individual movement such that any number may be changed simultaneously either up or down or a mixture.

The twin fader unit is used to select either rate of channel change or to set a "Top Limit". The left hand fader will specify linearly variable speed between 2 seconds and 20 seconds (bottom and top extremity respectively) and this will be the speed setting at which the rockers will ADD or SUBTRACT a "full house". The right hand fader will be normally in the max. position where operation of a microswitch is used to define the twin fader in it's speed selector mode as previously described. When the right hand fader is in any other position such that the microswitch is not operated (say less than about 95% of max.) it's position denotes a fixed proportion of maximum value and on pressing the top of the rocker this value is entered as a preset level. The top of the rocker will switch it in and the bottom will remove it. When this is carried out the operation is visually "instantaneous" (i.e. less than 100mS). This facility allows quick setting of approximate values and eliminates the need for each channel to be run up from zero.

The various functions of the different combinations of the two additional switches are shown in the following table:-

3 position switch channel store	4 position switch channel function	position 1 "RED MASTER"	position 2 "GREEN MASTER"	position 3 "FLASH"	position 4 "AUTO"
position 1 "CONTENTS 'A'"		<u>ADD</u> increases contents of RED A <u>SUB</u> decreases contents of RED A <u>P.B.</u> displays on channel meter contents of RED A	<u>ADD</u> increases contents of GREEN A <u>SUB</u> decreases contents of GREEN A <u>P.B.</u> displays on channel meter contents of GREEN A	<u>ADD.</u> As for P.B. <u>SUB.</u> As for P.B. <u>P.B.</u> Flashes channel at 1 second rate	<u>ADD.</u> Select this channel for Auto mod. <u>SUB.</u> Clear this channel for auto mod. <u>P.B.</u> Check P.B. lamp circuits - all channels
position 2 "CONTENTS 'B'"		<u>ADD</u> increases contents of RED B <u>SUB</u> decreases contents of RED B <u>P.B.</u> displays on channel meter contents of RED B	<u>ADD</u> increases contents of GREEN B <u>SUB</u> decreases contents of GREEN B <u>P.B.</u> displays on channel meter contents of GREEN B	<u>ADD.</u> As for P.B. <u>SUB.</u> As for P.B. <u>P.B.</u> Flashes channel at 1 second rate	<u>ADD.</u> Select this channel for Auto mod. <u>SUB.</u> Clear this channel for Auto mod. <u>P.B.</u> Check top rocker lamp circuits - all channels
position 3 COMBINED OUTPUT		<u>ADD</u> Nothing <u>SUB</u> Nothing <u>P.B.</u> Displays on channel meter total level at dimmer input	<u>ADD</u> Nothing <u>SUB</u> Nothing <u>P.B.</u> Displays on channel meter total level at dimmer input	<u>ADD</u> As for P.B. <u>SUB</u> As for P.B. <u>P.B.</u> Flashes channel at 1 second rate.	<u>ADD</u> Select this channel for Auto mod. <u>SUB.</u> Clear this channel for Auto mod. <u>P.B.</u> Check bottom rocker lamp circuits - all channels

The items ADD, SUBTRACT, P.B. are the three possible states of rocker. It may be noted that the push button (P.B.) may be operated simultaneously with either ADD or SUBTRACT.

When the CHANNEL FUNCTION switch is in either the RED or GREEN MASTER positions the dial will be connected for ADD and SUBTRACT as well as P.B. providing that only one rocker is being operated. When more than one rocker is being added or subtracted simultaneously the dial will indicate zero as it will if more than one P.B. is pressed simultaneously.

Auto Mod. allows selected channels to be set to various preset values and automatically substituted when cues containing other than zero in those channels are read. One of the locations in the memory unit will be allocated to this auto mod facility.

Reading a memory will be indicated on the channel rockers. The top half will display red master and the lower green master.

3. OPERATIONAL DESCRIPTION

The operational facilities are best explained by an appreciation of the general functional arrangement of the logic. This is shown schematically in Appendix B.

Basically each master has two backing stores, STORE A and STORE B. When a new memory is read it is fed into store B and the previously combined STORE A and STORE B effect (i.e. the actual stage lighting), is fed into STORE A. At the same instant the level of store A is taken to maximum and store B to minimum. (The previous levels could have been any value for STORE B and either zero or max. for STORE A).

3.1. Switch On

The contents of both A and B stores are set to zero with A at high level and B at low level.

3.2. Cue Select

Selects the memory address of the next required cue. This action will carry out part of the addressing of the memory. In the case of a drum unit complete cues should be stored on a single track to reduce access time due to track switching.

The tracking switching can then be arranged to be done by the cue select where a greater time is available.

3.3. Record

This is exactly the same as for IDM/DL; a cue number is selected, the lighting is set and the "record" button pressed. This push-button is duplicated for each master to simplify operation.

3.4. Read

Place the contents of the selected cue into STORE B from the memory and set STORE B to zero level. Transfers the combined pattern from two stores into the STORE A at the high level and resets STORE B to low level.

3.5. Add and Subtract

"Add" or "Subtract" is defined by which half (top or bottom) of the rocker is touched first after a Read command. This will be Add for the top half and subtract for the bottom half. The actions of "Add" or "Subtract" will be retained until the next Read command when the Add/Subtract decision will be repeated as before.

3.5.1. Add

The rocker top is touched to initiate "Add" and this increases the level of STORE B at the set IN RATE. This action may be stopped then continued, or reversed, or run continuously to any desired level. The level progress will be monitored by the meter.

3.5.2. Subtract

The rocker bottom is touched to initiate subtract and this action causes the B stores which hold other than zero to have substituted in them the contents of the corresponding A store and these A store channels will be cleared. At the same time the B level is increased to max. (This will not be shown on the meter which is permanently monitoring the B level since the meter is reversed for this operation). The operation of subtract is now to reduce the level of the B store at the set "IN RATE". This operation may be stopped then continued, or reversed, or run continuously to any desired level.

3.6. Auto Mod.

The channels requiring modification are adjusted to their required mod. level and recorded in a memory location reserved for auto mod.

Thereafter, when individual channel auto-mod. buttons are set (indicated by the centre push being lit and the mode switch in the auto-mod. position) any memory called which has some level recorded in those channels will have the mod levels substituted.

3.7. Fade Out

This is achieved by pressing the bottom of the rocker and running down the level of Store B.

4. ELECTRONIC DESIGN

4.1. Memory

For the demonstration model, the new core prototype memory will be used and for the pre-production unit a CMS type 256/256 memory. The interface will be built to work into the -20v. signal levels currently being used as standard since this will enable use of existing unmodified memories and the existing Test Unit. However, this will, of course, be using redundant circuits and the intention will be to remove these AFTER the pre-production unit is completed on subsequent models. (Note. This will necessitate a new or modified Test Unit).

4.2. Control Desk Interface

Propose minimum electronics in control desk and time shared cables to memory - indefinite length and number of cables reduced to handful.

4.2.1. List of Controls from Control Desk to Central Control

<u>Item No.</u>	<u>Function</u>	<u>Units</u>
1	Cue Select.	0
2		1
3		2
4		3
5		4
6		5
7		6
8		7
9		8
10		9

Item No.	Function	
10	<u>Cue Select.</u>	Tens 0
11		1
12		2
13		3
14		4
15		5
16		6
17		7
18		8
19		9
20		Hundreds 0
21		1
22		2
23		
24	<u>Masters.</u>	Red Rocker Add
25		Sub
26		P.B.
27		Record
28		Rerecord
29		Next
30		Recall
31		Cancel
32		Black Out
33		Speed Range
34		Speed 1
35		Speed 2
36		Speed 4
37		Speed 8
38		Speed 16
39	<u>Channel.</u>	Channel 1 rocker Add
40		Sub
41		P.B.
42		Channel 2 rocker Add
43		Sub
44		P.B.
45		Channel 3 rocker Add
46		Sub
47		P.B.
48		Channel 4 rocker Add
49		Sub
50		P.B.
51		Channel 5 rocker Add
52		Sub
53		P.B.
54		Channel 6 rocker Add
55		Sub
56		P.B.
57		Channel 7 rocker Add
58		Sub
59		P.B.
60		Channel 8 rocker Add
61		Sub
62		P.B.
63		Channel 9 rocker Add
64		Sub
65		P.B.
66		Channel 10 rocker Add
67		Sub
68		P.B.
69		Channel 11 rocker Add
70		Sub
71		P.B.
72		Channel 12 rocker Add

x2

<u>Item No.</u>	<u>Function</u>
72 70	Channel. Channel 12 rocker Sub
71	P.B.
72	Channel 13 rocker Add
73	Sub
74	P.B.
75	Channel 14 rocker Add
76	Sub
77	P.B.
78	Channel 15 rocker Add
79	Sub
80	P.B.
81	Channel 16 rocker Add
82	Sub
83	P.B.
84	Channel 17 rocker Add
85	Sub
86	P.B.
87	Channel 18 rocker Add
88	Sub
89	P.B.
90	Channel 19 rocker Add
91	Sub
92	P.B.
93	Channel 20 rocker Add
94	Sub
95	P.B.
96	Channel Function Switch - Red Master
97	Green master
98	Flash
99	Auto Mod.
100	Channel Store Switch - Contents A
101	Contents B
102	Combined Output

4.3. Dimmer Interface

Dimmer input is to be an analogue voltage compatible with existing dimmers.

4.4. Central Control

Core store as central control.

4.5. Future Developments

The design of the system should preferably aim to include the possibility of simple conversion to DDM/L Mk. 2, i.e. levers rather than rockers. To date no investigation has been made of the implications of this requirement.

5. GLOSSARY OF TERMS

Add

Auto Mod.

Channel Mimic

Indicator(s) which gives state of channel. For IDM/R Mk.2 a rocker with three lamps one each in the top, bottom and centre. The top and bottom lamps are off, dim or fully on when the channel contents equal zero, less than $\frac{1}{2}$ level, more than $\frac{1}{2}$ level respectively. The indication of more than or less than $\frac{1}{2}$ level might be omitted and replaced with a simple indication of 'something' or 'nothing' - on economic grounds. The top lamp indicates red master and the bottom one green master. The centre lamp is used in conjunction with a mode switch to indicate flash, auto mod. or dial.

Dial

Refers to the connection of a store to a meter to display in an analogue manner the store contents.

Fade Out

Flash

When the mode switch is on "Flash" pressing the centre button of the rocker will cause that lamp to flash on the stage at a one second rate with 50% duty cycle.

Playback

Subtract