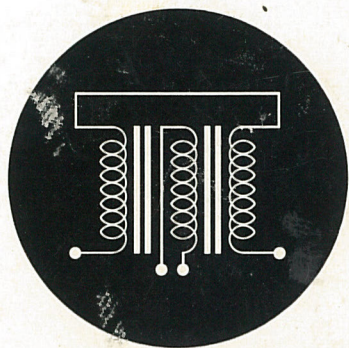


STRAND
SYSTEM SR
REMOTE CONTROL



INSTRUCTION
MANUAL

STRAND

Remote Lighting Control

All-Electric System SR

Strand System SR brings the advantage of remote dimmer control with its unique Strand finger-tip action within reach of little theatres, community centres, schools and the smaller television studios where the expense of the more elaborate preset systems cannot be faced and yet something much better than the more traditional direct-operated mechanical boards is desired.

Strand System SR provides just those facilities essential for today's lighting techniques. The ability to bring in a number of dimmers to a series of precise levels. To form, at the will of the operator, groups of lighting each with its master dimmer. The ability while cross-fading two groups to hold certain circuits static. Yet, at all times to have each dimmer under independent control and thus regulate the intensity of each circuit as and when required. Above all to provide a compact control panel which can be located in any position with the minimum of inconvenience rather than occupying valuable space on the stage or in the immediate neighbourhood; the current-carrying apparatus being housed, not necessarily together, in left-over spaces. System SR leaves the stage free of cumbersome perch platforms or switchboard enclosures.

Seated at his desk, preferably but not essentially out front with a view of the stage, the operator uses his fingers instead of his hands and is thus able to 'play' the lighting with a degree of expression out of the question in the old types of switchboard.

Nor is the control difficult to operate and maintain. With everything to hand yet still in a familiar switchboard form the operator immediately feels at ease and in control.

Finally, the control employs simple circuits based on the most robust of all dimmers—the virtually indestructible saturable reactor manufactured by Strand Electric themselves for this specific purpose. There are no moving parts to be adversely affected by dust and poor maintenance.

These claims are backed up by the fact that there are over 10,000 Strand saturable reactor dimmers in use mainly in the form of installations of 18 and 36 ways. System SR is the modern remote control for the smaller installation.

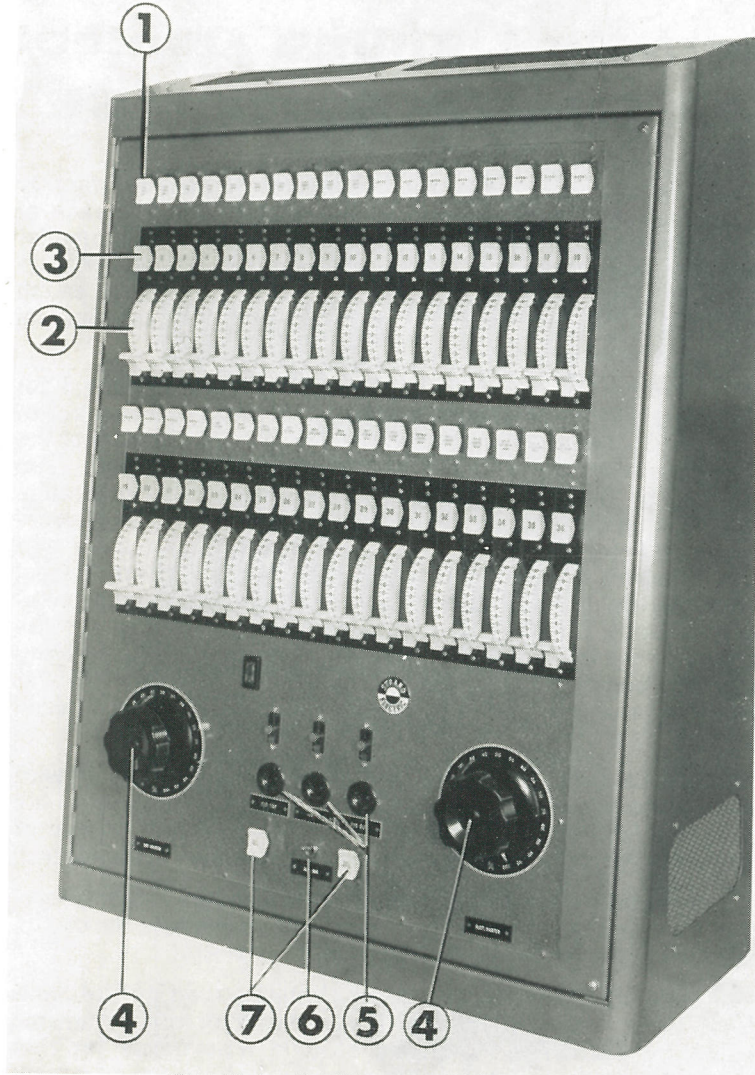


General Description

This system is available for 8, 18, 24, 36 or 54 individually controlled dimmer channels. Each equipment consists of a remote control cabinet and one or more dimmer racks for saturable reactor dimmers. Each size of dimmer is provided with tapping points to allow for load adjustment. Equipment with the suffix -/S to the Cat. Ref. is provided with two three-position switches to each channel to permit separate grouping-up for master switching and master dimming. These facilities are standard for 54 dimmer channels. Where there are only eight channels no master controls are provided as the eight dimmer levers can be operated by the fingers. Cabinets are supplied with the full complement of dimmer levers although some reactor dimmers, or even a complete dimmer rack, can be omitted for initial economy.

Control Cabinets

For 8, 18, 24 or 36 dimmer channels the standard cabinet is for wall mounting. A floor-standing upright cabinet is standard for 54 channels and is available for 24 or 36 dimmer channels for an additional charge. The controls are inclined from the vertical for ease of operation. All internal wiring is fitted and terminals provided for the control wiring to the dimmer rack(s).



Type CCR/36/S

36 Dimmer Channel Control Cabinet

1. Three-position switch with white, red, blue or green operating tablets engraved with a brief title. The choice of colour allows the channel controls to be patterned to make the layout more memorable. This switch groups the remote contactor in series with the dimmer to the 'Blackout A' master switch when in the top position, to channel off when in the middle, or to the 'Blackout B' master switch when down.

2. Moulded individual dimmer unit with stud-contact potentiometer provided with a large white scale engraved 0 to 10 with half divisions. The actual dimmer lever is coloured to correspond with the switch (1) described above. For setting the precise intensity level required.

3. Three-position switch with amber operating tablet engraved with the channel reference number. This amber switch is for grouping the individual dimmer lever (2) to 'Master Dimmer X' when in the top position, to independent live when in the middle,* or to 'Master Dimmer Y' when down.

4. Master dimmers with 330° motion and hand-grip operating knobs to facilitate slow change. One each for the X and Y dimming

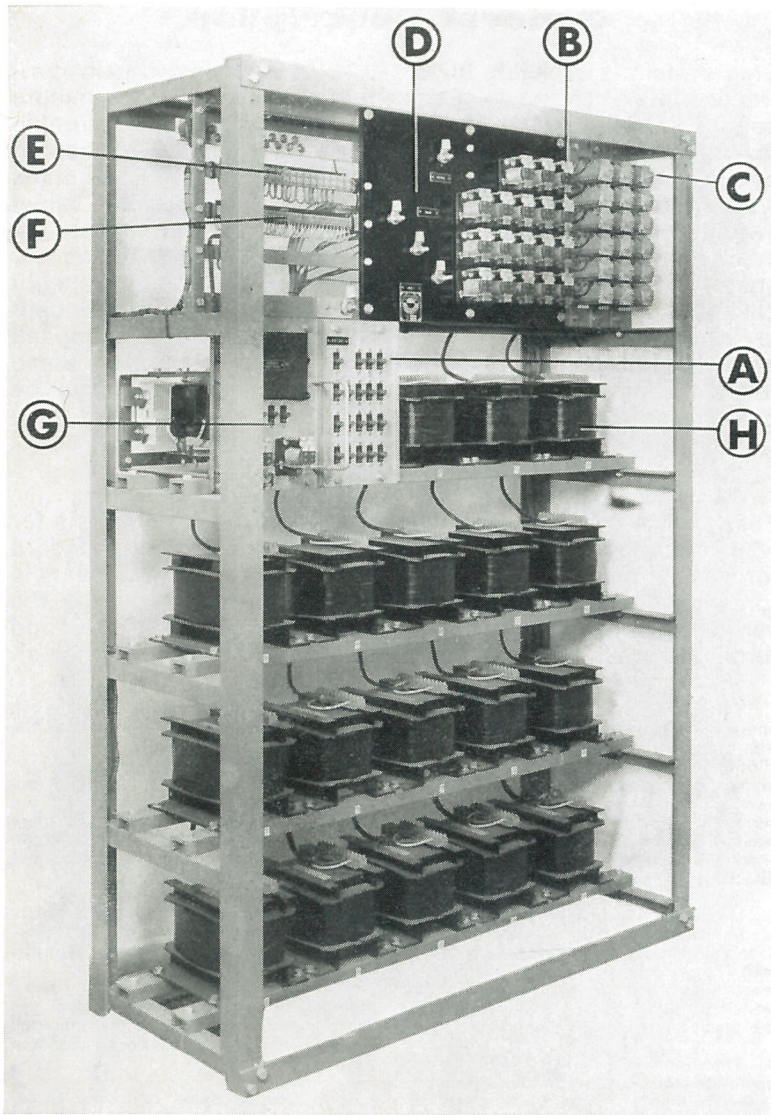
groups formed by the amber switches (3). For proportional collective control of the individual dimmer levers (2).

5. Quick-fade switches for both the X and Y Master Dimmers and a third for the group independent of both master dimmers which is formed when the amber switch (3) for each dimmer channel is in the mid position.*

6. 'All-fade' master switch for a quick-fade of all dimmer channels. This overrides all other dimming master controls.

7. 'Blackout A' and 'Blackout B' master switches for contactor switching of the two groups formed by the upper coloured three-position switch (1) for each channel.*

* Some models have only one three-position switch for each channel and therefore the single switch has to group the contactor to the blackout master switches (7) and the individual dimmer levers (2) to the two master dimmers (4). As the mid position of this switch corresponds to 'Channel Off' there is not the facility of making the dimmer lever independent of both master dimmers.



Dimmer Rack

for 18 Saturable Reactor Dimmers with cover(s) removed

Dimmer Racks

Standard dimmer racks are rated at 2 kW maximum each channel but, if specified at the time of order, any of the last four channels of each rack can be fitted with SR/3 3 kW maximum reactor dimmers. All components are contained within the steel framework and a wire-mesh cover is provided in front of the terminal area. A sheet-metal top and wire-mesh side covers are fitted as standard on the 110/120-volt range of equipment but on the 220/240-volt range these are an optional extra.

- | | |
|--|--|
| A. Thermal circuit breaker for protection and isolation of each channel. | E. Load and neutral terminals for connection of the tungsten lamp loads. |
| B. Contactor to each channel for load switching. | F. Terminals for the control wiring from the control cabinet. |
| C. Full-wave rectifier to each dimmer channel for the D.C. control of the saturable reactor dimmer. | G. Power pack unit (master rack only) for the control circuitry and the connection point for power supplies to the control cabinet. |
| D. Terminals for the incoming A.C. supply. | H. Saturable reactor dimmer, size as specified. |

Saturable Reactor Dimmers

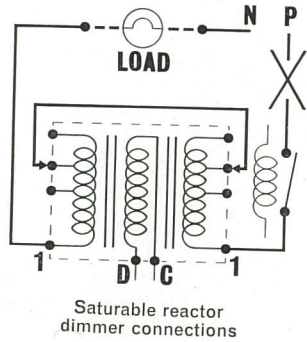
In this simple control system, which is not provided with a feedback network between the output and the control input, the saturable reactor dimmer depends upon load for satisfactory operation. Although each size of reactor dimmer is provided with tapping points to cater for unavoidable load variations, for optimum performance the size of the reactor dimmer should be chosen to match the tungsten lamp load.

If there is insufficient load the lamps will not be extinguished when the dimmer lever is zero. This may be tolerable in a television studio where the cameras are insensitive to such a low intensity, but for stage lighting it would not be acceptable. Even when the tapping points of a reactor are changed, if a load of less than 50% of the maximum rating of the dimmer is connected the range of control will be restricted and it will be impossible to dim the load to blackout. In addition, the response of the dimmer will noticeably lag behind the operation of the controls. It is therefore a short-sighted policy to fit larger dimmers than are necessary. The choice of dimmer size is not difficult for it is the intention of this lighting control that there should be a dimmer for each spotlight or group of floodlights and, therefore, the location of the lighting unit largely determines size of reactor dimmer required.

Saturable reactor dimmers for this system are available for 0.5, 1, 2 or 3 kW maximum load. Type SR/3 3 kW maximum reactors

can, however, only be fitted to the last four channels of each standard rack, due to their greater physical size.

The internal wiring of the dimmer rack connects the phase supply and the line to the tungsten lamp load to terminals 1-1 of each dimmer. A bridging cable is connected between two other like numbered terminals on top of the reactor dimmer. Two thinner D.C. control wires are connected to the central terminals D and C. Each reactor is supplied with the bridging cable connected for optimum performance of the maximum rated load. When changing tapping points, first trip the corresponding circuit breaker and then change the bridging cable



Saturable reactor dimmer connections

to another pair of like-numbered terminals. Balance between windings must be maintained by bridging like-numbered terminals.

SYSTEM SR STANDARD MODELS

Equipment is available for 220/240- or 110/120-volt, 50- or 60-cycle single- or multi-phase supplies. It is essential to state the voltage and frequency in all communications.

Control Cabinets and Dimmer Racks

CATALOGUE TYPE	Number and maximum capacity of dimmer channels	CONTROL CABINET			DIMMER RACK(S)						
		Mounting	Width ins.	Depth ins.	Height ins.	No. of Racks	Width ins.	Depth ins.	Height ins.		
CCR/8	8 x 3 kW max.*	Wall	...	14½	9	12½	1 x 8-way	...	24	19	66½
CCR/18	14 x 2 kW max. 4 x 3 kW max.*	Wall	...	29	12	28	1 x 18-way	...	45	19	66½
CCR/18/S	14 x 2 kW max. 4 x 3 kW max.*										
CCR/24	20 x 2 kW max. 4 x 3 kW max.*	Wall	...	29	13	38	1 x 24-way	...	64	19	66½
CCR/24/S	20 x 2 kW max. 4 x 3 kW max.*										
CCR/36	28 x 2 kW max. 8 x 3 kW max.*	Wall	...	29	13	39	2 x 18-way	...	45	19	66½
CCR/36/S	28 x 2 kW max. 8 x 3 kW max.*										
CCR/54	42 x 2 kW max. 12 x 3 kW max.*	Floor	...	36	16	72	3 x 18-way	...	45	19	66½

* The last four channels of each dimmer rack can accept SR/3 3 kW max. reactor dimmers if specified at the time of order, otherwise 2 kW max.

Reactor Dimmers

Type SR/05	0.5 kW maximum load	Weight 17 lb.
Type SR/1	1 kW maximum load	Weight 29 lb.
Type SR/2	2 kW maximum load	Weight 63 lb.
*Type SR/3	3 kW maximum load	Weight 78 lb.

SYSTEM SR VARIATIONS

- Available at the time of manufacture
- Substitution of dimmer rack capable of taking 3 kW reactor dimmers on any or all channels instead of on the last four channels only. 18-way rack width increased to 64 ins. 24-way rack width increased to 72 ins.
- Addition of metal top and wire-mesh side covers for 220/240-volt range dimmer racks.
- Addition of four switched-only accessory circuits consisting of four independent switches fitted to cabinet and contactor unit fixed to left-hand side of No. 1 Dimmer Rack increasing the width by 5 ins.
- Omission of one 18-way dimmer rack to effect initial economy. Control cabinets are always supplied with a full complement of dimmer levers.
- Substitution of floor-standing cabinet for 24- or 36-way wall-mounting cabinet. Dimensions as CCR/54 cabinet.
- Addition of four-leg base, with or without castors, to a wall-mounting cabinet.
- Addition of 2 kW switched-only channels for television requirements consisting of three-position switches fitted to cabinet and contactor unit designed for mounting on top of a dimmer rack, increasing the height by 20 ins.
- Available only as follows: CCR/18-18; CCR/24 or CCR/24/S-24; CCR/36-18 or 36; CCR/54-18.

Six 5 kW switched-only channels are available in place of an 18 or 24 x 2 kW unit.

INSTALLATION

The control cabinet should be sited so that the operator will be able to see the acting area from the same point of view as the audience. In the theatre this demands a position in the auditorium but in a television studio a picture monitor is of greater importance than a direct view of the studio. Localised lighting of the controls should be provided—this should come from over the shoulder of the operator. Lighting controls cannot be successfully illuminated from immediately overhead. Control cabinets are provided with ventilation grills at the sides and in the angled top—these must not be obstructed nor must

the natural ventilation be prevented by inclining the cabinets from the near-vertical. Access to the fixing holes and to the control circuit terminals of *wall-mounting cabinets* is by removing with the fingers the sprung centre-caps of the two master dimmer knobs. The knobs are then freed by loosening the collets with a screwdriver. The two retaining bolts on the right-hand side of the cabinet can then be slackened so that the whole front can be carefully hinged open. The *floor-standing cabinet* is provided with two rear removable panels for access and therefore the control wiring should enter the cabinet through a short length of flexible conduit to allow for access and inspection. The numbered and colour-coded control terminals are arranged in rows corresponding with the number of dimmer racks.

The dimmer racks should be sited as near to the various lamp loads as is practicable in order to avoid expensive cable runs at the lighting voltage. Although it is more usual to group dimmer racks together there is no necessity to do this. If racks are not installed in a special area restricted to authorised electrical staff, covers will normally be required. Metallic conduits and trunkings should not be rigidly fixed to dimmer racks of this type as otherwise it would be possible for the slight A.C. hum to be amplified and transmitted to other parts of the building. The terminals for the connection of the tungsten lamp loads, for the control wiring, and for the incoming A.C. supply are all accessible from the front when the wire-mesh cover is removed and, therefore, the dimmer racks can be mounted against a wall.

The sequence of the phase connection studs for the incoming supply is from the top left to the bottom right with the labelled neutral connection at the top right. Where a dimmer rack does not require connection of three phases the studs are sometimes commoned on the front of the panel. All dimmer racks should be earthed (grounded) to a common point.

The control wiring requires two three-core 70/·0076* (15 amp) cables and one three-core 14/·0076 cable between the control cabinet and the power pack fitted to No. 1 rack; two 14/·0076 cables between the cabinet and rack for each dimmer channel, and two 23/·0076* (5 amp) cables between the power pack on No. 1 rack and each additional rack. Each additional switch-only channel requires one 14/·0076 cable between cabinet and contactor unit, and one 23/·0076 between the contactor unit and the power pack.

An installation always consists of a master rack (No. 1 rack) which includes the power pack unit. Additional racks are added to make up the required number of dimmer channels. On each rack there are numbered and colour-coded (blue/orange for

* Increase cable size if over 100 ft. in length to avoid voltage drop.

dimmer, and yellow for switch) control terminals. A similar layout will be found in the cabinet. All the lettered terminals in the cabinet have to be connected to the power pack on No. 1 rack. Where there are additional racks their terminals L and M also require connection to the power pack on No. 1 rack. The terminals on the power pack are under a bakelite cover.

Interconnect between cabinet and power pack on No. 1 rack as follows:—

Using a three-core 70/·0076* join A to A with red
join B to B with black
join E to E with green

Using a three-core 70/·0076* join C to C with red
join D to D with black
join F to F with green

Using a three-core 70/·0076* join G to G with red
join H to H with black
join J to J with green

Interconnect between power pack on No. 1 rack and each additional rack as follows:—

Using a two-core 23/·0076* join L to L with red
join M to M with black

Note: Terminals N, P and Q are not used on rack without the power pack unit.

Interconnect between cabinets and corresponding dimmer rack(s). Using 12-core 14/·0076 join like-numbered and -coloured terminals.

Note: The recommended sequence for 12-core cables is as follows: White, slate, brown, red, red/blue, red/white, pink, orange, yellow, blue, violet, black—then repeat for next cable.

If four switched-only accessory circuits are fitted to the side of a rack its terminal L may be paralleled with rack's terminal L. If a switched-only unit for more than four channels is supplied, as may happen in smaller TV studios, its terminal L has to be connected to a terminal L on the power pack with a 23/·0076 cable. If all power pack L terminals are already in use, parallel with the centre one.

OPERATION

Numbers in brackets refer to photograph on page 4

To set up the control cabinet for normal operation first ensure that all dimmer levers (2) are down to zero and all the three-position switches (1 and 3) for each control channel are in the bottom position. On the master panel the Quick-fade, All Fade and Blackout switches all should be in the normal top position and both master dimmers to zero. Check that the equipment is

switched on—this is shown by the neon indicator lamp on the master panel. If at this stage there is a low level of light from any of the dimmer controlled lighting units this indicates that the load is outside the range of the reactor dimmer. (See REACTOR DIMMERS for tap-changing procedure.) It may be difficult to identify the offending channel—if so the channels may be switched off individually by putting the upper three-position switch (1) to mid 'off' position. Ensure that these switches are returned to the bottom position again when the offending dimmer channel has been found.

The first requirement of any new installation or new production is to light up the various control channels individually to check the setting, the focus and the colour of each lighting unit.

To Fade-in and Fade-out Channels Individually

Raise the Master Dimmer Y to full. As all the three-position switches have previously been put to the bottom position all channels will be switched on and when any individual dimmer lever is moved above zero the corresponding lighting load will change to the intensity level set on that lever. Any channels not required for the production should be switched off by putting the upper three-position switch to the mid position.

When all the lighting units have been checked the next requirement will usually be to build-up, step by step, the lighting for each scene or picture. This is done by setting the dimmer levers as described above until the total lighting, and balance, for each scene has been determined. When the levels have been plotted, fade Master Dimmer Y to zero and rehearse the timing of the fade-in of the channels collectively by raising the same master dimmer to full. Then determine the nature of the next lighting change. Is it to be an addition to the previous lighting, a subtraction of some channels, a quick fade to blackout, or a cross-fade to an entirely different set-up?

To Add One Group of Lighting to Another

Form another dimming group for the channels to be added by changing their amber three-position switches to the top position. Raise Master Dimmer X to full and determine the intensity levels of the new channels required by operating the dimmer levers directly as previously described. Then fade Master Dimmer X to zero and rehearse the timing of the change by raising Master Dimmer X to full.

To Subtract One Group of Lighting from the Remainder

If both master dimmers are available the channels which are to remain can be held on one dimming group with its master dimmer at full, while another group is faded to zero on the other master dimmer. Alternatively, if there are two three-position switches to each channel, the channels required to remain can

be made independent of both master dimmers by putting the amber switch to the mid position.

To Cross-fade from One Group of Lighting to Another

Either dimming group can be cross-faded with the other by fading one master dimmer to zero and at the same time raising the other master dimmer to full. Watch the visual effect to determine the exact timing. If there are two three-position switches to each channel any channel can remain unaffected during a cross-fade if its amber switch is first put to the mid position thereby making the dimmer lever independent of both master dimmers.

To Quick-fade a Group of Lighting

When a group has to be faded to zero quicker than is convenient by rotating a master dimmer knob, use the associated Quick-fade switch instead. Unless the same cue is to be operated in reverse shortly afterwards it is prudent subsequently to fade the master dimmer to zero and restore the Quick-fade switch to its normal position. A Quick-fade switch can be used in reverse to switch on a group provided that the master dimmer has been brought up to full before the switch is returned to normal on cue.

To Quick-fade all Dimmer Channels to Zero

Use the All-fade switch and subsequently fade both master dimmers to zero and ensure no channels are connected to the mid independent group before restoring the All-fade switch to normal.

To Fade all Dimmer Channels to Zero

First ensure that no channels are connected to the mid group independent of both master dimmers and then on cue fade both master dimmers to zero.

To Switch Off a Group of Lighting

A quick-fade switch can be used in conjunction with one of the dimming groups or, if an instant cut is necessary, one of the Blackout masters can be used.

To Use a Switching Group to Supplement Dimming Groups

Where there are separate three-position switches for grouping the dimming and switching groups a dimming group can be faded to zero on a master dimmer and some of the channels then switched off by a Blackout switch leaving the remainder immediately available to be faded up on the same master dimmer.

To Preset a Lighting Change in Advance

Provided no lighting is in use, i.e. during a blackout or interval, the various dimmer levers can be preset as required and either the Quick-fade or master dimmers used to bring them to the levels instantly or slowly. However, true presetting involves the setting of intensity levels for the next change irrespective of the lighting in use. This can only be done with the more elaborate

Strand controls with duplicate dimmer levers. In fact, some presetting can take place by ensuring the choice of dimmer channels not already in use for the effect to follow. To use this in the most effective way, resort is made to the grouping-up facilities provided by the amber three-position switches.

★ ★ ★

The provision of two forms of switching, Quick-fade and Black-out, requires some explanation because with correctly loaded reactor dimmers there seems very little visual difference.

The blackout switches operate contactors in series with the load circuits and thus give an instant cut. There is no light at the lamp and no potential will be present in the load circuit if the lamp load is unplugged. However, it is an inherent feature of all systems using a saturable reactor as a dimmer that the reactor, when unloaded, retains for some seconds a memory of its state at the time of unloading and a fleeting memory of the previous effect may show when the load is restored.

In practice this effect is usually of academic interest only and the vast majority of users of saturable reactor dimmers are quite unaware it exists. It is only in the rare instances in quick-fire revue or variety (vaudeville) where a number lit in blue instantly follows a brightly lit sketch which terminates in a blackout that precautions are likely to be needed. In these cases the All-fade or Quick-fade switches, which interrupt the control circuit not the load, should be used and the channels will be dimmed out to all intents and purposes instantly.

OPERATIONAL HINTS

When three-position switches are changed from the top to the bottom position this should be done with a decisive action in order to avoid any flicker when changing from one master group to another. The circuitry and the shape of the operating tablets have been designed to assist rapid operation.

Although there is no electrical necessity to do so it is better to avoid leaving a master dimmer at an intermediate position, unless a proportional cut is required, as this confuses the individual scale readings.

Slow changes operating a dimmer lever directly should be avoided if the lighting unit controlled is in close proximity to the subject illuminated, e.g. a window backing, due to the stud contact nature of the potentiometer. If the change is slow there is usually time to group to a master dimmer.

Flash boxes, smoke boxes and other similar devices should never be fired from a circuit which includes a dimmer of any kind. Neither should they be fired from a remotely controlled circuit but should be under the control of someone as near to the device as is practical and with a direct view of it.

This booklet applies specifically to standard system SR models supplied subsequent to January 1961. However, since the basic principles are the same it will be found useful as a guide to earlier models provided due allowance is made in respect of points of detail.

USE OF METER IN FAULT TRACING

An A.C./D.C. multi-range meter can be used to good effect to trace a fault. The following test potentials are not critical and vary according to the supply voltage. The live, or positive, connections are given first.

Between terminals a and b — 230 volt A.C.

Between terminals a and m — 230 volt A.C.

Between terminals j and l — 24 volt D.C.

When Blackout A switch normal:—

Between terminals g and l — 24 volt D.C.

Between terminals c and l — 24 volt D.C.

When Blackout B switch normal:—

Between terminals h and l — 24 volt D.C.

Between terminals d and l — 24 volt D.C.

Note terminals e, q and j are all at earth (ground) potential.

When channel switched on:—

Between channel switch (yellow) terminal and terminal l —
24 volt D.C.

When dimmer full on:—

Between channel dimmer (blue/orange) terminal and terminal m or b — 230 volt A.C.

Between terminals d and c on reactor dimmer —
170 volt D.C.

TROUBLE SHOOTING

Complete loss of control on all channels, no pilot light indication at cabinet

Check incoming A.C. supply including the phase feeding power unit on No. 1 rack. Check circuit breaker feeding power unit on No. 1 rack.

Complete loss of control on all channels but with pilot lamp alight on control cabinet

Is All-fade switch down? Are both Blackout switches down? Check circuit breakers on power unit. Check for loose or broken connections between terminals j-j.

Loss of control on either master dimmer

Is the associated Quick-fade switch down? Check corresponding circuit breaker on cabinet.

Loss of control on all of 18 consecutively numbered dimmer channels

Check circuit breakers for corresponding numbered dimmer rack on power unit. Check for loose or broken connections between terminals l-l or between terminals m-m.

Loss of control on Blackout A master

Is corresponding contactor on power unit closed? If not check connections between terminals g-g. If it is closed check connections between terminals c-c.

Loss of control on Blackout B master

As above, but check terminals h-h and d-d.

Complete loss of control on one channel only

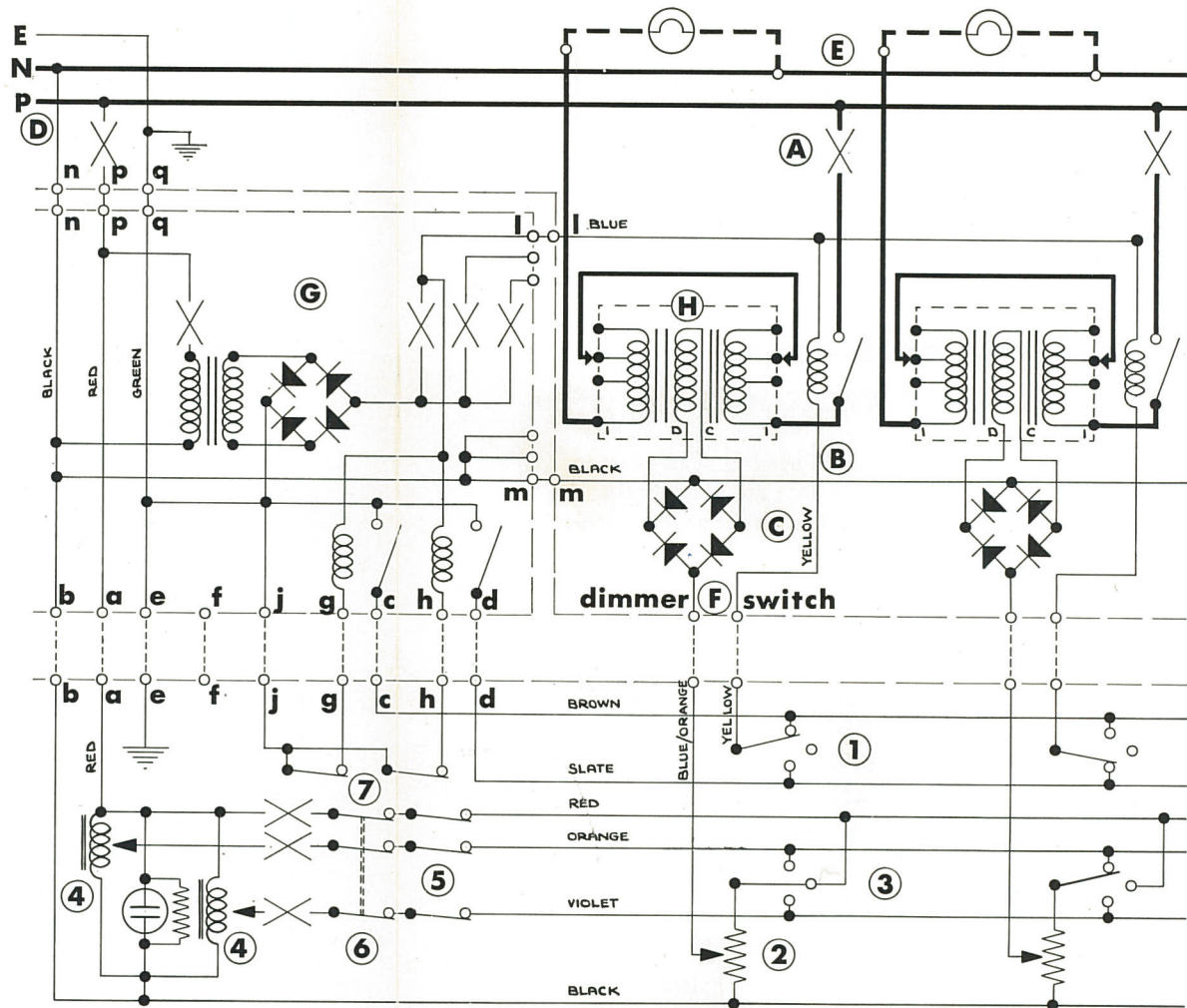
Check for faulty projection lamp and faulty flexible cable to the lighting unit. Check channel circuit breaker. If channel contactor is not closed check channel switch (yellow) connections. Check channel dimmer (blue/orange) connections.

One channel dimmer control limited to between full and approximately half-intensity

Check lamp load in relation to dimmer size and tapping points. Check black connection to dimmer lever.

Loss of control of one dimmer channel at one intermediate dimmer position.

Check resistor connection to stud contact of dimmer lever at this intermediate position. Use only high melting point solder if repair is necessary.



Numbers and letters in circles refer to photographs on pages 4 and 6

SYSTEM SR BASIC WIRING DIAGRAM

The upper part of the diagram shows part of No. 1 Dimmer Rack which is provided with the Power Pack shown on the left-hand side. On the 110/120-volt range of equipment an additional transformer is fitted between terminals n-n and p-p. The centre tap of the secondary winding of this transformer is internally connected to terminals m and l on the Power Pack. Part of the control cabinet is shown on the lower part of the diagram. Switch (1) has shorting type

contacts and switch (3) has non-shorting type contacts. Some models have only one three-position switch for each channel. The circuitry of the dimmer racks is unchanged but on the control cabinet the two three-position switches are combined on a single double-pole switch. The independent live busbar and associated Quick-fade switch are omitted as the mid position of the single three-position switch corresponds to 'channel off'.



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