

STRAND PRESET LIGHTING CONTROL

All-electric Systems CRD and C/AE

Strand System CRD is based on a 30 channel Trinistor (Silicon Controlled Rectifier) unit. The channels have a capacity of 2.5 or 5kW. For 10kW, two channels are connected in parallel. Dimmers are load independent and provided with overload and surge protection. A high degree of clean-up is provided to neutralise any undesirable effects of the chopped waveform. Two systems of control desk can be provided, the standard CRD which gives dimmer pre-setting and switch selection to allow formation of three groups at will by the operator. The second system C/AE replaces switch grouping by a special form of illuminated scale to the dimmer levers and instant memory action for 20 groups. The way the memory action and display is combined with dimmer pre-setting extends the facilities very considerably since the operator only needs to reset levers for dimmers which have to change intensity. For the first time the full range of control so long available in Strand electro-mechanical systems is realised in all-electric form. The quality of "staying put" until instructed to change otherwise referred to as 'inertia' is combined with the instant response of the latest all-electric dimmer.

The importance of System C/AE will be appreciated when it is realised that it is the use of memory action in Strand systems which has allowed television in Britain to avoid multi-preset desks with their many miniature levers and which has brought about the rise of the lighting supervisor to his present position of importance in what is known as the 'hands off' technique. Strand controls achieve full expression with fewer controls and in consequence are simpler and more rapid to operate while occupying less space. This enables them to be more readily integrated in the production system.

System C/AE is also of importance to the larger theatre installations as it provides full control with far fewer presets than would otherwise be necessary.

**STRAND SYSTEM CRD A PRESET CONTROL UTILIZING SILICON
CONTROLLED RECTIFIERS DIRECTLY FOR DIMMING**

The Strand Electric System CRD incorporates the silicon controlled rectifier in a form essentially practical for theatre and television. All temptations presented by the news flashes and publicity gimmicks originating in the United States have been firmly resisted. In its practical form this dimmer is not particularly compact and its lightweight nature has been much overstated. It is true that the rectifier device itself is so small that it can be worn at the end of a watch chain, but around this nucleus a host of auxiliary equipment must be congregated. These auxiliaries are necessary to protect the device, to make it work as a dimmer, to make it work along with a number of its fellows as a complete stage or TV lighting control, and above all to make its chopped waveforms acceptable. Add to these the fact that the best economic use can be made of the devices when they are kept within certain temperature limits then one can see that talk of decentralisation all over the studio in the sense of scattering the dimmers locally to their outlets is certainly not practical. (But see Dimmer Banks below).

Dimmer Banks:

The Strand Electric silicon controlled rectifier dimmer bank has been standardised at 30 dimmer channels, the minimum likely to be of practical and economic value in these particular fields. Each 30 channel bank is a self-contained unit complete and ready to work with its own power pack and cooling equipment. All that is required is the connection of the mains feed, the lighting circuits, and the multicore cable to the remote control desk. Larger installations are built up by additional 30 channel banks. These banks being quite independent need not be housed together in the same rooms. Should it be desired in order to effect a saving in copper, banks could, in a theatre, be local to the fly gallery over either side of the stage (the normal feed positions for the majority of the lighting), under the stage for the stage dips (pockets) and "out front" to feed the auditorium spotlight circuits (particularly numerous nowadays). Such decentralisation by banks instead of by dimmers precludes use of a central patching field but this may be advantageous rather than otherwise and is discussed in 'Patching' below. Each standard channel will carry up to 25 amps, on 120 volt a 50 amp. channel is available. Larger amperages are built up by ganging standard ways. It is part of the conception of this system that there shall be a large number of small wattage dimmers instead of a small number of large wattage dimmers (further discussed under 'patching', below). Each 30 dimmer rack is housed in a well styled metal cabinet 7ft.0ins. wide x 2ft.0ins. deep x 5ft.6¼ ins. high, weighing 12½.cwts. To facilitate transport and handling onsite at the time of installation these racks split into two equal parts. The weight is explained by the high degree of clean-up applied to the waveform. For this purpose iron cored chokes are used but it must be emphasised that the actual load carrying and regulation takes place wholly at each pair of silicon controlled rectifiers (connected back to back) and the moment the point in the dimming curve is reached where the waveform is sufficiently complete, the chokes are cut out. The degree of smoothing employed is such that there is no audible lamp filament sing whatever the form of filament lamp used. This high degree of smoothing has equally beneficial effects in respect of the reduction of electrical interference and radiation of mechanical noise.

Provision has been made to safeguard completely the silicon controlled rectifier against the current surges to be experienced when "hot" patching or plugging in cold tungsten lamps, or under short circuit conditions, in particular, when additions are made to a channel already partly loaded. Only if the bank blowing equipment fails is there any need to exercise caution in these respects. Such a failure is indicated at the bank and control desk visually and audibly and such indication would be repeated at the patching field if installed. Orthodox protection is provided by a circuit breaker per channel and as a final resort, an internal fuse. No special precautions such as micro switches are necessary at the patch panel, reliance on such devices represents bad practice since it is all too likely that a "hot" connection may be made elsewhere in the circuit, for example at the local outlet feeding a particular lighting unit or series of lighting units. In the Strand system the protection is part of the dimmer itself

Control Desk:

The Strand control desk represents the unique combination of engineering design and user experience. By long custom the Strand engineers responsible for designing lighting controls have had to man and operate their own controls. Ever present danger of design having its head with cost possibly as the sole brake is automatically curbed by the fact that a Strand control project is subject at all stages to close scrutiny of a number of informed users, one of whom is the designer himself. By this count any control philosophy involving literally thousands of small levers for remote control as is common in the United States, would have been stifled at birth. Some of these miniature forms need three distinct finger movements to traverse from full-on to off which then leads to 3,000 finger movements to clear a 10 preset 100 channel panel down to zero (off). Such a task is automatically ruled out by the designer who has to operate himself. Nor, in our opinion, is the notion of a large scale rehearsal dimmer lever, which has to be matched on miniature preset levers a happy one.

It is Strand Electric's claim that their lighting controls are operators' controls, and it is a tribute to their design that alone in the world Britain's TV lighting designers actually work their own controls without electrician or other specialist intermediaries. This to such dramatic and technical effect as represented by the B.B.C's 'Hands Off' technique. Against the importance of the design of control desk the actual form of dimmer rates very low indeed. It is the practical nature of the control desk which will ultimately weld the largest installation together.

First importance is given to the nature of dimmer lever itself. The Strand lever is comparatively large, designed for finger operation and engraved with a large scale, in black on a white or light background. The scale itself is $3\frac{1}{4}$ ins. long and is engraved 0-10 with half divisions marked. At 0 the light is out and the dimmer 'off', the scale itself conforms to the proposal of the American IES that (halfway) = 25% light.* Economy in spacing is achieved where necessary, by making odd and even number channels share the same scale thus reducing horizontal centres from 1 inch to $\frac{3}{4}$ without operational sacrifice. The fixed quadrant scale provides both a fixed landmark in a sea of moving parts and a convenient rest to steady the hand when operating an individual lever very slowly. Differing preset levers are

* An alternative curve for television is available with halfway = 50% light

never interleaved side by side since this interferes both with the ability to 'play' the lighting within a preset and the facility during rehearsal of an assistant 'plotting' while the operator carries on with the setting of a new cue.

The unique ability to 'play' the lighting within a preset (i.e. to carry out running changes and minor changes) is due to the fact that no miniaturisation is employed and that each preset is in fact a complete switchboard, forms the basis of the claim that no more than four presets need and indeed should be installed. Strand can of course make ten preset systems, technically once two presets are achieved the rest is easy, but the confusion in respect of a normal operator as the number of controls goes up more than outweighs any gain. Setting up and resetting has to be faced even when 10 presets are used; after all only a simple show would be covered thereby and such simple shows would be easy to do anyway. Once resetting has to be considered then four easily identified sets of identical large levers to hand are infinitely quicker to appraise and operate than any forest of levers, be they large or small or mixed in size.

The Strand desk is based on 2ft.3½ins. wide, 4ft.6ins. high, 1ft.2ins. deep near vertical wing module (operational area 1ft.11ins. wide x 3ft.4ins. high) which covers 120 channels as 2 presets repeated one above the other. For the less than this number the appropriate number of levers are blanked off. The levers are arranged in eight rows of thirty so that counting in tens may be practised. To aid rapid location, the centre tens group in each row is marked off from its neighbours on either side. Larger numbers of channels are accommodated by increasing the width of the wing.

A four preset setup for 120 channels would consist of two wing modules one to the left of the operator representing presets I and II with a similar arrangement for Presets III and IV on his right. For 200 or more channels the wings are twice as wide. The presets are also identified by coloured knobs on the dimmer levers as Red, White, Green and Amber, respectively. Such colour identification removes much of the difficulty in rapidly picking out the master faders on the centre desk.

Master Panel:

The master panel takes the form of a desk between the two wings. In addition to the controls it provides ample space for the reading and writing of the lighting plot.

The essential feature of the master panel is its simplicity, all temptation to use a multiplicity of controls has been firmly resisted. Two examples of this are the use of only one set of grouping switches instead of a set to each preset and the absence of cross-faders as such.

Except in something basically simple from the lighting point of view, like a symphony concert, an operator has to be in attendance at the control anyway, in consequence there is no reason why he should not be given work to do. It is therefore necessary to provide such controls as will cover the most complex likely sequence of changes to be encountered while permitting rapid re-setting for the next sequence. This the multiple presetting and group mastering systems fail to do because both the possibilities and the technical means to carry them out, outpace the immediate comprehension of the man (operator) whose servant they are supposed to be. Some multi-preset

systems provide ten dimmer levers plus a transfer switch and a rehearsal lever to each channel, i.e. 1,200 levers, all but one hundred of which are capable of an infinite variety of intermediate stations. An additional complication is sometimes encountered when a number of selector buttons e.g. 8 are provided to each channel for grouping within a preset. This not only further increases the number of channel controls but also involves intricate mastering.

The Strand System under recommendation relies on four dimmer levers and one three-position switch only per channel - a total of a mere 500 levers for 100 channels, but quite enough for ordinary mortals however well trained!

The layout for a 120 way master desk will have four rows of 30 three-position switches corresponding to the four rows of dimmer levers on the wings. The object of these switches is to form optional groups within a preset. The switches are tablet type, that is, their operating knob forms the label and their three positions are clearly indicated with a pronounced lock. In the top position they connect to the X master, in the middle to the Y, and in the bottom to the Z.

The masters themselves are exactly similar to the individual dimmer levers, except that each has its own scale. As these are already correct for finger operation, slow or fast, there is no need to enlarge them. Above each master there is a three position tablet switch giving 'On Grand Master A', 'Cut' and 'On Grand Master B'. The grand masters themselves are large rotary knobs giving 290° rotation and in consequence, very slow manual operation is possible. A cut switch is provided to A and B also a DBO (Dead Blackout) over-riding everything.

In those instances where a patch panel is not part of the installation, a separate master for the front-of-house circuits in front of the curtain is provided. This operates irrespective of any grouping and can be used to douse unwanted light patches as the curtain descends. The masters are mounted in one row but grouped in threes separated by one blank space. Each of the four threes are coloured and engraved to correspond to the four presets. The arrangement allows considerable 'playing' upon the masters using the fingers instead of the hands, and in consequence locking up to the Grand Masters will be the exception rather than the rule. Pilot lamps on each preset wing indicate which preset and which of its three groups is alive.

Movement from one master to another or from one preset to another is quite free:- presets can be 'piled' for example, (superimposed one upon another) or cross-faded or faded to out.

A view of the stage over the centre desk is recommended but due to its low height it is immaterial whether the control is located low in the orchestra pit position or high at the back of the circle. It is intended that the operator shall be seated to carry out all control operations. Ample panel space is available on the centre desk to allow the location of inter-com., cue lights, clock and other necessary facilities.

Patching:

Strand Electric manufacture two main types of patching field. Type J.K.

in which the circuits are represented by male jacks and cords on the table and the dimmers by one or more female sockets to each on the vertical panel. The other type, J.L., employs female jacks (Jills?) and cords on the table for the dimmers and male sockets on the vertical panel. The second type is preferred in Britain where the main object in a television studio (patching is never used in a theatre) is to re-arrange channels in an order appropriate to the particular scenic layout. The United States usage of a large number of circuits which have to be accommodated on relatively few dimmers requires the first type (JK).

In both cases a large robust jack is used and built-in jumpers are preferred as a method of extension rather than extra long leads retracted overhead. Working with the head acutely angled upwards is unnecessarily tiring and uncomfortable as anyone who has tried it will know. The cords are retractable by weights and the underside of the table is divided up to prevent tangling. Jacks and sockets are double pole and this can be used to impart some automatic discrimination. For example, a 2 kW. (or under) circuit can be plugged into and fed from any 2.5 or 5 kW. channel, whereas a 5 kW. circuit can only be fed from a 5 kW. channel. Where required a combined live load test and ammeter channel with its own local contactor on the patch panel can be fitted.

No micro switch devices are fitted as the Strand system, CRD. requires requires no such protection.

Alternative to Patching:

The practice of patching in large theatre type installations is peculiar to the United States. Television patching practice is not comparable and European theatre technicians look askance at installations such as the theatre in the recently opened McCormick Hall, Chicago, where 996 circuits are patched to a mere 147 dimmers or even the rather similar, if somewhat less unwieldy ratio of the O'Keefe Centre Toronto and others. A large theatre in Europe expects to instal a large number of smaller wattage dimmers rather than a small number of large wattage dimmers. The latter, the United States practice, originated with the college theatre (Broadway still exists on portable dimmer set-ups and has nothing modern to show) where economy was then important. Thus large numbers of circuits were made to share the few expensive dimmers that could be afforded. 'Patching' was born and under the guise of 'flexibility' soon was endowed with merits it did not possess. The arrival of the 10 preset all-electric control systems made its retention essential since no one could rightly conceive of 200 or so channels breeding literally thousands of miniature levers.

On the other hand, Strand Electric in London alone have equipped no less than 29 theatres with remote control right on their doorstep in the West End and have thus intimate experience of the requirements of professional theatre working. Four controls have over 200 dimmers each and the average lies around 150. Experience in the German Opera houses and in theatres such as the Comedie Francais, in Paris, confirms the desirability of larger numbers of dimmers and a higher degree of semi-permanent connection of lighting than a patch panel can provide. Where the many circuits of a large stage have to be squeezed onto a mere 96 dimmers then they have to be re-grouped according to the imagined, or stated requirements of each production, great or small, long

run or one night stand. Nothing is normally at the ready, alert to go into instant action. This state of readiness, without the need of a lot of planning or forethought, is particularly desirable in places such as the O'Keefe Centre and the McCormick Hall, and indeed such as the proposed Montreal Place des Artes. It also applies to much smaller enterprises where a variety of styles and types of production will also demand true versatility. For this the large patch panel and the multi-preset system are too complex and not instant enough.

However, increase in the number of channels requires increased outlay. In part, this can be covered by deletion of the patch panel and the consequent saving in respect of payment for it and the extra copper and installation required in routing everything via it. The socket outlets in the flys and on the hanging pipes t as substitute. These points have in any case to be visited when hanging and setting a layout whether there is a patch panel or not.

SUMMARY

1. Strand System CRD uses the silicon controlled rectifier directly to provide a variable load dimmer in which the effects of the chopped waveform have been minimised (it is clean). The rectifiers are protected from surges due to cold patching and short circuits.
2. System CRD is based on 30 channel racks any or all of the racks can be 5kW. 10kW channels use two 5kW in parallel as one control channel. For each 10kW channel therefore, the control desk is reduced by one channel.
3. System CRD preset desks can be constructed for any number of presets. In its recommended form of four presets it can be claimed that due to clarity of layout and convenient size and arrangement of levers the control becomes an operator's control and a better servant than complex multi-preset setups of 10 presets.
4. An alternative form of control desk, known as System C/AE and described on page 11 is available, which provides an extension of facilities in the shape of instant memory action for twenty groups. The memory action replaces the three position tablet switches and the selections are displayed and operated at the individual dimmer levers.

Technical Notes on System CRD:

1. All the power supplies from the racks to the desk are 24 v. A.C.
2. At least two racks supply the desk so that there is no 'master' rack.
3. Only one control line is required for each channel and this never exceeds 24 v. D.C. (2 mA).
4. Each rack is provided with automatic ventilation with green and red pilot indication on desk.
5. All control lines operate dimmers irrespective of the phase to which their load is connected.
6. The control cable can be of any length because the amplifier has a high resistance input.
7. There is no inter-action between control channels because the input reactance is low.
8. 'Full' and 'Zero' adjustments are provided on each channel amplifier so that all channels can be made to have the same dimming curve between '0' and '10' (full).
9. A silicon transistor is used in each amplifier on the D.C. section to eliminate drift.
10. To correct for phase displacement, the D.C. level from the control unit is compared in the amplifier with a synchronised firing waveform produced in the sawtooth unit.
11. The gate circuit is fired continuously during the conduction period thus ensuring that there is no loss of an occasional half-cycle as can result from a one-shot gate circuit.
12. Each rack contains its own power unit.
13. All dimmer channels can easily be changed to any phase as required.
14. All channels will carry up to 25 amps. on 120 volt a 50 amp channel is also available. Larger loads per channel are easily obtained by coupling. (Plugs and sockets provided with each rack).
15. A 25 watt lamp is controlled in the same dimming curve as the full load rating of the dimmer.
16. When a 25 watt lamp is at any position of illumination, the full load may be cold patched without affecting its intensity.
17. The maximum voltage drop across the dimmer when half the rated current is flowing at 'Full' is 3 volts.
18. The maximum voltage drop across the dimmer channel when the rated current is flowing at 'Full' is 4 volts.

19. A feedback unit always ensures that the dimmer cannot be overloaded.
20. All sub-assemblies are made as plug in modules.
21. Thermal/magnetic circuit-breakers are provided for load short circuits and isolators.
22. High-speed semi-conductor fuses are included for internal faults.
23. Unity power-factor when in the 'Full' position.
24. The AI (anti-interference) rack is in series with all load wires (i.e. is part of the dimmer channels) and cleans up the output waveform to B.S. 800 for radio noise, and also removes electrical audio frequencies.
25. When a dimmer channel is in the 'Full' position, the AI rack is electrically shorted as interference is only caused when dimming.
26. All unwanted noise which could occur in trunking, lamps, etc. is kept in the AI rack and thus makes a 50 p.r.f. noise which is no greater than an equivalent magnetic amplifier.

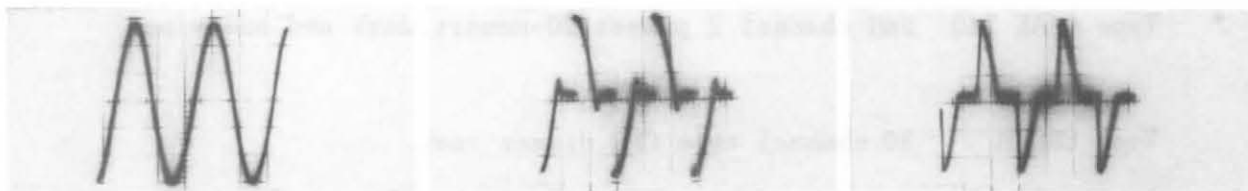
Ventilation of Dimmer Room

Heat dissipation to be allowed for is as follows:-

Desk	= 50 watts - constant
All Racks	= 300 watts each when idle
30 x 15 amp channels	= 3,000 watts on full load
30 x 25 amp channels	= 5,000 watts on full load
30 x 50 amp channels	= 8,000 watts on full load

Maximum permitted ambient temperature 40°C

The channel heat loss reduces with dimming and unlike thyatron dimmers and magnetic amplifier dimmers is nil at the 0 position (off).



Typical examples of wave form taken at the mid-dimmer position, potentially the worst for interference

- (1) Input waveform
- (2) Output from SCR's and input to filter, risetime approximately 2 microseconds.
- (3) Output from filter and supply to 5Kw lamp (risetime reduced 1 microsecond).

SYSTEM CRD 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, wattage and frequency in all communications.

Type CRD/60	60 channel 2 preset type K desk (self-contained desk, no wings)
Type CRD/90	90 channel 2 preset type CRD desk (centre table and one standard wing module)
Type CRD/90/4	90 channel 4 preset type CRD desk (centre table and two standard wing modules)
Type CRD/120	120 channel 2 preset type CRD desk (centre table and one standard wing module)
Type CRD/120/4	120 channel 4 preset type CRD desk (centre table and two standard wing modules)

- * Type C/AE 120 120 channel 2 preset 20-memory desk only.
- * Type C/AE 180 180 channel 2 preset 20-memory desk and one wing.
- * Type C/AE 200 210 channel 2 preset 20-memory desk and one wing.
- * Type C/AE 240 240 channel 2 preset 20-memory desk and one wing.

Type CRD/R 30 channel type CRD dimmer rack.

- * See page 11 et seq.

STRAND SYSTEM C/AE

(Patent Applied For)

Note: The expression "channel" is used throughout in preference to circuit so that "circuit can be later used for the lantern side of any "patching" or "alternative choice" switching arrangements.

Introduction

Although the results and operational combinations possible can be extremely complex, basically this control is very simple as there are only two dimmer levers (one per preset) per channel and only four master dimmers (two per preset). Except for a special overriding dimmer in theatre models affecting all front-of-house spotlighting there are no group-masters as such. Nor is the switchboard encumbered by separate selector switches to determine whether channels are on their master or independent. There are, however, twenty instantly adjustable combination pushes with which to form groups to suit the particular production. It is these which make it possible to simplify the master dimmers and reduce the number of dimmer presets. This last result is achieved by not squandering a whole series of preset levers on a change affecting only some of the dimmers. This also leads to quicker re-setting of dimmer presets because only those which have to change have to be reset. That the theory behind the use of memory action to select dimmers for change is sound, is shown by its success applied over, in particular, the past ten years to all major Strand theatre and Strand television controls. Hitherto, it has been a handicap that such facilities could only be applied to an electro-mechanical servo-dimmer bank and thus flexibility in respect of speed has been poor. The finding of a substitute ("park") in an all-electric circuit for the inertia of a mechanical bank represents a real breakthrough. Here at last in System C/AE, the first really flexible all-electric control desk is joined to the latest in all-electric dimmers - the silicon controlled rectifier (Trinistor).

In system C/AE all dimmers are variable load and all dimmers can be instantly adjusted by going to the lever displayed as being in control. Furthermore at the dimmer banks considerable reductions in size and weight are possible. This shows to particular advantage where there are a large number of channels over 2kW in size as the Trinistor used throughout can be 5kW capacity.

Desk Layout

In smaller models up to 120 channels there will be a centre desk only. On larger models there will be a centre desk and one or two wings depending on the number of channels. Except for the fact that the centre desk also contains the master controls and is made so that the operator can see over it (when seated) whereas the wings are vertical (to save floor space) the layout is identical on each. There can conveniently be housed four rows of 60 dimmer levers (total 240) on each. In television practice it is often preferred to use the centre desk for master controls only, all individual dimmers being housed as necessary on one or two wings. The centre desk has a table surface for production layouts and scripts. Such an arrangement provides extra space for ancillary services such as talk-back, etc.

Dimmer Levers

These are identical on both presets and are of the individual plug-in from the front type. The units are moulded with translucent scales reading 0 to 10 (full). There are two display pilot lamps in each scale, one at the top and one at the bottom. These pilots are very much under-run to avoid glare and give infinite life. The scale has a slight rocking motion which operates a momentary contact micro-switch, (See Selection Controls below.)

Master Dimmers

There will be master dimmer levers of the standard vertical motion non-luminous type arranged to be operated by the right-hand. These are as follows:-

1. White Preset (White knob and scale)
2. White Park (Black knob and white scale)
3. Green Preset (Green knob and scale)
4. Green Park (Black knob and green scale)

When specified, as for an opera house, motorised variable speed slow motion can be coupled to each of the above. Mounted above and below the above levers will be the following pushes:-

1. Transfer to White Master and White Cancel
2. " to White Park and Park Trip
3. " to Green Master and Green Cancel
4. " to Green Park and Park Trip

Selection Controls

The rocking scales to the dimmer levers are used as selectors provided any one of three couplers is energised, at all other times they remain inert and can therefore be used as a rest for the fingers when making a slow check on an individual lever. The three couplers appear as hand controls and foot pistons. They are:-

1. "Reversers on"
2. "Individual Park"
3. "Individual De-Park"

Normal selection uses the "Reversers on" and under these circumstances touching a dimmer scale will light the bottom lamp in it - the channel is "selected". Another touch and the light goes off - the channel is no longer selected. A selection of a number of channels made this way can be used immediately by operating the appropriate master dimmers or automatically memorised for recall whenever required (see below).

Memory Action

There are twenty memory pushes on each preset on which any group can instantly be formed. A selection is made by hand and then the master Pre-setter toe piston is pressed and the particular memory push on which the combination is to be stored. Both are then released and thereafter that combination remains locked. Only the use of the Presetter and that particular memory push together can change it. Such combinations can be added together or sub-

stituted one for another. The memory pushes have two distinct touches for this purpose, the light one gives 'add' and the heavy deep one 'subtract'. Memory pushes display both in themselves and in the bottom of the dimmer scales and combination used. When memories are added then the display is additive. Combinations once displayed can be modified individually by hand provided the "Reversers on" coupler is used at the time.

The memories can be reset for further combinations if required during a lighting lull or interval in the performance. To ensure no interference with the show when setting up new selections the desk is immobilised by using a control called "SUST". A sustained desk nevertheless leaves the individual dimmer levers active so that individual changes can still take place.

"SUST" is also a useful device when it is desired to check or modify by hand the contents of a memory before use, particularly in the case of a switching cue.

Front of House Dimmers (Theatre Only)

This is a supplementary dimmer lever connected in effect in series with the master preset dimmer levers and which allows the front of house circuits to be delayed in fade-ins and advanced in fade-outs or removed and added to fixed lighting to avoid untidy patches of light on the House Tabs. It is suggested that the float spot circuits should also form part of this master group but not the float itself.

Call Lighting and Dip Testing (Theatre only)

No special arrangements are included as standard but suitable provision can be made after discussion.

Fluorescent, Xenon and Carbon Arc Lighting

No special arrangements are included as standard but suitable provision can be made after discussion.

Blackouts

One per preset is provided. All can be operated as one by hand.

Electricians Panel (Television only)

No special arrangement are included as standard but suitable provision can be made.

Basic Method of Operation

Switching and dimming are combined. Whether the Trinistor acts as a switch or a dimmer merely depends on the speed of control change applied to it. Assuming both preset master dimmers are down and both Park levers are up, channels are selected by hand using the Reverser coupler and dimmer scales or a suitable memory push on the preset required. As selected the appropriate scales become lit from their bottom pilots and channels may set

to their marks individually and faded into them as a group using the white preset master dimmer. Or the preset master dimmer may be put up and the channels brought in and out, one by one, individually using the fingers. Once the preset master dimmer has arrived at the top the aim will usually (but not invariably) be to transfer the group to the park master by touching the transfer push. All dimmer scales affected will change over to their top pilots. This group can then be removed on the park master if required or transferred back as a group or individually to the preset master later on. The object of the parking action is to free the preset master for further group action. Interlocks provide that neither transfer to park or preset master dimmer (except individually using "Individual Park" and "De-Park" couplers) can take place except when the receiving master is full on. In the case of cancel and park trips the masters must be at the bottom end. There is a special control to override the interlocks when switching changes are required.

The state of the Master Preset and Park dimmers is further displayed by dimming pilot lights prominently featured on the centre desk and on each preset wing. Groups and combinations can be different on each preset and thus on a two preset control four different groups can be "in play" so to speak, at one time. Channels can at the same time be under individual adjustment except that of course at no time can an individual be at a high level than represented by the highest master available at the time. In other words, if it so chances that none of the masters is at full, not unnaturally no individual dimmer can be at full.

Presets can be "piled" that is, channels can be common to, and energised by, more than one preset when required. The intensity in such a case will be that of the highest preset at the time, taking into account the balance of master dimmers and individual levers.

Accommodation

The dimmer rack equipment is remarkably compact and occupies the same space as System CRD (set out elsewhere in this book). The control desk assembly itself is exceptionally small and easily accommodated F.O.H. in a theatre or in a production suite, but at that end System C/AE requires some extra space for associated magnetic action and memory action which should be near but need not be in the same room as the control desk itself.

Economic Sizes

The standard equipment is based on a 30 channel 5kW SCR racks and the control desk on a 2 preset 20 memory control desk. Schemes should be devised with these sizes in mind. A 10kW channel consists of two 5kWs in parallel and in consequence the number of control channels is reduced by one for each such channel installed.

Preset Patching

The system of the preset patching allows the use of alternative circuits either between scenes or between productions at the touch of a single selector switch and thereby waste of dimmers can be reduced. The system is in

operation at the Adelphi and Old Vic theatres London. It is assumed in a theatre that preset patching would apply to certain Fly and Bridge points and to the compartment battens. Where, as for example in an Opera house, there are four-colour compartment flood battens and a four-colour footlight, the preset patching could provide 3 circuits to each of the 4 colour dimmers. The circuits each being Left, Centre and Right all of which could be preset to be brought in at any one time. Wastage of dimmer channels would be avoided thereby. There would be ten such presets operated from the main control desk.



FIG. 1. System CRD self-contained rack with covers removed showing circuit breakers in foreground followed by 15 dimmer channels and clean-up unit at the far end. (A further 15 channels are housed at the rear).

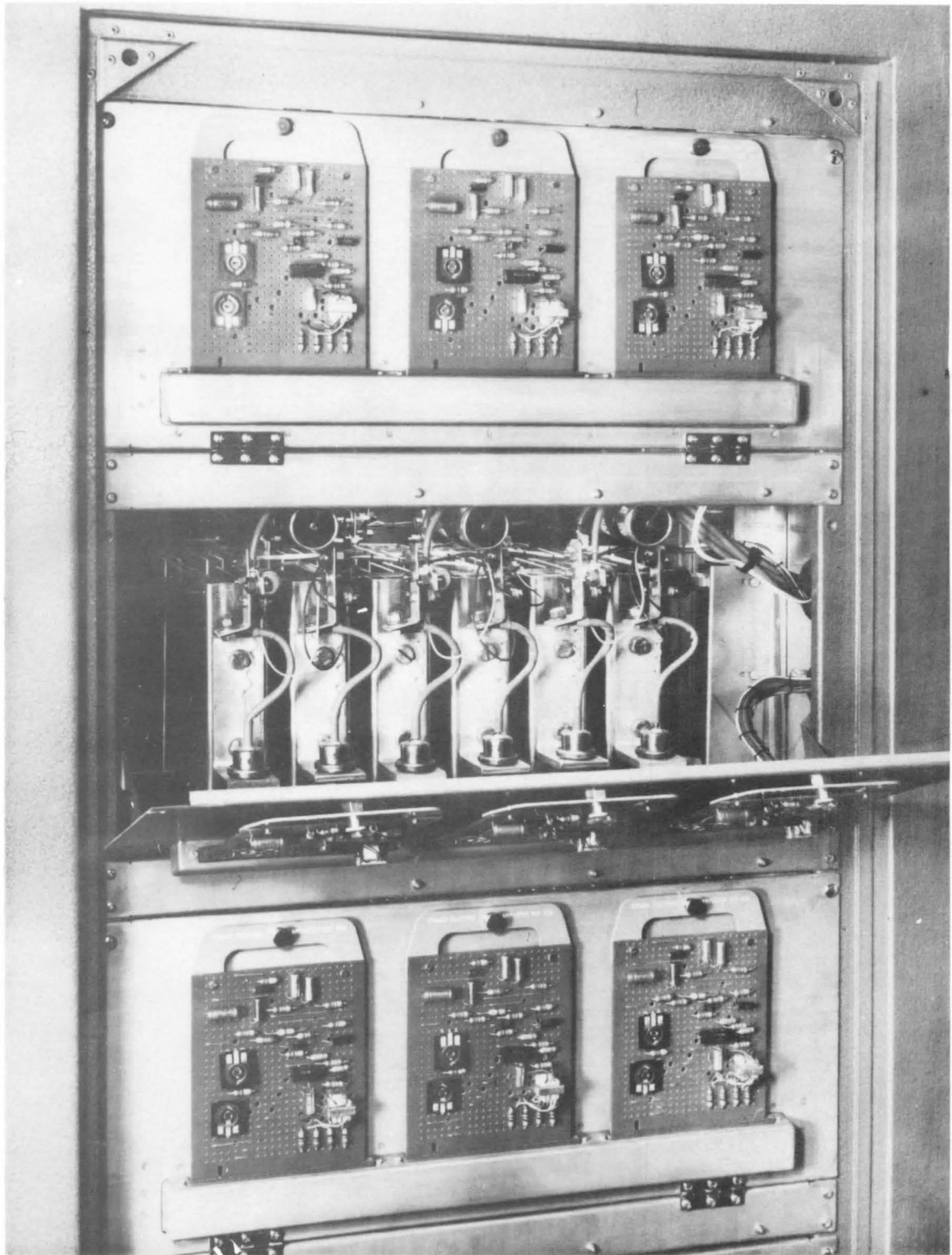


FIG. 2. System CRD showing nine dimmers in close-up. Three channel amplifiers are hinged down to show the pairs of silicon controlled rectifiers behind.



FIG. 3. System CRD showing waveform generator and power pack withdrawn for inspection.

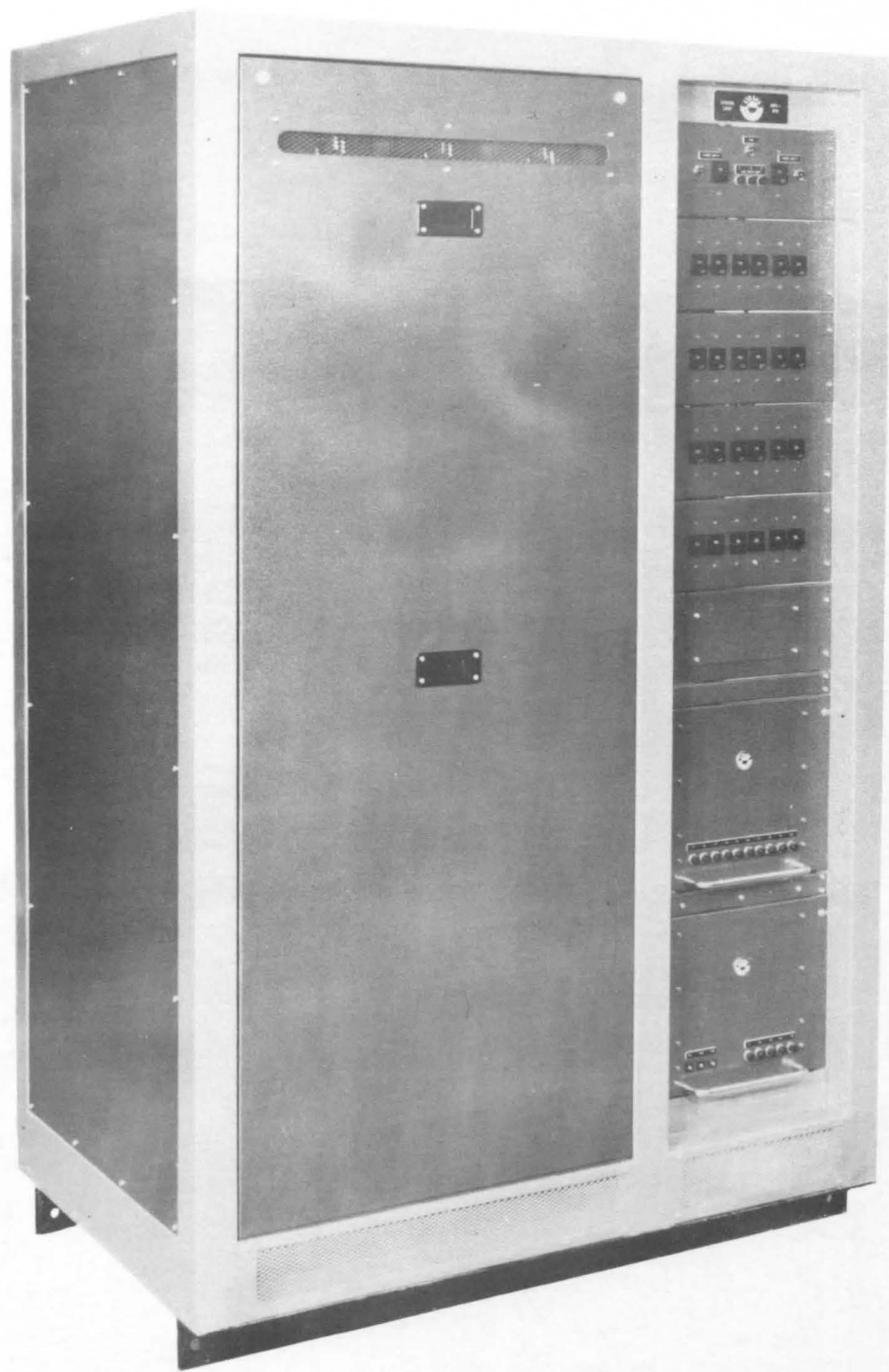


FIG. 4. Half rack with covers fitted. Note racks are split into these halves for ease in transport and to assist installation in existing buildings.

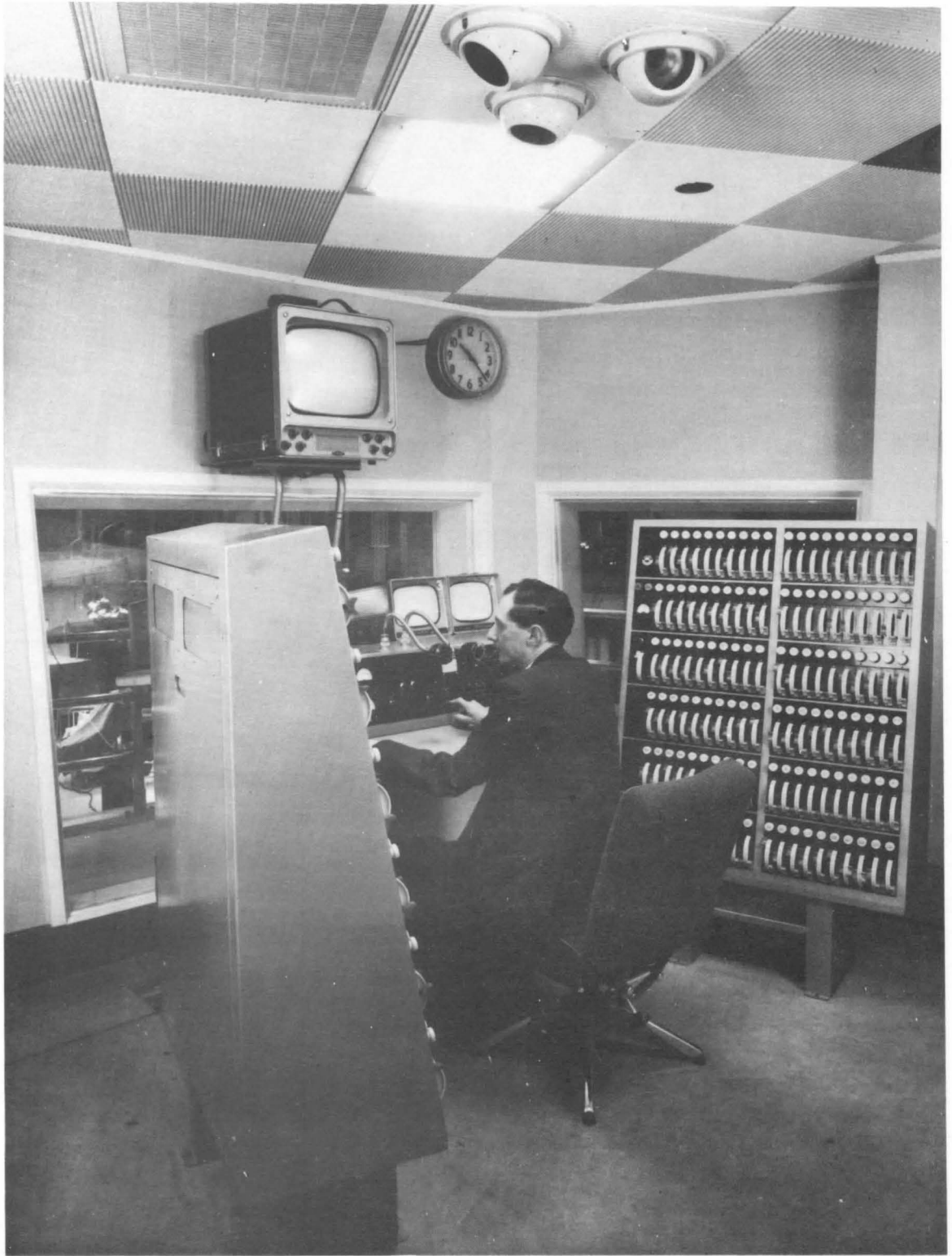


FIG. 5. Strand 240 channel control assembly showing relationship of wings to centre table and the accessibility of controls to operator seated in centre.

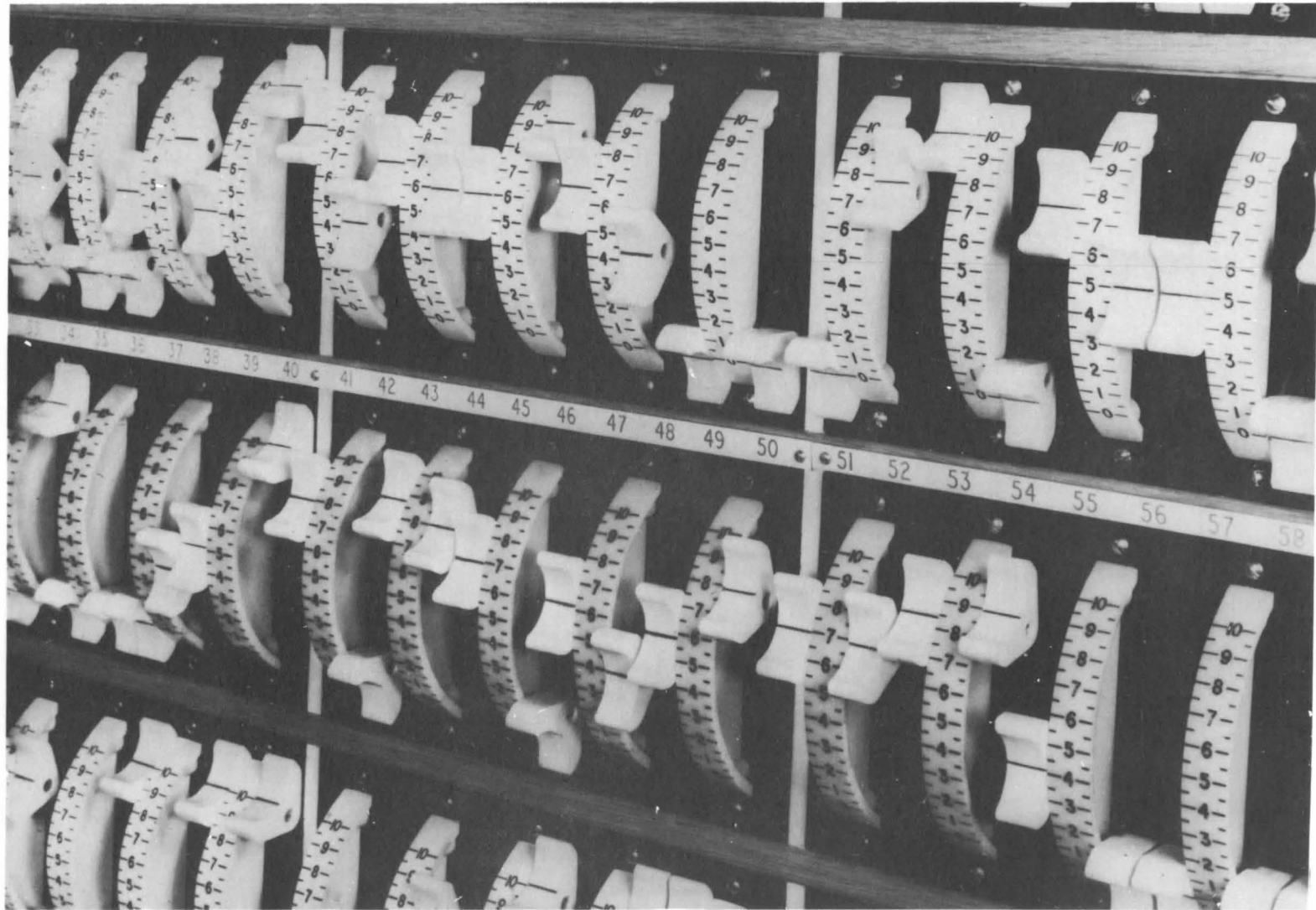


FIG. 6. Strand twin dimmer units showing method of sharing fixed scale quadrant to reduce centres without prejudicing rapid and accurate finger operation. Scales are $3\frac{1}{2}$ " long and the horizontal centres between pairs of levers is $1\frac{1}{2}$ ". Note rapid identification boundary lines (white verticals) for centre tens group.

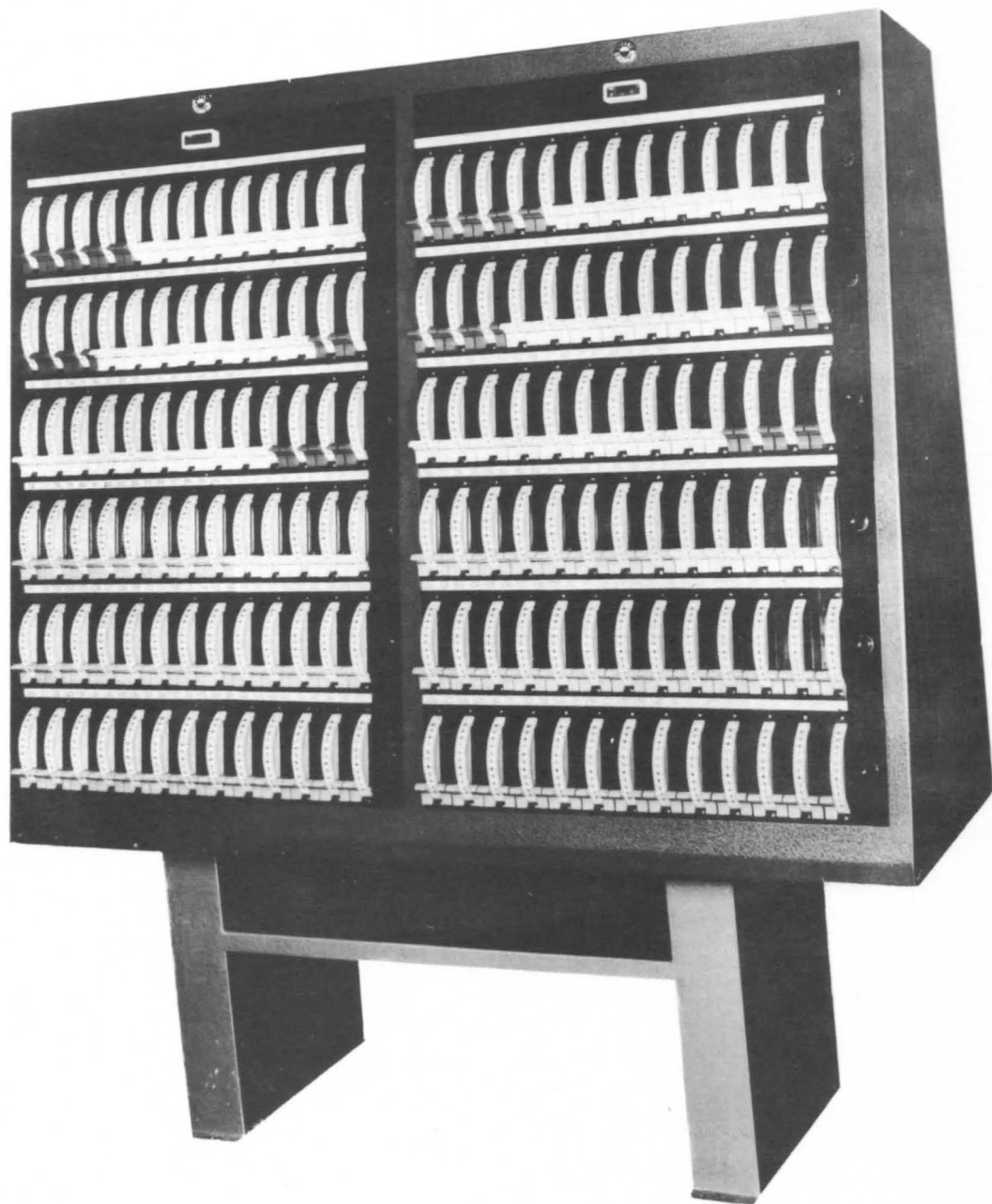


Fig. 7 150 channel two preset wing at the Adelphi Theatre, London.

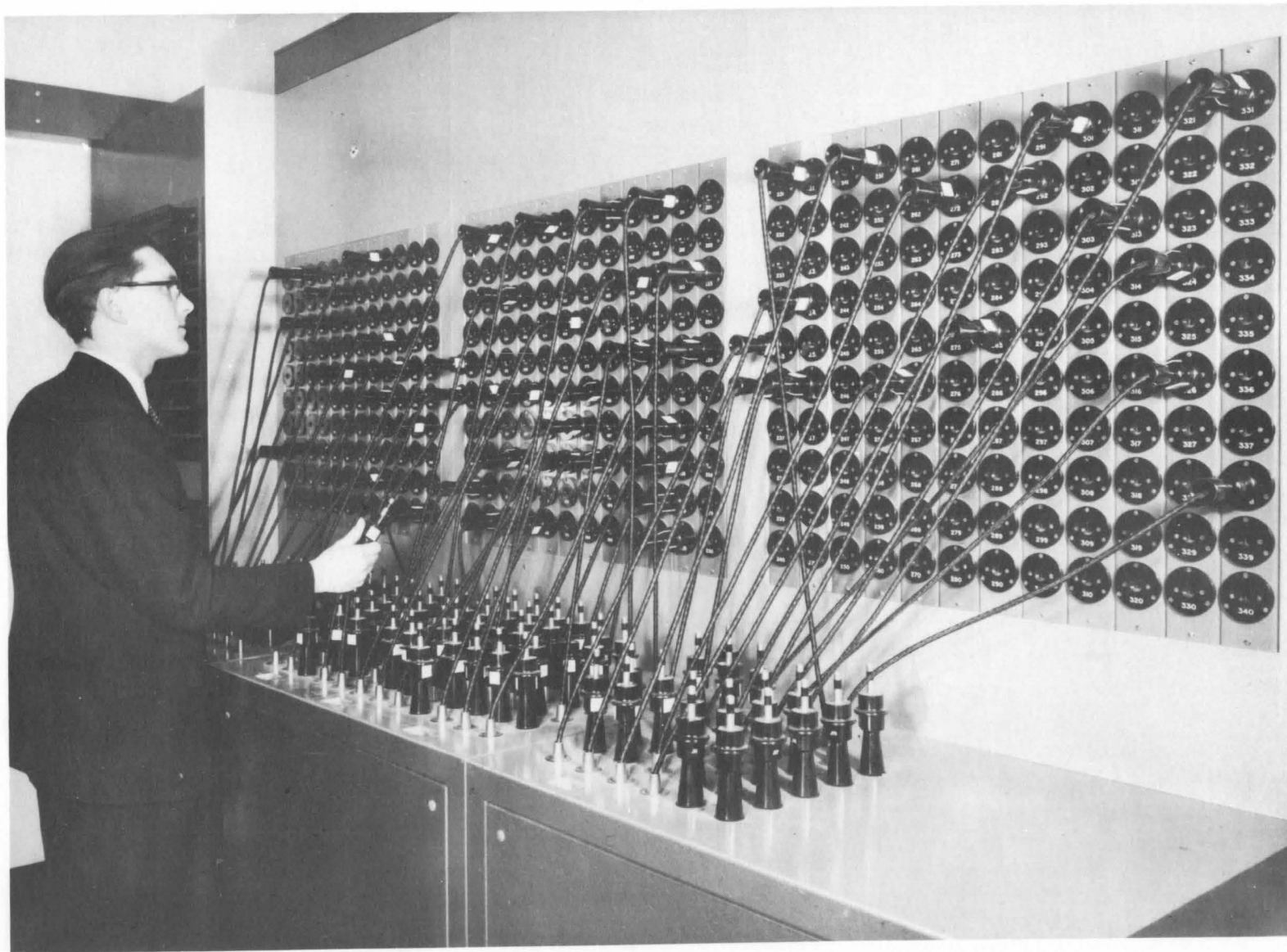


FIG. 8. Close-up of standard Strand JK Patch panel used in television studios.

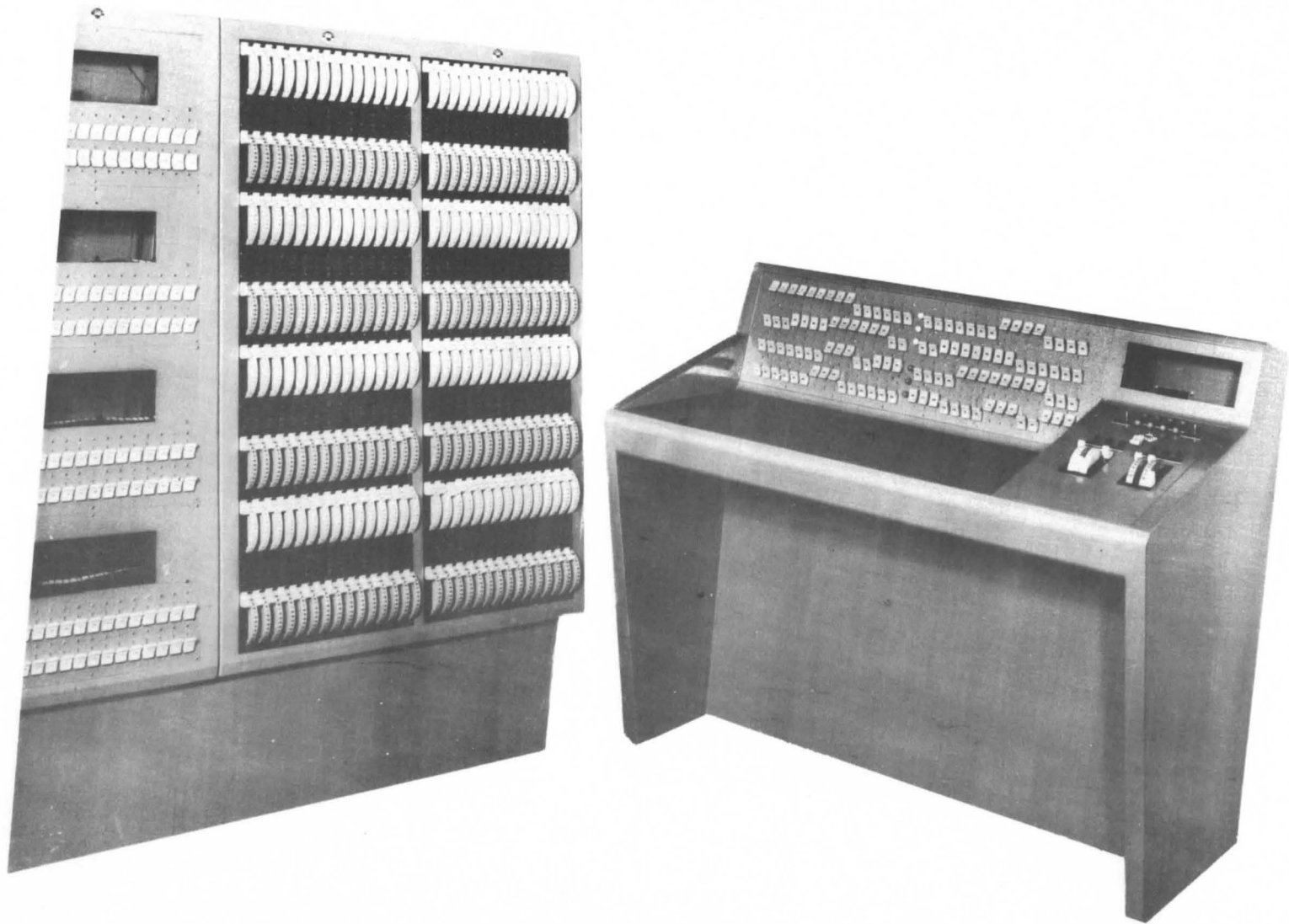


Fig. 9 120 channel System CRD desk and wing for N.T.S. Holland. Extra switches at the left hand end of the wing and pilot lights over each dimmer are for remote circuit patching system. Spaces are for special instruments to be fitted on site.

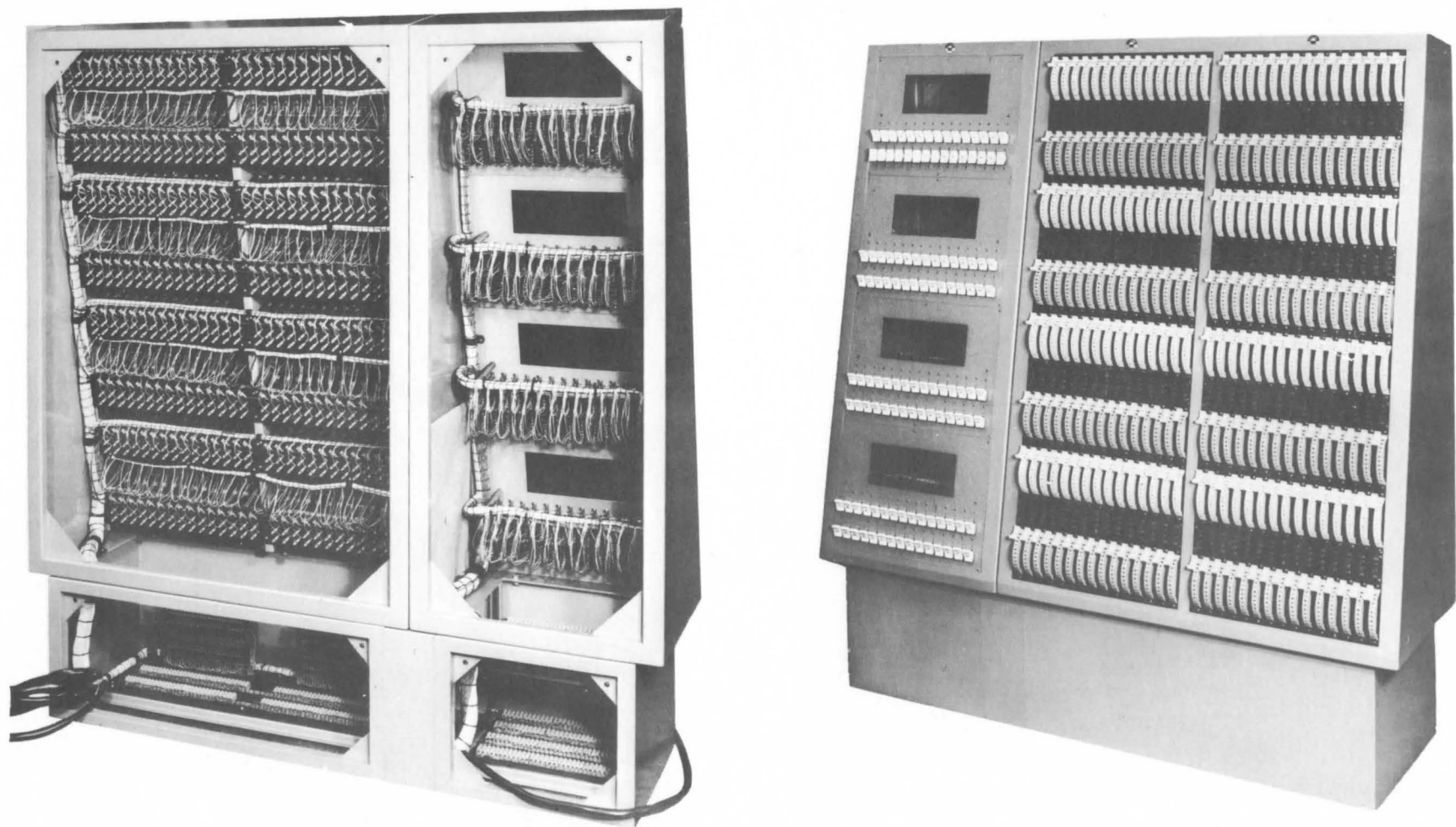
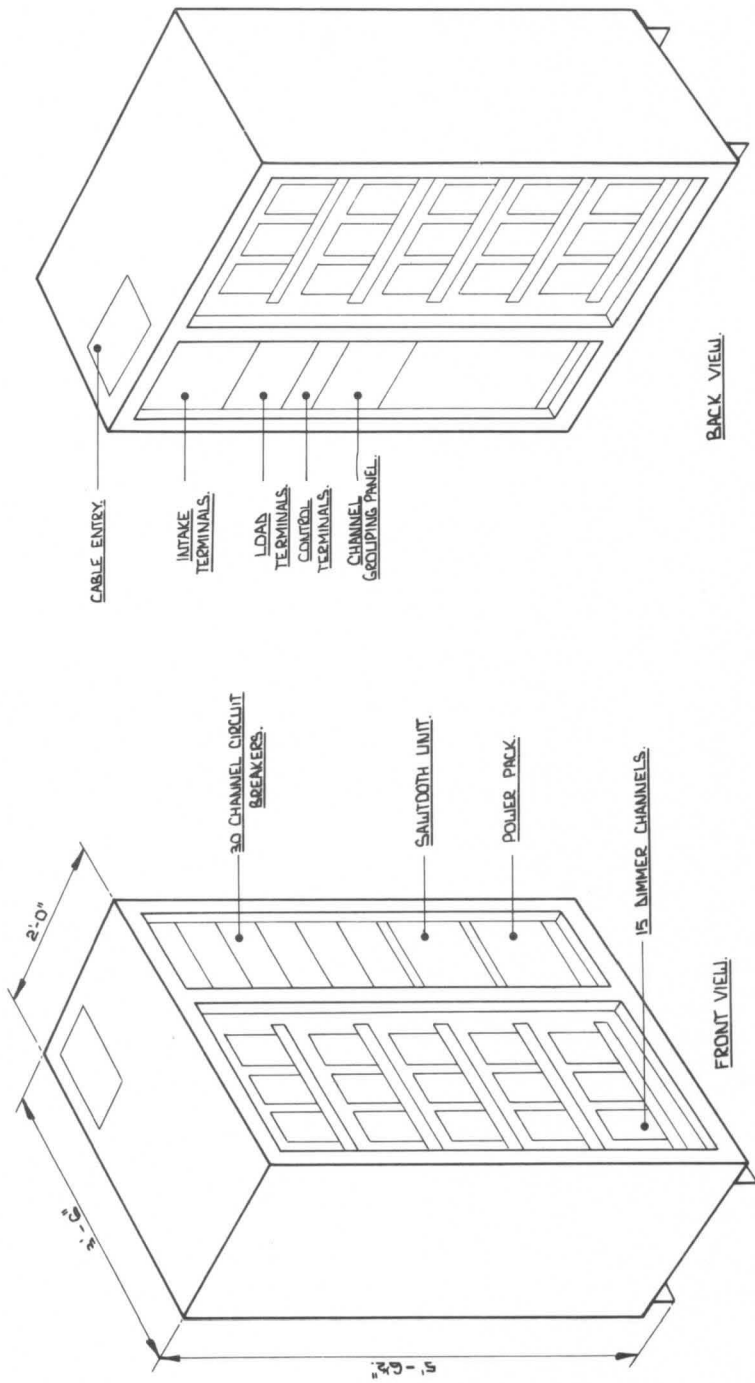


Fig. 10 Front view and back view with covers removed to show CRD wing unit for N.T.S. Holland.

(A)



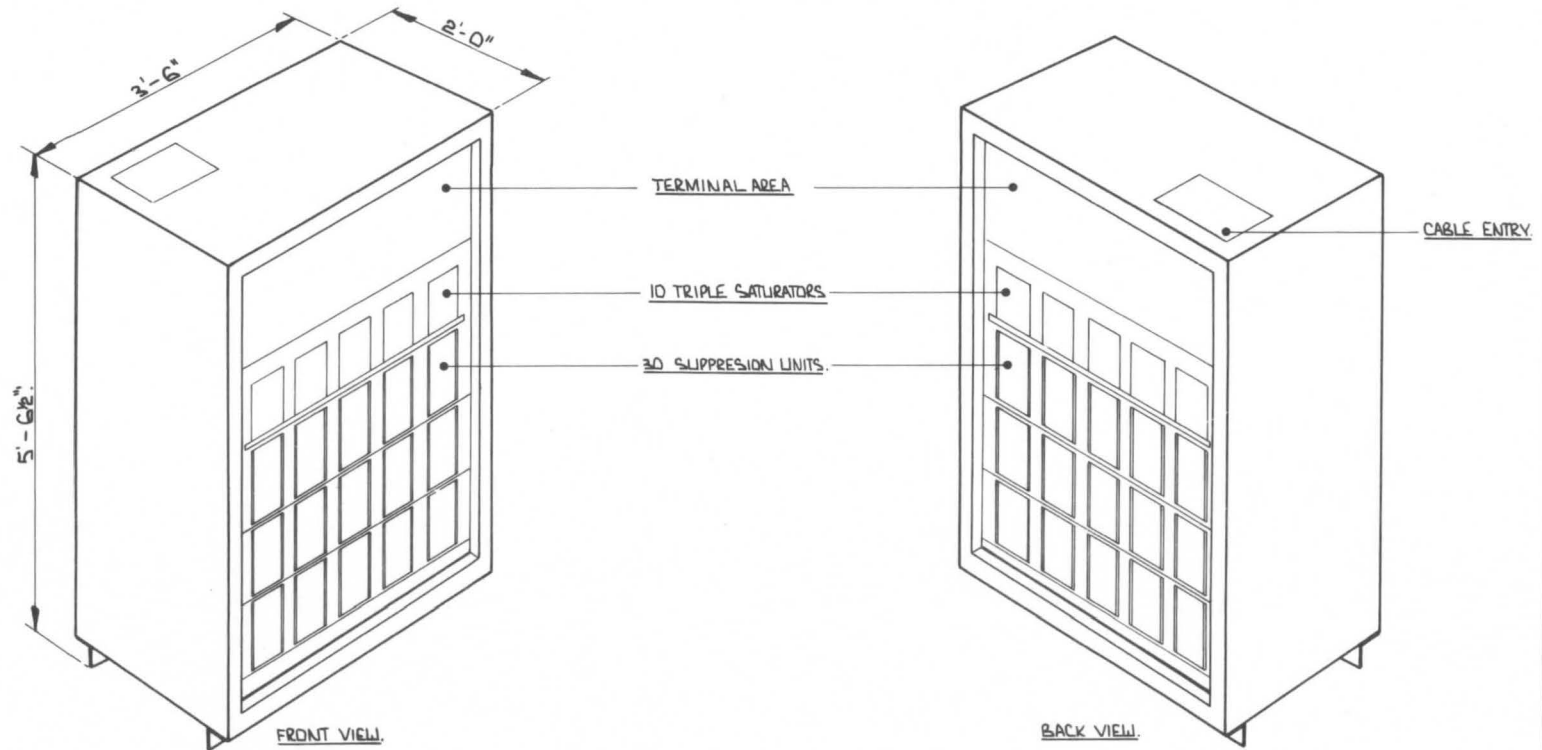
SCHEMATIC SYSTEM CRD WITH COVERS REMOVED.

THE STRAND ELECTRIC & ENGINEERING CO LTD

KING STREET, COVENT GARDEN,

LONDON, W.C.2.

(B)



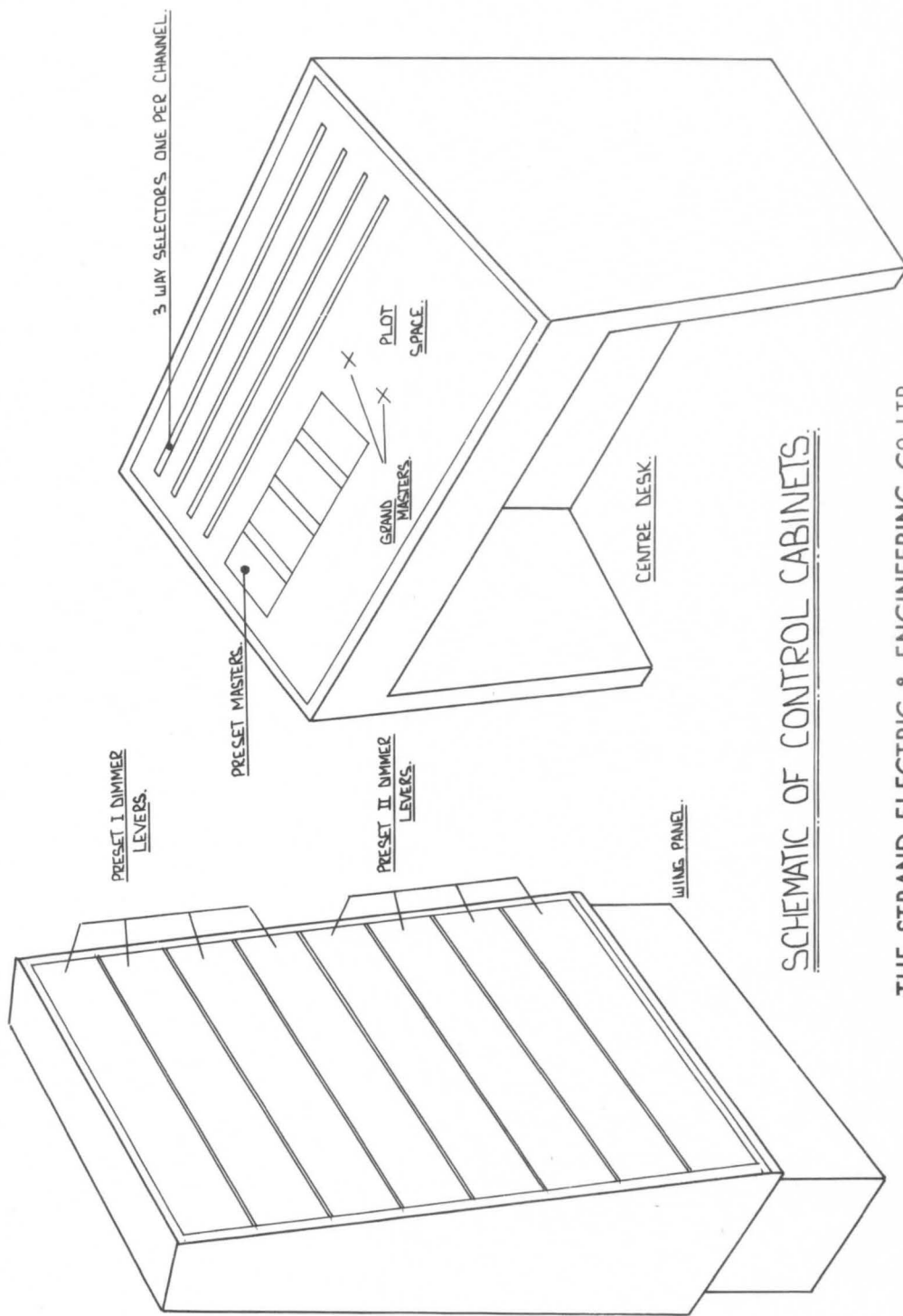
SYSTEM CRD CLEAN UP RACK, COVERS REMOVED.

THE STRAND ELECTRIC & ENGINEERING CO LTD

KING STREET, COVENT GARDEN,

LONDON, W.C.2.

(C)

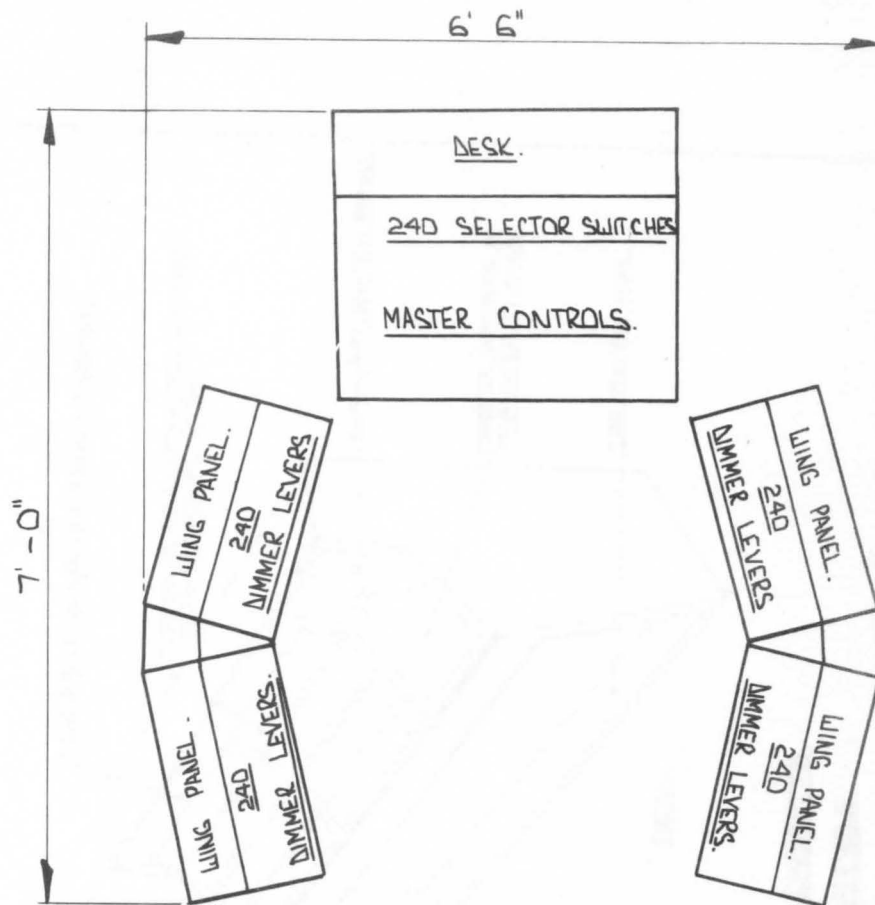


SCHEMATIC OF CONTROL CABINETS.

THE STRAND ELECTRIC & ENGINEERING CO LTD

KING STREET, COVENT GARDEN,

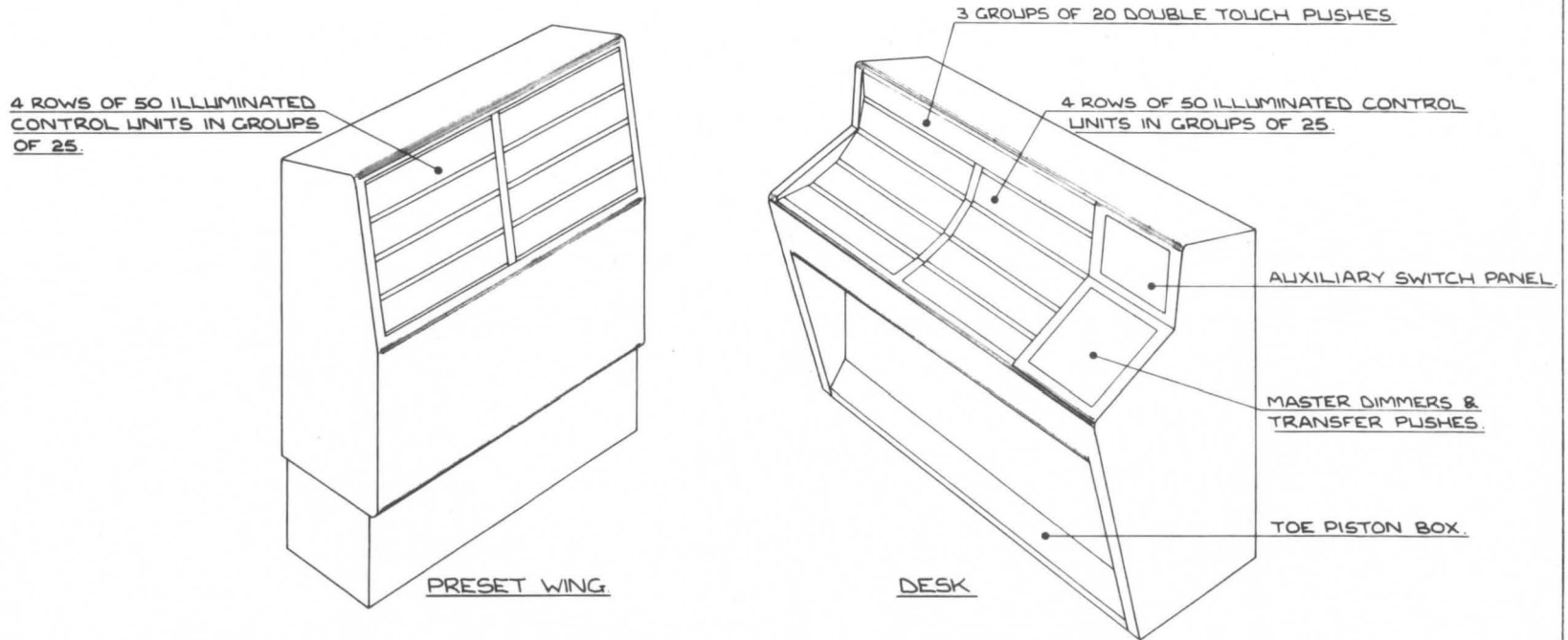
LONDON, W.C.2.



FLOOR PLAN OF CONTROL POSITION.
240 CHANNELS. 4 PRESETS.

THE STRAND ELECTRIC & ENGINEERING CO LTD
 KING STREET, COVENT GARDEN.
 LONDON, W.C.2.

(E)

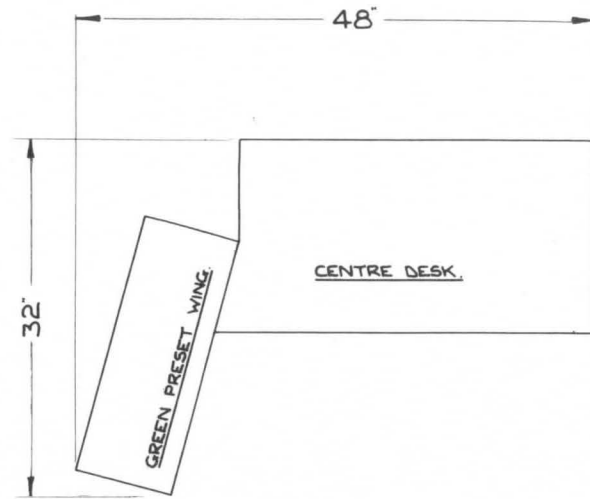
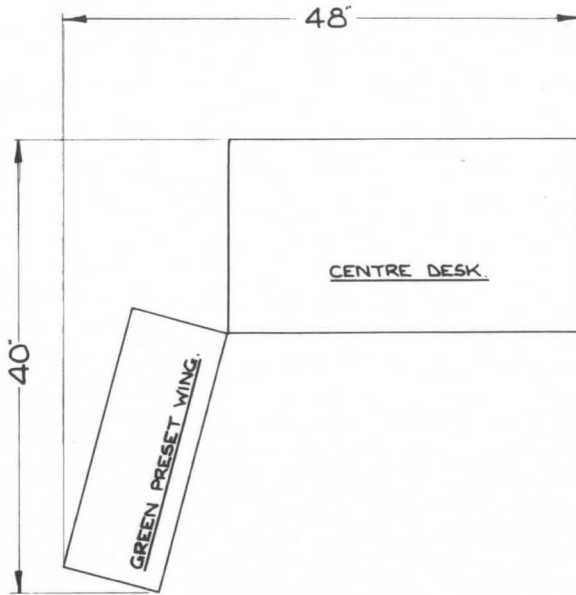


SCHEMATIC OF CONTROL CABINETS.

SYSTEM C/AE. 200 CHANNELS.

THE STRAND ELECTRIC & ENGINEERING CO^Y LTD
KING STREET, COVENT GARDEN,
LONDON, W.C.2.

(F)



ALTERNATIVE FLOOR PLANS.
SYSTEM C/AE. 200 CHANNELS.

THE STRAND ELECTRIC & ENGINEERING CO LTD
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