

Thorn Q-file

Lighting Control Equipment



Why Q-file?

The title Q-FILE aptly describes an extremely versatile stage and studio lighting control system in which "cues" (i.e. lighting changes) are "filed" (i.e. memorised) during rehearsal. These cues may then be repeated during a production with supreme ease and accuracy.

Through this use of modern electronic technology the whole process of planning and using theatrical lighting becomes an "armchair" exercise. Even the most ambitious lighting changes can be initiated by the operation of no more than two push buttons.

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Highlights of Q-file

- 100 separate memories can be used individually or in any combination.
- Memories include full range of brightness levels.
- Memory recall as Instant Action or Automatic Fade/Crossfade.
- Independent simultaneous control of Fade-Up and Fade-Down at different speeds.
- Memories can be added or subtracted with instant effect during a Fade or Crossfade.
- Instant manual over-ride of all circuits at all times.
- Facility for "Blind" Plotting or modifying memories without affecting lighting in use.
- Ability to control up to 390 lighting circuits with individual power ratings of up to 10 kilowatts.
- Mimic diagram shows circuits in use at all times.



*A Thorn Q-File Electronic
Lighting Control Console,
complete with circuit mimic.*



Q-File lighting control system in the Southampton studios of Southern Independent Television.

Advantages of Q-file

Q-FILE is the most sophisticated equipment of its type in the world and the most convenient and simple to operate.

Convenient?

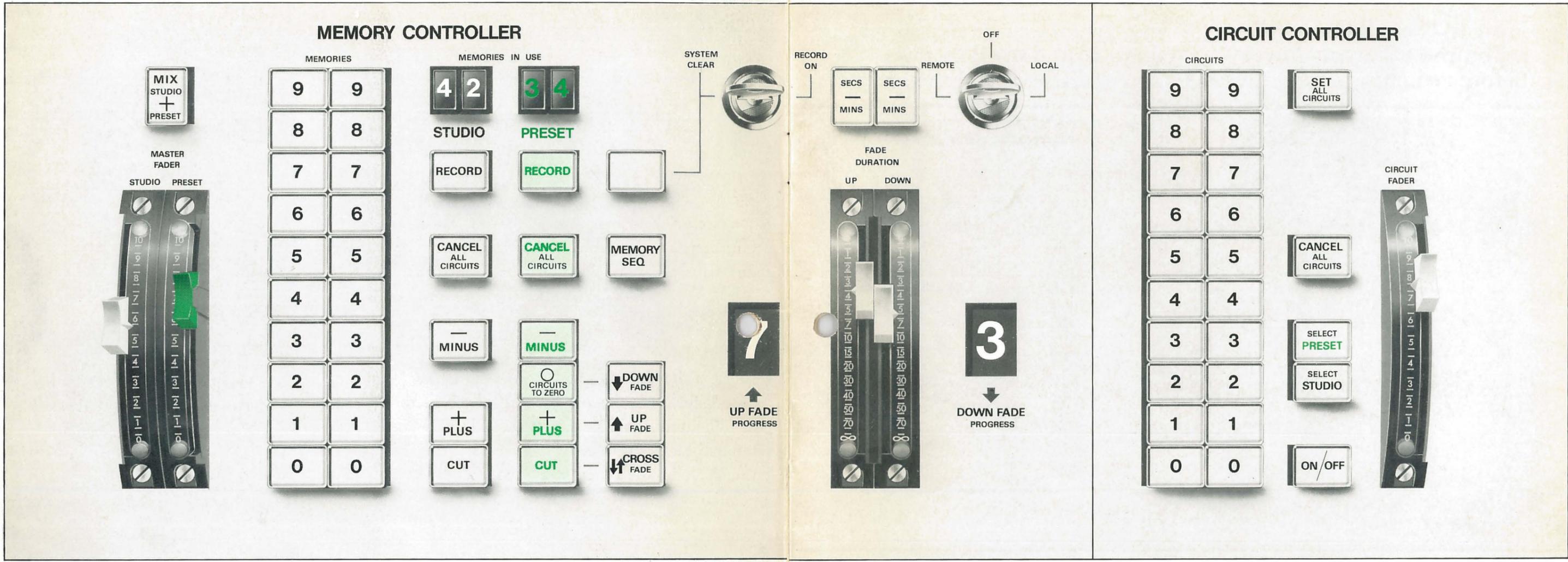
What other system offers full control of up to 390 circuits from a panel *only 2 square feet* in area? One seated operator has every control at his fingertips, and foot operations are eliminated.

Simple to Operate?

Simplicity and speed must be related, so consider the following evidence:

1. At the beginning of a lighting rehearsal, any or *all* lighting circuits can be switched On in groups of tens or hundreds in *about 3 seconds*. This time includes the selection of any required common starting level of intensity.
2. Any individual circuit can be selected and adjusted in *about 2 seconds* at all times. The need to match the fader to an existing memorised circuit level is eliminated by an automatic servo action.
3. The *complete* lighting situation at any time can be recorded in any selected memory in *less than 2 seconds*.
4. A succession of memorised lighting changes can be recalled at a speed in excess of *one change per second*. Also, except in rare instances, any lighting change can be initiated by pressing one push button. The timing of changes is therefore reduced to the ultimate simplicity of a *single operator action* "on cue".

The Q-file Console Panel



Two-thirds full size.

The most noticeable feature of the Q-File control console is the absence of the usual banks and rows of circuit faders. This unnecessary and space-consuming arrangement has been superseded by a single servo controlled fader associated with a compact group of circuit selection push buttons, and although this involves some departure from traditional operating procedure, experience has shown that this new technique is easily learned and accepted with enthusiasm.

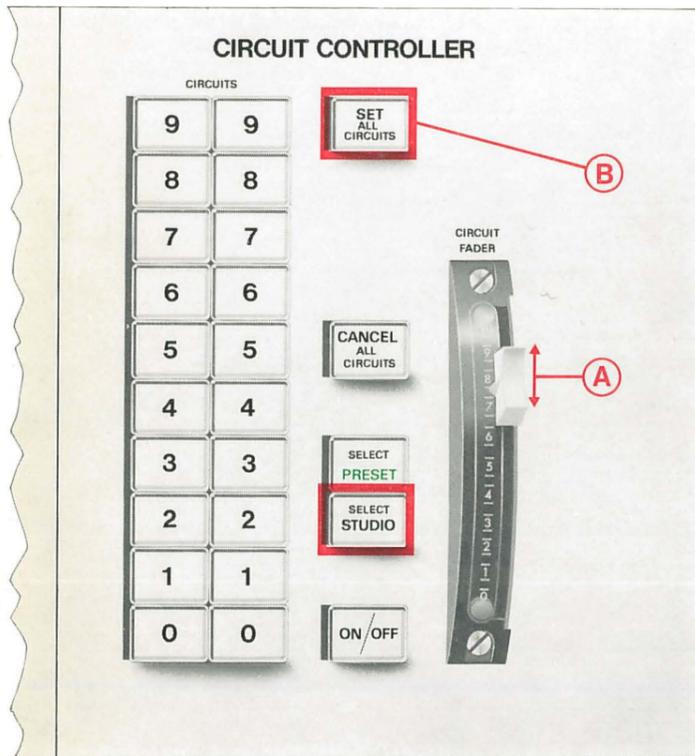
On examining the panel, it will be noticed that certain controls are grouped under the headings "Studio" and "Preset". These terms identify two computer type storage elements, in each of which electronic data representing individual lighting circuits can be assembled to represent a complete lighting scene.

The data in the Studio store determines the existing lighting while that in the Preset store can represent a follow-up lighting situation in

much the same way as the second preset in a conventional two scene preset manual system. However, in the Q-File equivalents, these two presets are coupled to a memory bank which enables one hundred different lighting scenes to be recorded from, and subsequently recalled to, either preset. The overall concept is therefore comparable to a manual system having 100 presets plus numerous added advantages due to the speed and flexibility of the electronic processes involved.

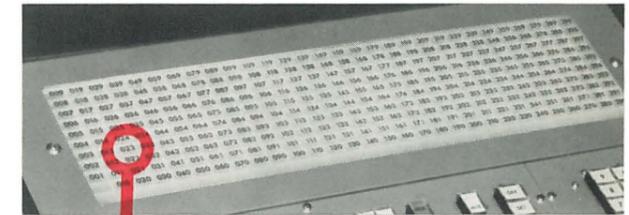
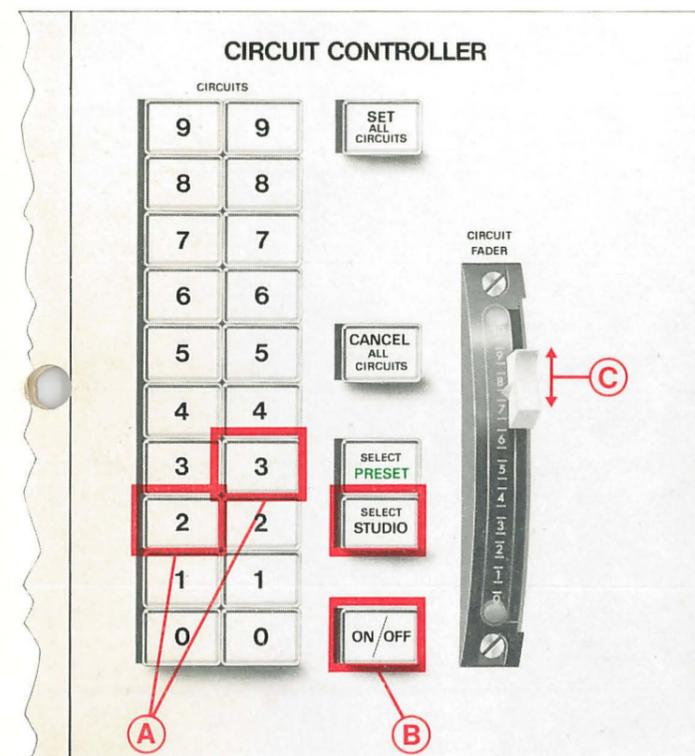
Lighting a scene by use of the Circuit Controller

1 How to "Set all Circuits" to a Common Starting Level before switching on.



Firstly depress the "SELECT STUDIO" button to obtain direct control of the lights.

2 How to Switch on Circuits and adjust their Individual Levels.



Mimic Diagram shows Circuits in use at all times

A Move the CIRCUIT FADER to the required common brightness level.

B Press the button marked SET ALL CIRCUIITS

A Press the appropriate CIRCUIT buttons. For example, to select circuit number 23, press "2" in the left hand column and "3" in the right hand column.

B Switch on the circuit at the common starting level by pressing the ON/OFF button. (Note that repeated operation of this button will switch the circuit On and Off alternatively.)

C Readjust the CIRCUIT FADER to produce the required brightness level for this particular circuit.

Note

The CIRCUIT FADER has the ability to move automatically to the existing level for any selected circuit. Thus, if the SET ALL CIRCUIITS facility has been used, the fader will return automatically to the common level whenever a new circuit is selected for switching On and individual adjustment.

Repeat this process of selecting, switching On and adjusting circuits until the required overall lighting effect is achieved. It should be noted that any number of separate circuits can be selected at the same time and controlled as a group.

Note

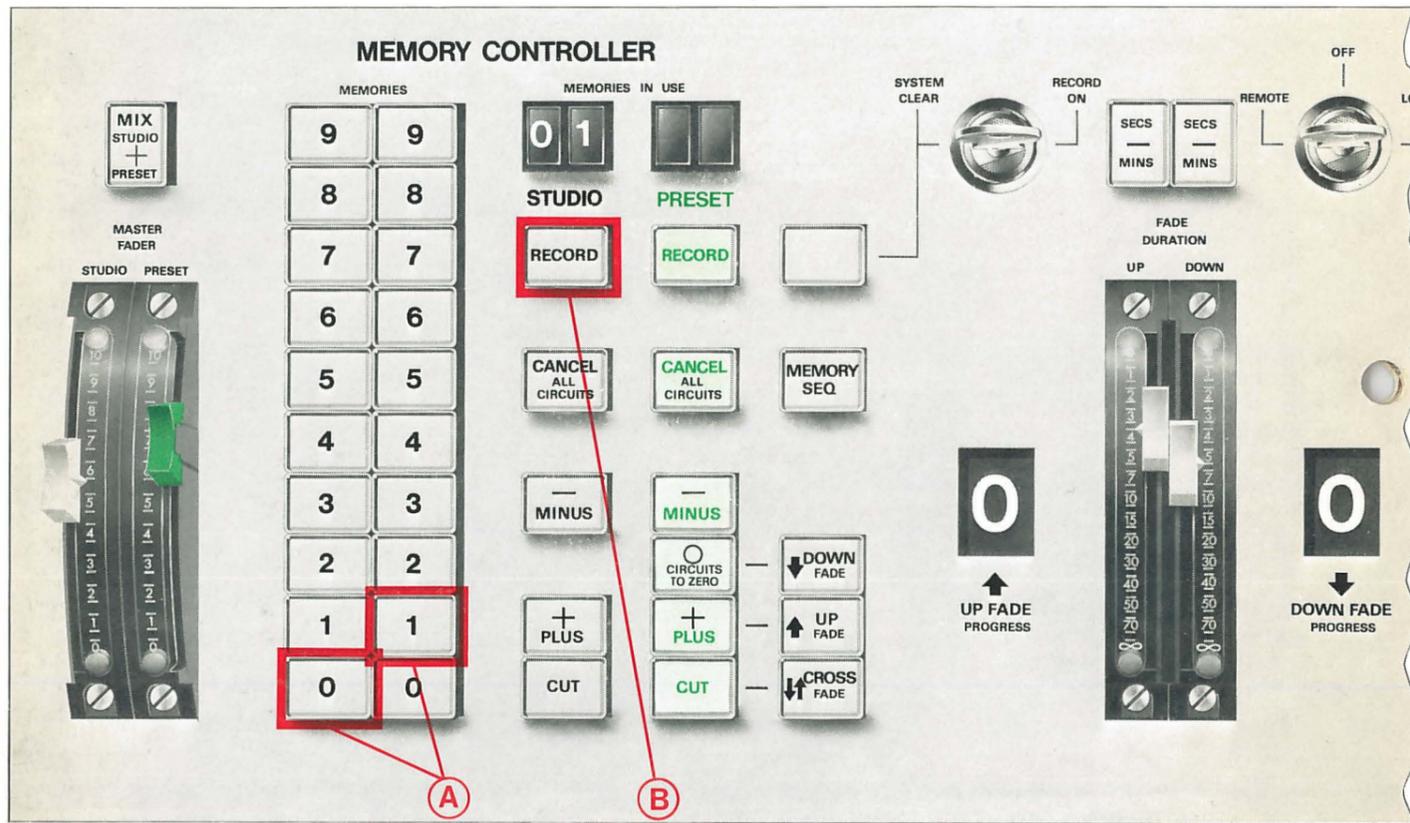
This action provides the computer with its first instruction and individual circuits may now be switched On at the common level.

Note:

The computer has now been instructed to switch On particular circuits and to set their levels in accordance with action (c). These two instructions will be separately remembered for each circuit until such time as a deliberate change is made. Thus, a subsequent switch Off action will not "lose" the chosen level.

Memorising and recalling a lighting scene by use of the Memory Controller

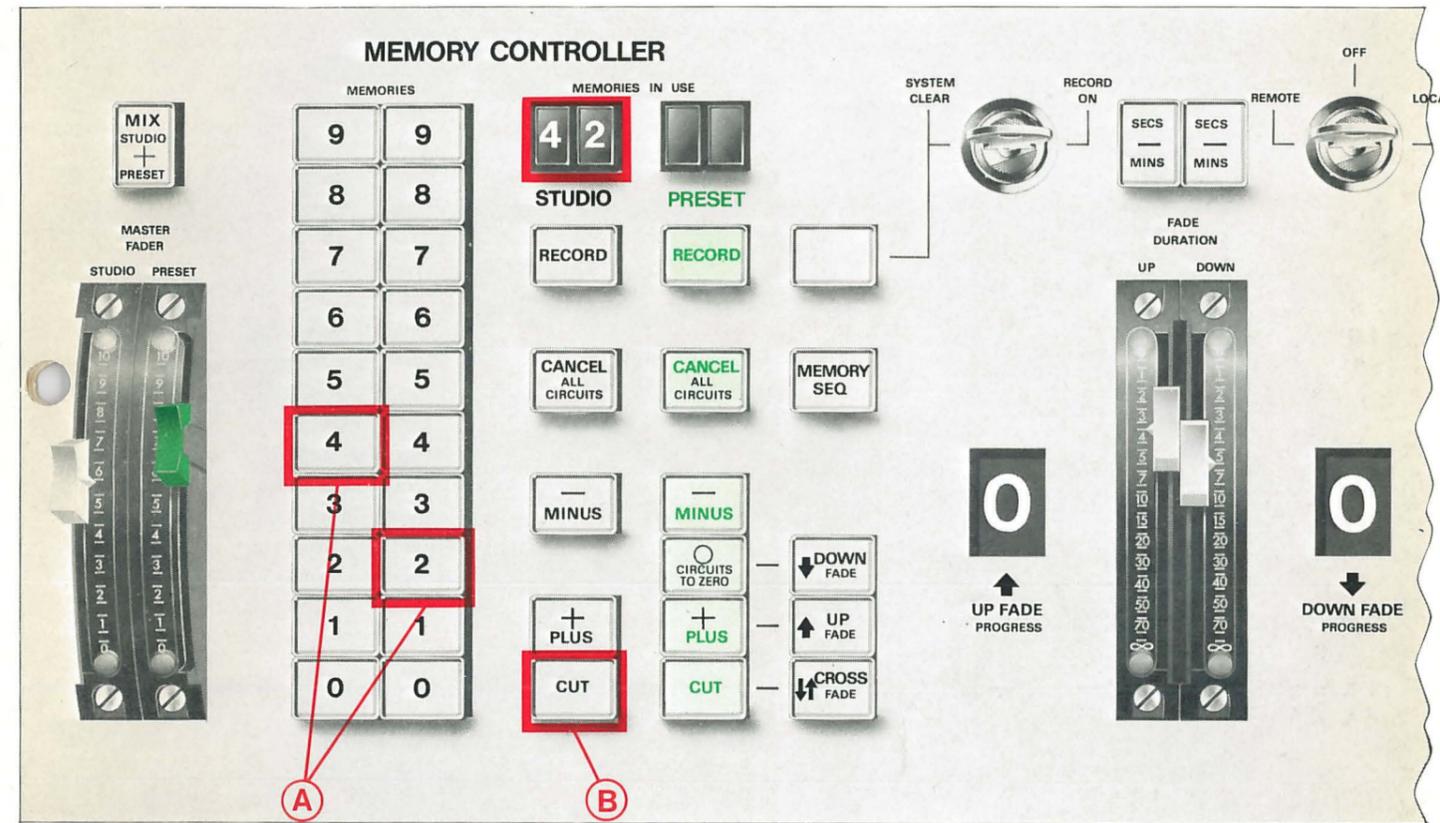
1 How to Memorise the First Lighting scene.



A Choose any convenient memory number and press the appropriate buttons in the group labelled MEMORIES: Memory number 1 is a logical starting point and is selected by pressing "0" in the left hand column and "1" in the right hand column.

B Press the STUDIO RECORD button. The selected memory will now contain a complete record of the present lighting.

2 How to Recall a Lighting Scene as a Switch Action (i.e. "Snap" cue).



A Select the Memory number required (e.g. 42).

B Press the CUT button to recall the Lighting Scene recorded in memory 42.

By repeating this process, all the rehearsed lighting changes can be recalled scene by scene.

Note

As in the case of a tape recording, the memory is permanent and will remain unchanged until deliberately erased or replaced with new instructions. It is therefore unaffected by switching Off the equipment when the studio is not in use.

With the Scene 1 lighting in Memory No. 1, let us now consider the next lighting change. This may simply involve a few different lights or brightness levels, in which case the Scene 1 lighting is retained but modified where necessary by use of the circuit

controller as before. The result is then memorised by selecting, say, Memory No. 2 and again pressing the STUDIO RECORD button.

Alternatively, the Scene 1 lighting may be extinguished by pressing the CANCEL ALL CIRCUITS button, and the original process repeated for Scene 2.

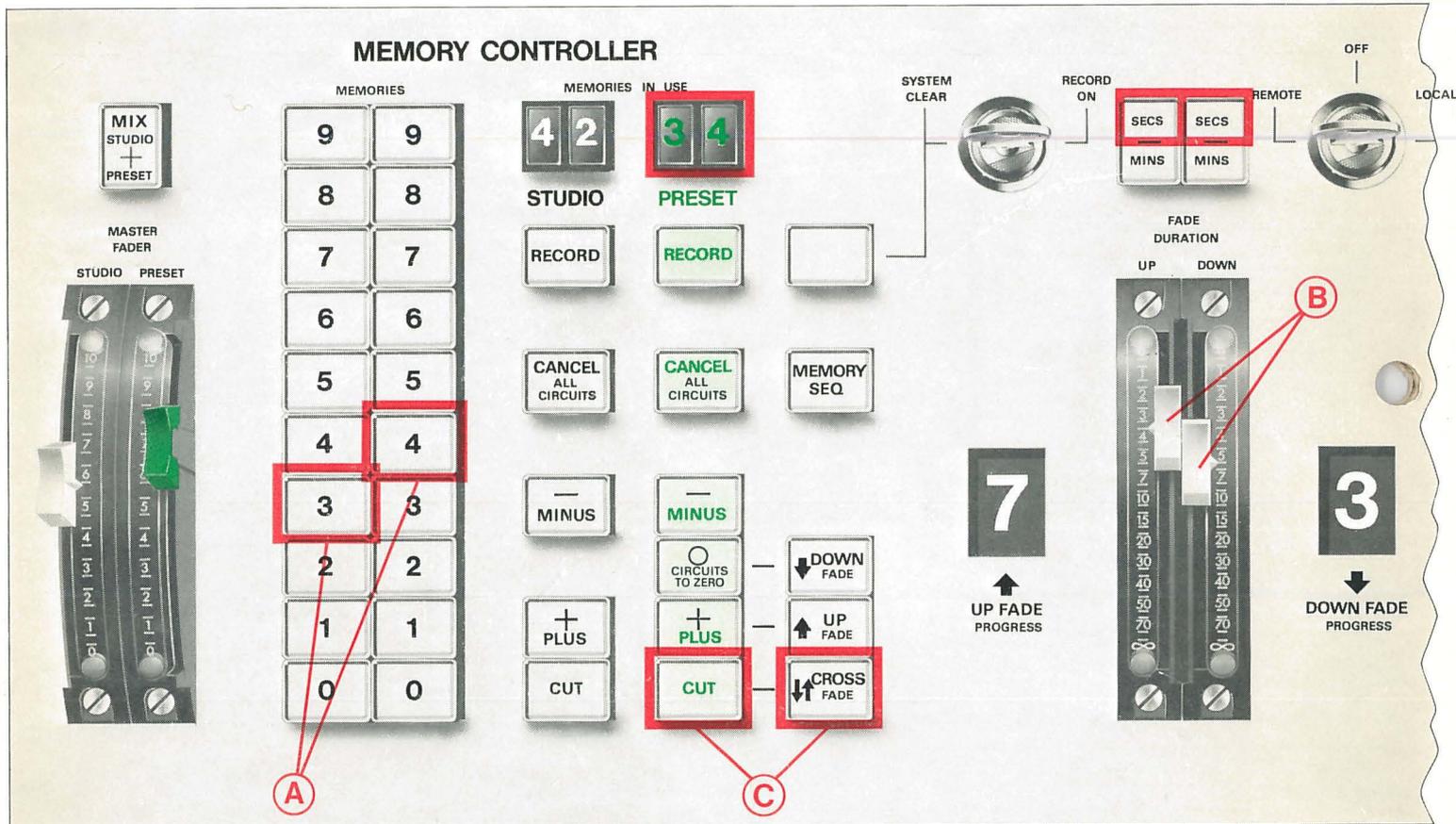
In this way, every lighting change for an entire show can be placed on record as a series of up to one hundred different memories.

Note: Adding and subtracting Memories

Use of the CUT button replaces all the previous lighting with that represented by the new memory. It is, however, possible to retain the existing lighting but to add to this the additional circuits represented in a new memory. This is achieved by selecting the memory to be added and then pressing the STUDIO PLUS button. Any number of memories may be added in this way and subsequently subtracted by corresponding use of the STUDIO MINUS button.

3

How to Recall a Lighting Scene as a Fade Action (i.e. a crossfade).



A Select the Memory number (e.g. 34).

B Set the FADE DURATION controls to the required times. Note that the time for fade UP and fade DOWN can be independently controlled and if necessary readjusted while the fade is taking place.

C Press the PRESET CUT button and the CROSSFADE button in that order or simultaneously. (These two buttons are mounted side by side for convenient simultaneous operation.)

Note: Independent Fade-Up and Fade-Down

When the CROSSFADE button is used, these two actions take place simultaneously. However, separate UP FADE and DOWN FADE buttons enable any groups of circuits to be added or removed from the existing lighting as an appropriate fade action.

A memory representing a new group of circuits is selected and added to the existing lighting by pressing the PRESET PLUS and UP FADE buttons simultaneously. Use of the CIRCUITS TO ZERO button and the DOWN FADE button will fade out the circuits represented in the new memory.

Interrupted Fades

It should be noted that either or both the UP and DOWN stages of a fade can be interrupted by a second operation of the appropriate starting button. A third operation of this button will restart the fade at the interrupted level. A similar action results from moving the fade duration levers to their infinity positions.

Other Q-file standard facilities

Blind Plotting

In normal operation, the lighting in use is determined directly by the STUDIO state of board but only indirectly by the PRESET state. In consequence, a complete lighting situation including brightness levels can be pre-programmed in PRESET without disturbing the STUDIO lighting in use at that time. While this action is of course "blind", the mimic diagram indicates the selected circuits in PRESET, and the operator is able to plan ahead while a rehearsal is actually in progress. The lighting prepared in PRESET can be memorised and subsequently recalled in STUDIO for actual use and modification where appropriate. In the same way, any existing memories can be recalled in PRESET and, if necessary, corrected and re-memorised.

Mix STUDIO/PRESET Facility and Master Faders

As explained above, the PRESET state does not normally have any direct influence on the lighting in use. However, if the MIX button is depressed, direct PRESET control becomes available simultaneously with that from STUDIO. In these circumstances, the lighting represented by two separate memories can be combined under the control of the STUDIO and PRESET master faders respectively. A simple manual crossfade is possible by this means.

Automatic Memory Sequencing

Before recalling a memory it is normally necessary to press the appropriate memory selector buttons. However, provided that memories are to be recalled in numerical sequence, it is possible for the selection of the following memory to take place automatically whenever a memory is brought into use by a CUT, PLUS, MINUS or ZERO action.

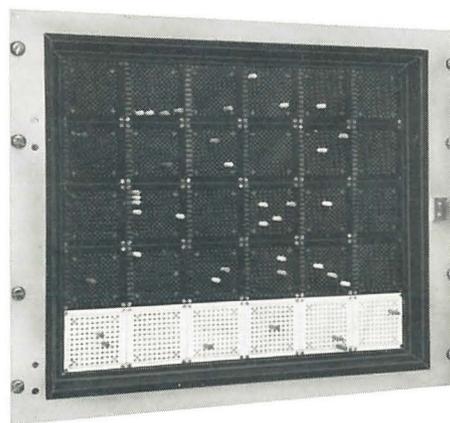
Automatic sequencing is initiated by depressing the MEMORY SEQ button.

Auxiliary Fader Unit

This compact unit mounts ten manually operated faders, each of which, by means of a miniature patch panel, can be given control of any lighting circuit or combination of circuits. The association of circuits and faders is simply a matter of inserting small plugs into the appropriate holes in a plug matrix. These auxiliary faders can be given control of any lighting circuits which for some special reason are best manipulated by direct manual means, e.g. follow spots, orchestra lights, etc. Also, should a failure ever occur in the electronic control system, a previously established emergency lighting plot can be immediately brought into use by means of a single fader.



Auxiliary fader unit.



Plug matrix unit.

Optional extra facilities

Auto-Add

This useful facility provides an easy means of changing the levels of any circuits which may be incorrectly represented in any number of existing memories. The corrected levels are recorded in Memory No. 99 and with Auto-Add in operation, these Memory 99 levels will take charge whenever any other memory representing these circuits is recalled for use. This automatic over-ride avoids the need to correct individual memories, and saves time where a large number of these are involved.

Remote Control Unit

This compact and portable unit enables lighting scenes to be set up, memorised and recalled from any convenient position on a studio floor or in a theatre auditorium. Crossfading and memory combining facilities are not provided, but in all other respects, the portable unit reproduces the main console controls.



Remote control unit.

Typical lighting exercises

1. DRAMA

Required Lighting Effect	Preparation	Action "On Cue"
Cue 1 Room interior lit by dull daylight admitted via window.	Select memory 1 representing the appropriate lighting.	Press STUDIO CUT button.
Cue 2 Sun emerges from behind cloud. Room interior brightens rapidly.	Select memory 2 representing the sun and the increased room lighting. Set UP fade duration to 10 seconds. Press PRESET PLUS button.	Press UP FADE button.
Cue 3 Daylight fades slowly to night.	Select memory 3 representing night lighting. Set both fade duration controls to say 15 mins. Press PRESET CUT button.	Press CROSSFADE button.
Cue 4 Actor enters room and switches on light: Daylight continues to fade.	Select memory 4 representing "practical" and "fill" lights.	Press STUDIO PLUS button.
Cue 5 Street lights and flashing neon sign become visible through window.	Select memory 5 representing street lights and neon sign.	Press STUDIO PLUS button.
Cue 6 Following a period of night lighting, the exterior lighting increases with approaching dawn.	Select memory 6 representing dawn lighting. Press PRESET CUT button. Add memories 4 and 5 (PRESET PLUS button) to retain the "practical" and street lighting. Set both fade duration controls to, say, 10 minutes.	Press CROSSFADE button.
Cue 7 Actor departs, switching off light.	Select memory 4 representing "practical" and "fill" lights.	Press STUDIO MINUS button.
Cue 8 Street lighting and neon sign extinguished.	Select memory 5 representing street lighting and neon sign.	Press STUDIO MINUS button.

2. LIGHT ENTERTAINMENT

Required Lighting Effect

Consider a setting in which a cyclorama undergoes a repeating cycle of ten rapid colour patterns while the foreground lighting remains constant. In addition, three follow spots require independent control.

Preparation

1. Prepare ten memories, each of which represents a particular colour pattern plus the constant foreground lighting. These memories can be conveniently numbered 0 to 9 inclusive.
2. Allocate one auxiliary fader to each of the follow spot circuits.

Action "On Cue"

The colour changes may take place either as "switch cues" in rapid succession, or as "dissolves" requiring a few seconds for each change.

Switch Cues (i.e. Fast Changes)

Press memory selector button "0" in the left hand (tens) column. The ten memories can then be separately recalled in rapid succession by pressing the appropriate button in the right hand (units) column immediately followed by the

STUDIO CUT button. The action is therefore 1 - CUT, 2 - CUT, 3 - CUT, etc.

Note: The foreground lighting remains unchanged since it is similarly represented in all the memories.

The above action can be further simplified by use of the automatic MEMORY SEQUENCE facility. Operation of the CUT button will then automatically select the next memory. Fast changes to music are possible by this means, and the 0 to 9 sequence will automatically repeat if the "0" button in the tens column is held in its depressed state.

"Dissolves" (i.e. Fade Changes)

Set the two fade duration controls to an appropriate "dissolve" time, say 5 seconds. Proceed as for Switch Cues but initiate the changes by pressing the PRESET CUT and CROSSFADE buttons simultaneously. The MEMORY SEQUENCE facility may again be used.

Follow Spots

These may be faded in or out by direct manipulation of the individual auxiliary faders in the usual way.

Choosing the size of system

Up to 390 lighting circuits can be controlled by a single Q-FILE installation and these circuits may have individual power ratings of 2, 5 or 10 Kilowatts in any combination depending on the types of dimmer supplied.

Because of the modular design of the electronic control elements, the cost of the equipment varies in discrete steps and a 200 circuit installation would, for example, be appreciably more costly than a 199 circuit installation.

For this reason, there are economic advantages in specifying numbers of lighting circuits approaching the upper end of the following groups:

Up to 80 circuits	200-240 circuits
81-99 circuits	241-299 circuits
100-160 circuits	300-320 circuits
161-199 circuits	321-390 circuits

Duplex system

Within certain size limitations, an important cost saving can be achieved where two studios are located in reasonably close proximity to each other. Under such circumstances, it is possible for both studios to share common electronic equipment while at the same time retaining complete operational independence.

Taking into account certain technical considerations, the maximum economic advantage is realised when the number

of lighting circuits in each studio is close to but ^{NOT} more than the paired figures shown in the following table:

Studio A	Studio B
90 circuits	90 circuits
or 90 circuits	190 circuits
or 90 circuits	290 circuits
or 190 circuits	190 circuits

The technical principle of Q-file

Figure 1 shows in block form the main functional elements of the system. The centre block, labelled Memories, represents the permanent record of lighting data. The blocks on either side represent electronic stores containing data in use, and this can be copied into or out of the memories.

These stores are named as the Studio and Preset store respectively. The data in the Studio store directly controls the dimmers and therefore determines the actual lighting situation at any time. The Preset store does not normally have direct control of the dimmers but provides a number of functions which will be explained later.

To set up a lighting scene the circuit controller is used to feed electronic data representing circuit On/Off states and levels into the Studio store. Since this store has direct control of the dimmers, the operator's actions are immediately manifest as a growing pattern of lighting. This may be permanently

recorded at any time simply by selecting one of the hundred memories and copying the store data into this by pressing the Studio RECORD button.

Once the state of lighting has been recorded, i.e. copied into a memory, the existing Studio store data can be cancelled and a new lighting scene developed and memorised.

The instant recall of any memory can take place in three different ways:

- By a CUT action which replaces the original store data with that represented by the new memory.
- By a PLUS action which adds any new lighting circuits represented in the new memory and substitutes new levels for circuits which are already in use.
- By a MINUS action which switches Off all circuits represented in the new memory.

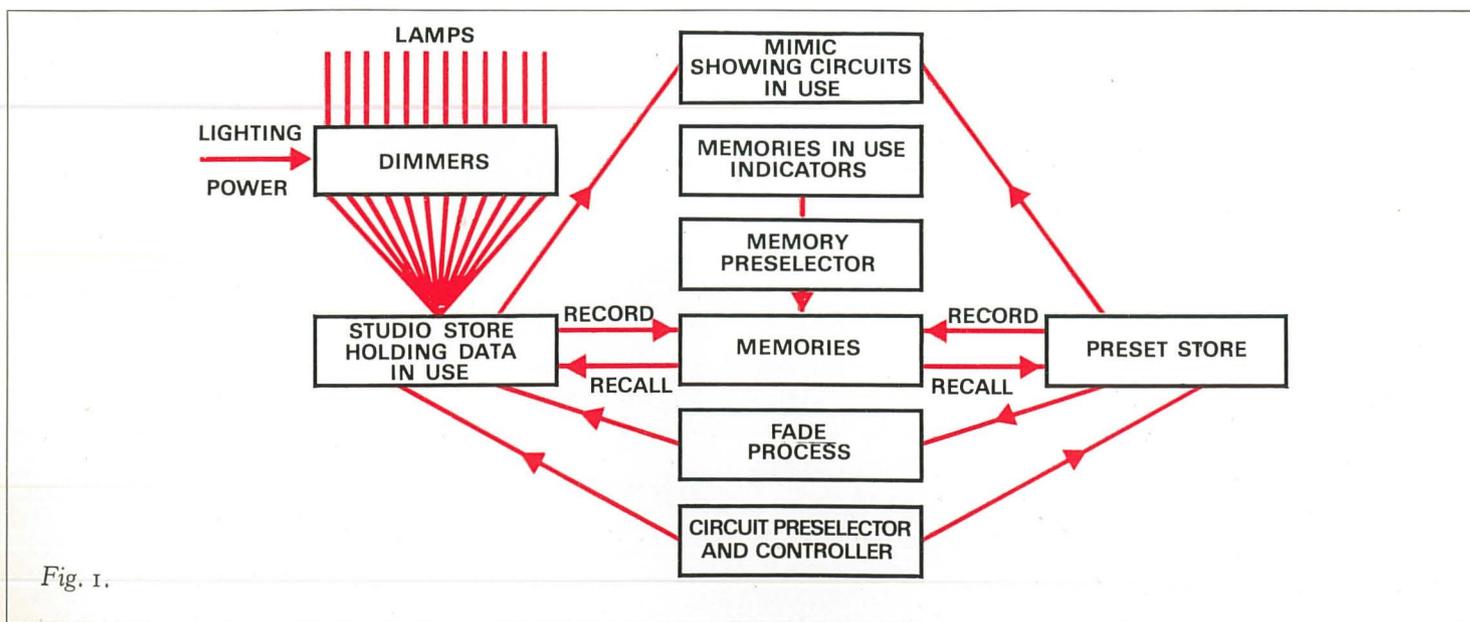


Fig. 1.

It may be useful on occasions to retain an original pattern of lighting for use during a rehearsal but at the same time to plan the next lighting cue in advance. This can be done by retaining the Studio store data and using the circuit controller to feed data into the Preset store.

Since this store does not directly control the dimmers, the existing lighting is not disturbed. However, the mimic diagram can also display the on/off state of circuits represented in the Preset store, and the operator is able to include data representing their brightness level by use of his calibrated fader control. When completed, this "blind" plot may be recorded and the corresponding memory can be subsequently "cut" into the Studio store for use and live adjustment. Operation of the Studio store RECORD button will then modify the original memory to correspond to the corrected lighting.

Apart from its use as an electronic notepad for the blind plotting of future cues, the Preset store also provides the means for examining and (if necessary) modifying existing memories without disturbing lights already in use. However, the most important role of this store occurs during a fade when it is fed with information representing the state of lighting required at the end of the fade. This data will normally result from "cutting", i.e. copying the next memory into this store. When the fade is initiated, the original Studio store data changes to match that in the Preset store in a time determined by the setting of the fade duration controls. It is important to note that during a fade, the only circuits which will change are those for which new data exists in the Preset store. Circuits represented as Off in the Preset store will remain unchanged. Thus, in a crossfade where original lights have to be extinguished, it is necessary to represent these circuits as ON at zero level in the Preset store. This occurs automatically whenever the CROSSFADE button is depressed. A "remainder zero" action is not always required and in this case the desired effect can be achieved by the simultaneous depression of two separate UP FADE and DOWN FADE buttons. Used individually, these two buttons enable simple up and down fades to be initiated independently if required.

While a fade is in progress, new data can be added to, or subtracted from either store, using either the circuit controller or the memory PLUS and MINUS buttons. In the case of the Studio store, the added data becomes immediately effective as actual lighting.

Thus, a practical light and its associated fill lights can be brought into use by adding a memory representing these lights to the data already in the Studio store. This added data is not affected by the fade process. In the event of the added data representing circuits which are already fading, these circuits are automatically excluded from the fade and immediately brought to the levels represented in the added memory.

If the new data is added to the Preset store, it becomes effective as a continuation of the fade, and will be completely matched in the Studio store in the time set by the fade duration controls.

Notwithstanding its automatic electronic functions, Q-file retains various means of manual control familiar to operators

of conventional systems. Individual circuit levels are adjusted by means of a quadrant fader in the usual way and a pair of master faders provide overall control of the lighting represented by the Studio store and Preset store data respectively. The operation of a MIX STUDIO/PRESET button enables both stores to control the lighting simultaneously, thus providing a situation comparable to the conventional two scene, two master control board with manual crossfade.

The Control Console

Apart from functional limitations, traditional lighting control boards have very frequently raised problems of location due to the need to accommodate possibly several hundred individual fader control levers. This one fader for each circuit concept presents a further problem when memories, including circuit levels, are also involved. This is due to the fact that whenever a previously prepared memory is recalled for manual readjustment, it is almost certain that the present settings of the faders will differ from those which were used in setting up the earlier memory. Thus, the resumption of manual control must in some way include a matching action between each fader and its previously memorised level.

In Q-file both space and matching problems have been solved by the use of a single servo-controlled fader which can be "addressed" to any circuit or group of circuits by means of a set of decimal coded preselector push buttons.

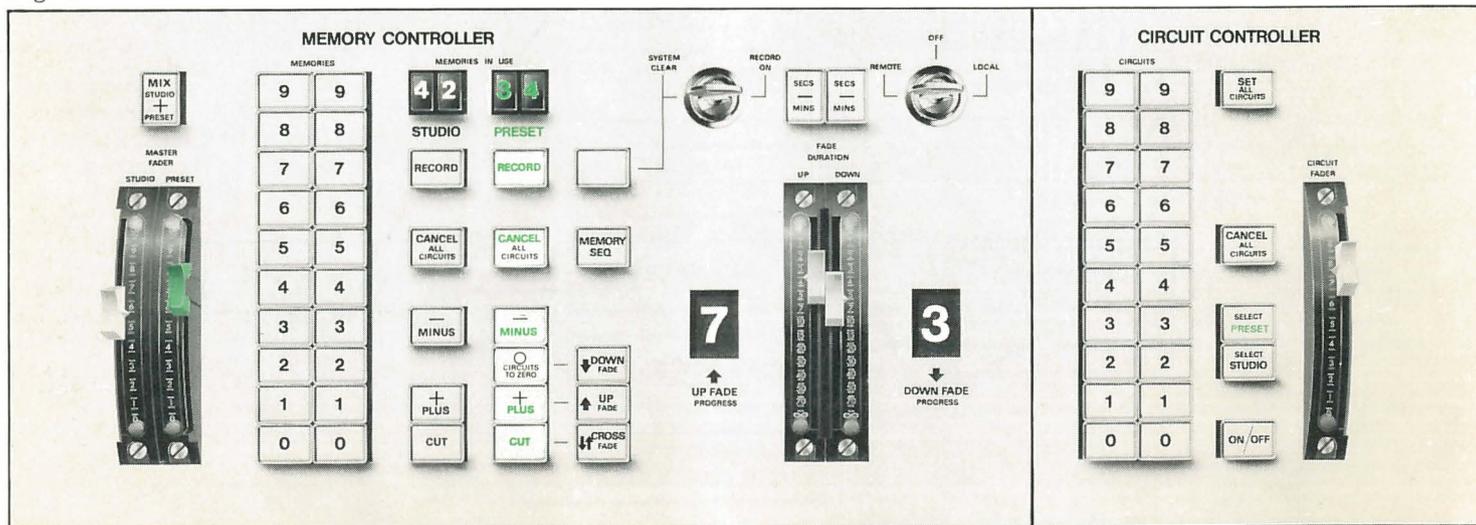
Figure 2 shows a typical panel arrangement. On the right hand side can be seen the servo-fader adjacent to the circuit preselector buttons. Operation of the appropriate buttons in the hundreds, tens and units columns enables the operator to assume control of any circuit or group of circuits. At the commencement of a lighting exercise some convenient common starting level for all circuits can be predetermined by use of the servo-fader and the SET ALL CIRCUITS button. Individual circuits may then be preselected and switched On by use of the ON/OFF button (alternate operations of this button switch the preselected circuits On or Off).

Immediately a circuit number is preselected, the servo-fader will move automatically to the level represented for this circuit in the store at that time. If the operator now takes hold of the fader lever, an automatic sensing device disconnects the servo drive and enables the preselected circuit to be manually readjusted in a perfectly normal manner. On releasing the control lever, the servo drive is reconnected but the fader retains its new setting, since this is already matched by a corresponding level in the store.

Thus, by a process of successive circuit selection and adjustment, the desired state of lighting is achieved, and this is represented electronically in the Studio store in terms of circuit ON/OFF states and levels. A "blind" plotting exercise can be carried out in the Preset store in exactly the same way.

As previously stated, circuits represented as On in the stores are indicated by the illumination of numbered windows on the mimic diagram. Different colours are used to show the

Fig. 2.



state of the Studio and Preset stores. An accurate indication of the level can always be obtained from the servofader which automatically positions itself to correspond to the level of the circuit whose number has been preselected. The significant preselector buttons are at all times indicated by internal illumination.

The rest of the panel carries the master controls. These include the memory preselector buttons and the RECORD CUT, PLUS and MINUS buttons for each store. In the case of the Preset store, a button labelled CIRCUITS TO ZERO is also provided. This is necessary since a fade out action requires that the circuits concerned be On at zero level in the Preset store, as previously explained. Also included are the fade controls comprising the CROSSFADE button, the individual UP and DOWN fade buttons and the fade duration control levers. A second operation of any fade initiating button stops the original action enabling any stage of fade to be interrupted and, if necessary, resumed at the interrupted level by a third operation of the same button. Each button is internally illuminated while the corresponding stage of fade is in progress. The fade duration control levers are calibrated 1-70, which figures can represent seconds or minutes as determined by operation of the range buttons. The end stop position is marked as infinity, and returning the levers to this position provides an alternative method of stopping the fade, or manually delaying its commencement.

The master control panel also mounts the two master faders and the MIX STUDIO/PRESET button which gives the Preset store temporary direct control of the dimmers.

The CANCEL ALL CIRCUITS buttons switch Off all circuits in their related stores but do not cancel the stored dimmer levels. These latter may be reset individually or collectively by use of the SET ALL CIRCUITS button.

Above the two sets of action buttons are a pair of MEMORIES IN USE digital indicators which display the number of the last memory recalled for use in either store by means of a CUT, PLUS or MINUS/ZERO action. Where recall is by means of a crossfade, the Studio store indicator will initially display the memory number corresponding to the lighting at the start of fade, whereas that for the Preset store will display the memory number, representing the end of fade situation. On completion of the crossfade, the Studio store indicator will change to correspond to that for the Preset store.

Elsewhere, two larger windows display numbers changing from 0 to 10 as the corresponding stage of fade progresses.

Control Equipment

This is normally housed in three or possibly four 19 in. racks mounting individual sub-units employing printed card assemblies. These racks may be located several hundred feet from the control panel and dimmers, and because of the very low internal heat dissipation, no special ventilation is necessary.

Dimmers

These are of the thyristor type designed to a very rigid specification. Current types have power ratings of 2kW, 5kW, and 10kW. The efficiency of these dimmers is 98 per cent of their full load rating and special consideration has been given to their stability, enabling individual dimmers to be interchanged without introducing output voltage variations of more than about 1 per cent of full output.

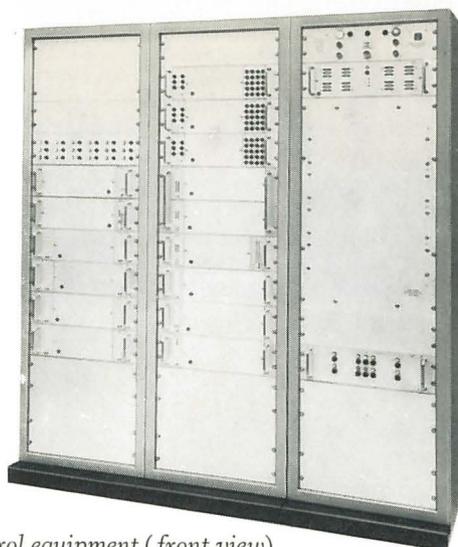
The control circuit provides a basically square law relationship between control voltage and light output when using tungsten lamps.

A degree of compensation for mains voltage variations is incorporated, enabling this to be reduced by about 50 per cent over most of the control range.

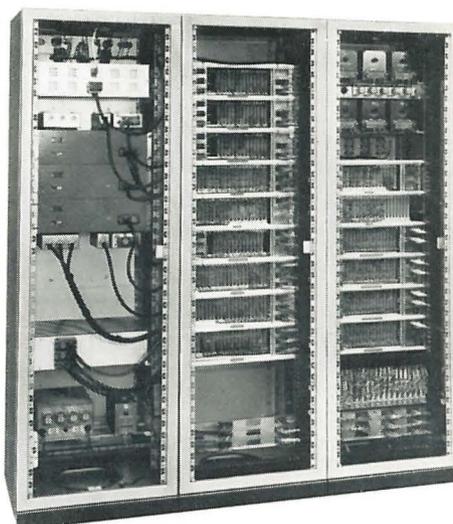
Each dimmer includes a specially designed filter choke which minimises the risk of lamp sing and sound circuit interference by limiting thyristor current rise time to a minimum of about 0.8 msec.

Both 5kW and 10kW dimmers have the same physical dimensions (8 in. x 5¼ in. x 15 in.) and plug into cabinets accommodating twenty 5kW units or any mixture of 5kW and 10kW dimmers having a total power handling capacity not exceeding 100kW. The dimensions of these cabinets are approximately 2 ft. x 2 ft. x 6 ft. high and each cabinet is fitted

with a fan and filter which can be omitted if forced underfloor ventilation is provided. If sufficient airflow is available, an input air temperature as high as 40°C can be tolerated.



Control equipment (front view).



Control equipment (rear view).



A typical Q-File dimmer room installation. Each rack provides 100 Kilowatts of dimmer capacity (5 Kilowatt dimmers are shown here).

The electronic design of the system

The Q-File system employs semiconductors throughout, and includes no moving parts or electro-mechanical devices other than the panel controls. All data processing and memorising is by digital means, using magnetic core stores and well-established computer type techniques. The two stores use core memories associated with registers which enable the core store information to be sequentially read out, modified if necessary and rewritten. The files employ magnetic core memories into and out of which the stored information can be copied.

Channel information is initially set up in terms of an 8-bit word which includes the ON/OFF state and 80 discrete brightness levels. This data is memorised as a 5-bit word on a 20 step basis, permitting recall of the original information within a maximum non-cumulative tolerance of $2\frac{1}{2}$ per cent of

full brightness. All 80 steps are employed during a fade between memorised levels.

The design of the equipment makes provision for duplex operation of the data storage system. This enables two studios or stages to share common control equipment but at the same time to retain complete operational independence. Duplex operation offers obvious economies in capital cost where two separate studios are physically adjacent.

The functions described do not by any means exhaust the possible applications of the equipment. For example, the position of colour change wheels could be memorised and included in a file. Also, the memorised data need not be restricted to lighting and in the case of a television studio could include routing instructions for video and sound circuits, selection being under the control of the appropriate engineer.

Summary of facilities

(a) Control of Individual Circuits

Every lighting circuit can be individually selected, switched on and adjusted for level by means of a conventional quadrant type fader. A complete lighting scene may, therefore, be set up in the usual way.

This direct access to individual circuits is always available and enables the operator to assume over-riding manual control at all times.

(b) Memorising

A complete record of the existing state of lighting can be memorised instantly in any one of the 100 memory files at any time (even during a crossfade).

(c) "Blind" Plotting and Memorising

The processes under (a) and (b) can be carried out "in preset", i.e. independently of the actual luminaires and dimmers whose existing state remains unaffected. Thus, with the studio already lit for an earlier scene, a future lighting situation can be pre-planned in terms of anticipated requirements for circuits and dimmer levels.

A memory of this "blind" plot can then be prepared and in due course, this memory may be recalled as a "live" state of lighting for actual use and fine adjustment.

(d) The Checking and Modification of Existing Memories

This may also be carried out independently of the lighting in use at that time. The process is simply an extension of (c) above in which an existing memory is recalled in the preset state for independent examination and readjustment.

(e) The Recalling of Memories

Any previously memorised state of lighting can be instantly recalled any number of times. Since the memorised data is in digital form, the original lighting is always reproduced with complete accuracy.

(f) Fading and Crossfading between Memories

In the Q-File system, all fade operations can take place automatically in a time predetermined by two fade duration controls.

The range of adjustment is 1 to 70 seconds or 1 to 70 minutes as determined by a range selector button associated with each control.

If necessary, these controls can be readjusted while the fade is taking place.

Any existing state of lighting can be replaced with that in a new memory file by means of a crossfade. In carrying out this process, four different fade variations are possible:

	Start of Fade	Fade Duration
(1) Fade Down } Fade Up }	Simultaneous	Identical
(2) Fade Down } Fade Up }	Simultaneous	Different
(3) Fade Down } Fade Up }	Independent	Identical
(4) Fade Down } Fade Up }	Independent	Different

Two possibilities exist where circuits already in use are *not* included in the new memory file. These circuits may be:

- (1) Automatically faded out.
- or (2) Retained at their original levels.

Note:

Where a circuit already in use is represented at the same level in the new memory, *no change* will occur during a crossfade process. In many conventional systems the dimmer level of such a circuit would temporarily fall while the fade was taking place.

The time required to complete a fade is independent of the starting and finishing levels of the independent lighting circuits. In other words, all circuit levels change proportionately during the fade, irrespective of the magnitude of the individual changes.

Combining of Memories

Any number of randomly selected memories can be used simultaneously by addition or subtraction.

Addition of a new memory adds any additional circuits and substitutes new levels for such circuits as are already in use.

Subtraction of a new memory switches off all circuits contained in this new memory.

Apart from the combining of complete memories, individual non-memorised circuits can be switched On or Off at any time and their levels adjusted as required.

Thorn Electrical Industries Limited

Theatre Lighting Division,
Great Cambridge Road, Enfield, Middlesex.
Telephone: 01-363 5353 Telex: 263201
A member of the Thorn Group



THORN OVERSEAS COMPANIES

Australia

Thorn Electrical Industries (Australia) Pty Ltd
West Heidelberg, Victoria 3081

Austria

Thorn Electrical Industries GmbH, Vienna

Belgium

International Rectifier Europe SA, Brussels

Denmark

Thorn Electric A/S, Copenhagen-Vanlose

France

Comptoir Central de France,
83, Rue Pierre-DEMOURS
Paris 17

Germany

Etron-Licht GmbH, Hamburg
Crypton Autopruefgeraete GmbH Stuttgart

India

Metal Lamp Press Caps (India) Pty Ltd
Ulsoor, Bangalore 8

Italy

Societa Industriale Vecentina Illuminazione SpA
Cavazzale, Vicenza

New Zealand

Thorn Electrical Industries (NZ) Ltd
West Lynn, Auckland

Norway

Norske Thorn A/S Oslo

Rhodesia

Thorn Electrical Industries (Central Africa) (Pvt)
Salisbury

South Africa

Thorn Electrical Industries (South Africa) Pty
Industria, Transvaal

Sweden

Svenska Thorn AB, Stockholm

