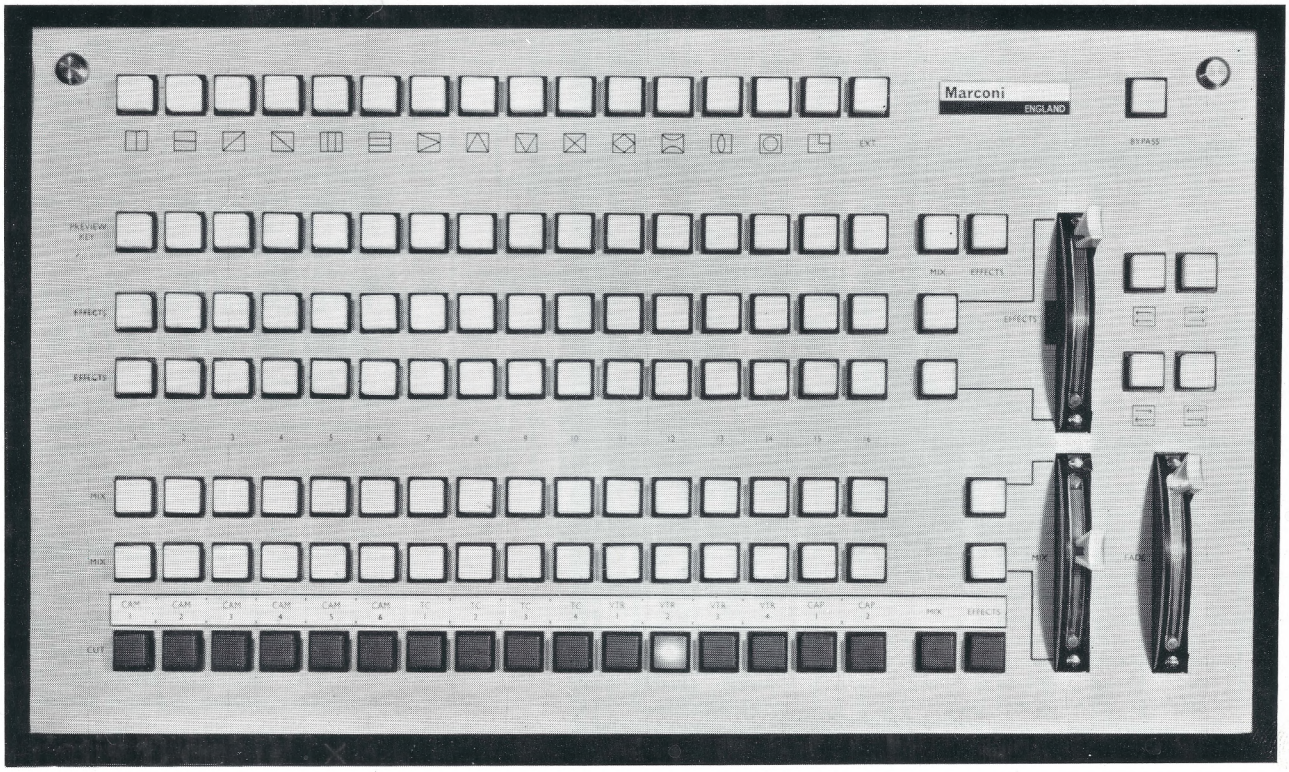
Marconi Broadcasting Systems

Vision Mixer

B3724



Features

8 or 16 inputs standard

Solid state matrix

Digital control logic

Modular design using i.c's

PAL–NTSC–black and white

Special effects standard on 16 input mixer

Choice of processing electronics

Modular delay equalization

Facilities

Vertical interval cutting throughout

7 matrix outputs from 16 input mixer

4 matrix outputs from 8 input mixer

3 Isolated transmission outputs

Emergency by-pass circuit

Isolated cue circuit contacts

Readily adapted for computer control

Introduction

The B3724 is really more than just one new vision mixer, it is a new basic design for vision mixing systems. Marconi has completed a long and careful study of the problems associated with all solid-state video switching and the knowledge gained is to be seen in the B3724 mixer.

The solid-state matrix at the heart of the new mixer is built up of the modular eight by one video switches using microcircuit crosspoints. This new crosspoint is the design feature which has made really high performance solid-state mixers a reality.

To go with the new matrix, new video input amplifiers, output amplifiers and control components have been developed. The control system also relies mainly on microcircuits and uses a digital coding technique to reduce the complexity and bulk of inter-unit wiring and enable computer control. This control system lends itself to vertical interval cutting and so all signal transitions are made in this mode.

Preview facilities are comprehensive, the Engineering Preview row being controlled by a separate panel normally

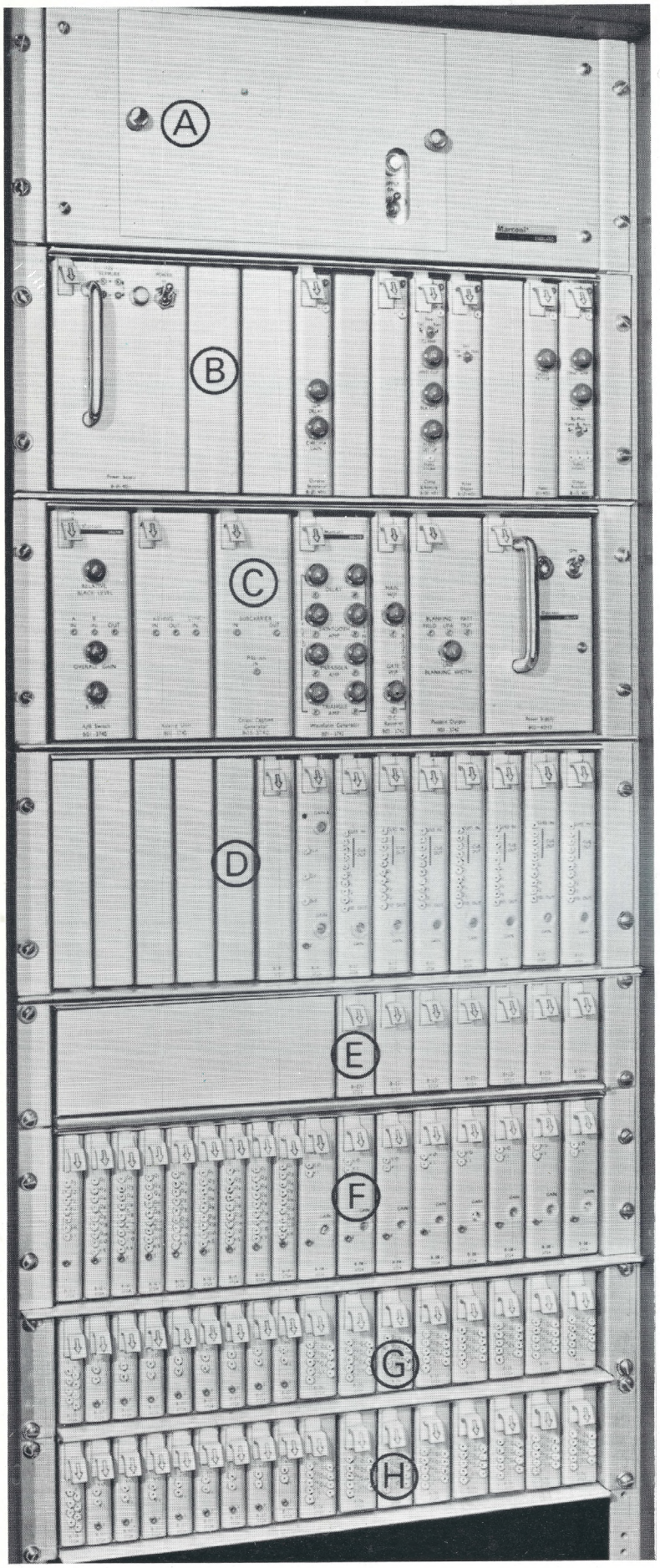


Fig.1 A complete 16×8 Vision Mixer Assembly. Total rack height 1·1m (43·75in) A – Power Supply, B – Processing Amplifier, C – Special Effects, D – Mixer Electronics, E – Delay Units, F – Store and Output Unit, G – Crosspoint Unit, H – Extension Crosspoint Unit

located with the Senior Vision Engineer. The front cover illustration shows the facilities provided on the control panel of a 16×7 mixer.

Non-synchronous input signals can be accepted. For each of these the appropriate key on the sync panel must be switched to the NON-SYNC position. This ensures that the mix and effects buttons on the particular input selected are inoperative, to avoid picture disturbance.

The units which comprise the two basic types of mixer are described below.

Rack Mounted Units

The modular construction principle has been adopted from the start of this mixer design. Modules plug into back connectors fitted to modular equipment frames and the complete frames are assembled into standard rack cabinets. It is convenient to describe these sub-assemblies and the modules they contain in turn.

The Semiconductor Matrix B01–3724

The mechanical form of this is shown in Fig.1 and it will be seen that to expand the matrix from eight inputs to sixteen inputs requires only 89mm (3·5in.) of extra rack space. The matrix can be expanded further to twenty-four or thirty-two inputs.

The Crosspoint Unit B03–3724

Each unit contains, from left to right, the cues output module, eight video input amplifiers and up to eight video switches. The extension crosspoint unit is similar.

8×1 Video Switch B06–3724

Each switch is a one output, eight input matrix. The micrologic crosspoints are of flatpack form ideally suited to mounting on the printed board. The board carries the other discrete components associated with the crosspoints. The video switch module is 30·4mm wide and has the usual Marconi structure.

The small size of each crosspoint has enabled design of very compact busbars and this factor is largely responsible for the fact that the B01–3724 outperforms both relay matrices and semiconductor matrices using discrete crosspoints. The crosspoint functions as an amplifier of unity gain when switched on, and presents a very high isolation when switched off.

Video Input Amplifier B07–3724

This module is 20·3mm wide. The amplifier uses silicon transistors in a d.c restored circuit. Input impedance is high and bridging connections are provided with two sockets so that termination can be achieved simply by use of plug in 75Ω terminations. Input signals are normally at 1V peak to peak and +3dB can be accommodated. Non-useful d.c components up to ±3V have no degrading effect on performance. Output impedance is chosen so that the amplifier can drive up to eight crosspoints. This is adequate even for very complex mixers.

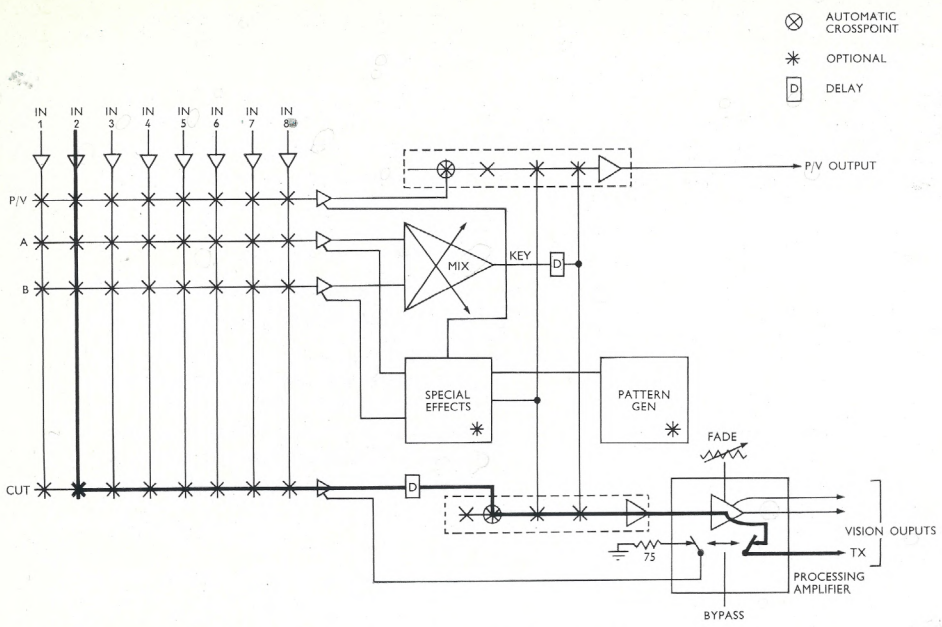


Fig.2 Vision Facilities. 8 input mixer, showing normal cut path

Cues Output B12–3724

The third type of module fitted in the crosspoint unit is the Cues Output Module. This 20·3mm wide unit contains reed relays chosen because they are compact, silent in operation, and extremely reliable. Reliability is assured by the sealed construction, no moving parts are exposed to the air.
The use of relays for cues has proved the best solution since the polarity and nature of the cue circuit current does not affect relay performance whereas diode or transistor logic gates impose special restrictions on the type of cue circuit. One pair of closing contacts is associated with each video input, they can carry up to 0·5A at up to 40V, with a maximum loading of 10W. The mixer logic ensures that each cue relay is energized only when its related video input is connected to transmission output via one or more video crosspoints.

Store and Output Unit B02–3724

This assembly occupies 133mm of rack space, the component modules from right to left are up to eight video output units, up to eight buffer stores and one cut timer.

Video Output Amplifier B08–3724

A 30·4mm wide module which contains an isolation amplifier designed for use at the output of a matrix row. The amplifier can be driven from one or more video switches connected to form a row, and two isolated outputs are provided. These outputs are at standard level in 75Ω ; this greatly facilitates mixer design particularly when using special effects or similar ancillary electronics. A small range of preset gain control is available to ensure that the over all gain of any path through the matrix may be adjusted to unity.

Buffer Store, B10–3724

This 20·3mm wide module accepts binary coded control information fed from the control panel. The binary information is sent down five wires, for a maximum of sixteen inputs. A sixth input wire enables the same Buffer Store to operate for up to thirty-two inputs. The input binaries of the buffer store read the data from the control panel when the first of two clock pulses sent from the cut timer is received. Outputs are fed to the 8×1 video switches in digital form. A further set of outputs are provided to the cue lamps in the control panel in encoded form, see Fig.3.

Each buffer store is allocated to one row of the mixer so that seven are used in the studio mixer and four in the mobile version.

Cut Timer B11–3724

A single module, also 20·3mm wide, which contains micrologic timing circuits mounted on a printed board. The cut timer derives two sets of clock pulses from an input of synchronizing pulses. These pulses are produced at carefully chosen moments during the vertical blanking interval, the first pulse is used to set up digital control circuits, the second to determine the exact moment of video switching. This moment is chosen so that the cut is made following the field sync interval, thus a perfect transfer from one signal to another is always observed. In the event of failure of the local sync feed, switching will continue at random timings, but with minimal picture disturbance.

The Mixer Electronics B04–3724

The plug-in modules for this are housed in a frame 180mm high. These modules are: one mixer logic, normally one A/B mixer and the appropriate number of 4×1 switches.

Mixer Logic B18–3724

This single module contains silicon integrated circuits used to determine the pattern of control needed for the re-entry circuits including the automatic crosspoints in certain 4×1 switch functions.

A/B Mixer B16–3724

This is another new module developed especially to ensure the highest performance on colour signals. The B16–3724 Mixer is controlled by a single fader and provides a high crossfade linearity, better than 1·5%. Sync, colour burst and picture amplitudes are thus maintained substantially constant during mixing operations and regeneration of sync and burst in the output processing amplifier is therefore not essential. The high impedance bridging inputs are provided so that when required the outputs from the A and B rows can be extended to special effects equipment. Two outputs have better than 50dB isolation at 5MHz, and the studio mixer uses one for direct outputs,

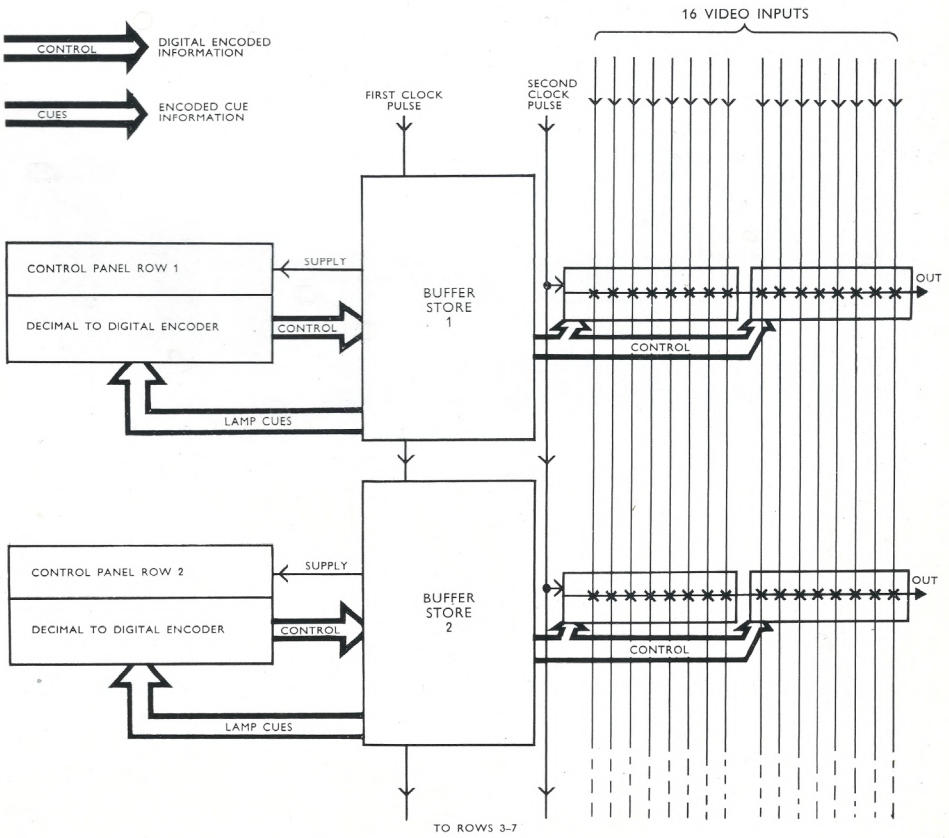


Fig.3 Matrix Control

one for re-entry. The frequency response is maintained at 10MHz to ensure negligible signal degradation.

Control of the A/B mixer is by a variable input of 0 to 5V d.c normally obtained from the mix fader on the main control panel. Cues are derived by solid-state logic direct from this varying d.c. No microswitches are required on the faders.

4×1 Switch B17–3724

A 31mm wide module containing four micrologic crosspoints and associated discrete components. As its name implies the module is a 4×1 matrix which, used as a four input device, provides two identical outputs which offer more than 50dB of isolation at 5MHz. The use of these separate 4×1 switches for re-entry and for selection of delays in the studio mixer enables the excellent crosstalk performance of the basic matrix to be maintained even in very complex mixers. The 4×1 switch alone has crosstalk isolation better than 80dB at 5MHz.

The choice of crosspoint to be switched in each 4×1 is controlled by the output from the mixer logic module. The time of the cut is controlled by the second clock pulse from the cut timer, thus 4×1 switches operate at the same instant in the vertical interval as the 8×1 switches.

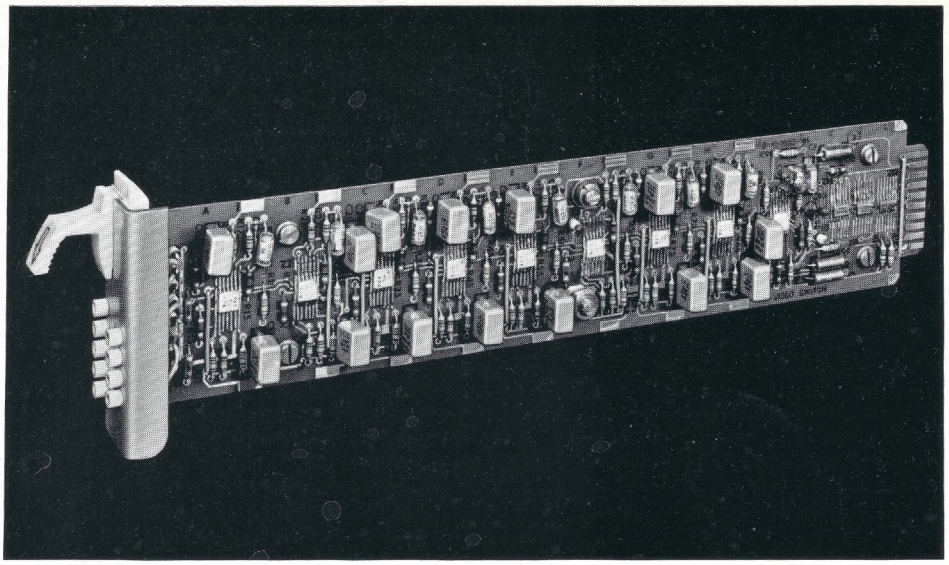
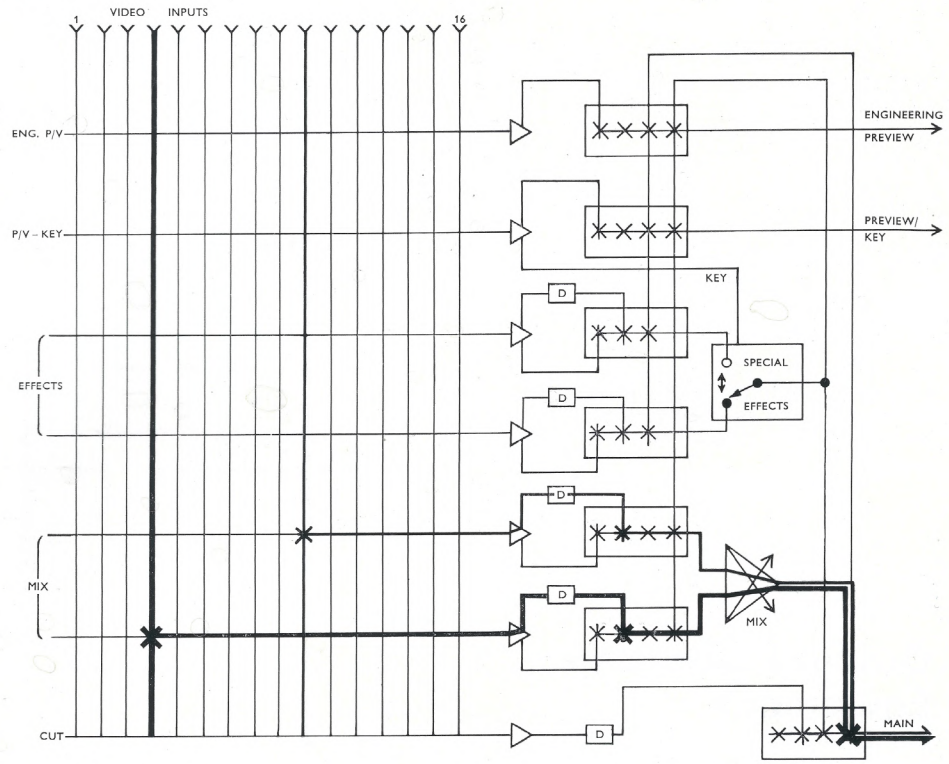


Fig.4 8×1 Video Switch

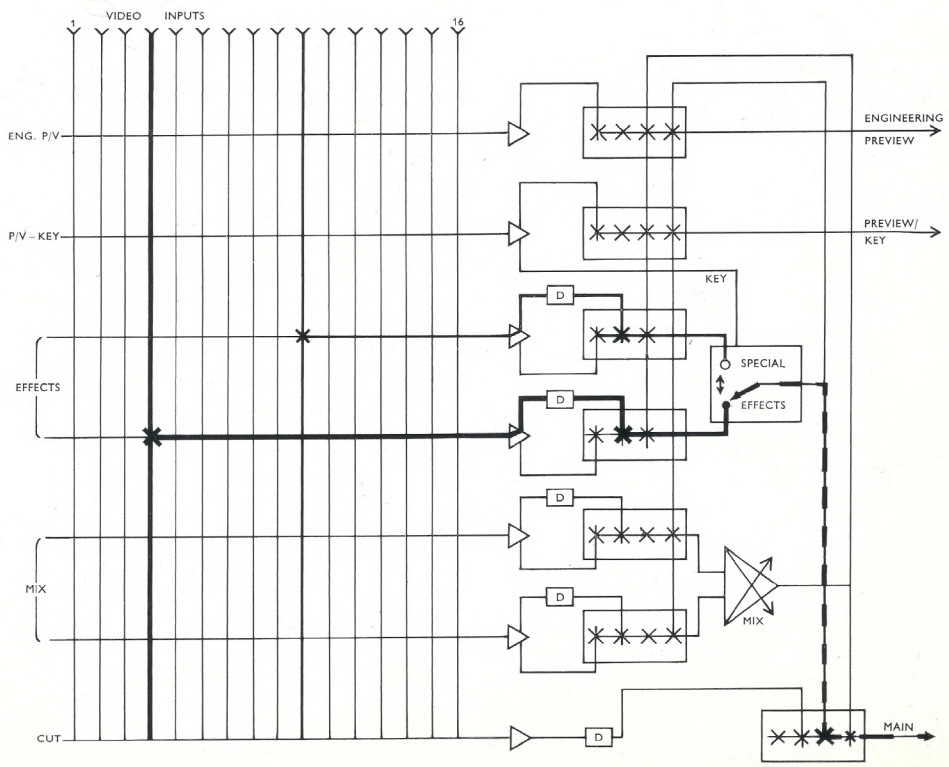
Typical Vision Mixer Operating Modes

The following simplified diagrams illustrate the basic modes in which the studio mixer may be used. The symbol D indicates a fixed delay, provided as rack mounted modules within the studio mixer.

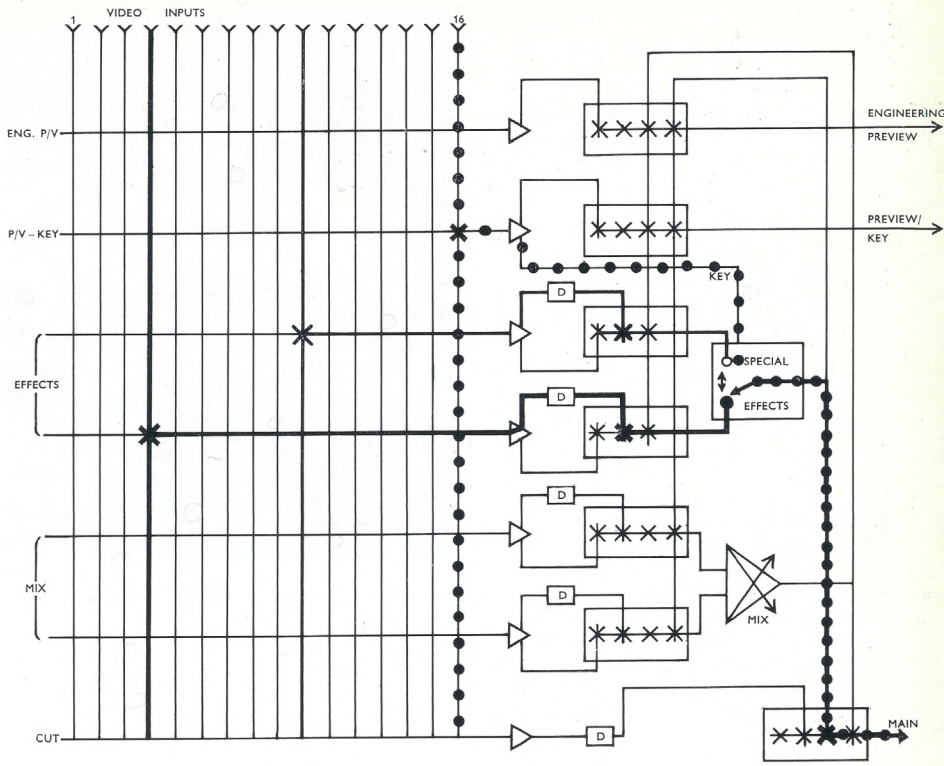
(1) The MIX path. The signal on input 4 has been selected on a MIX row and input 10 connected to the other MIX row. When the MIX button is operated, inputs 4 and 10 appear in a ratio controlled by the MIX fader. The transfer occurs in the field blanking period, no disturbance is visible.



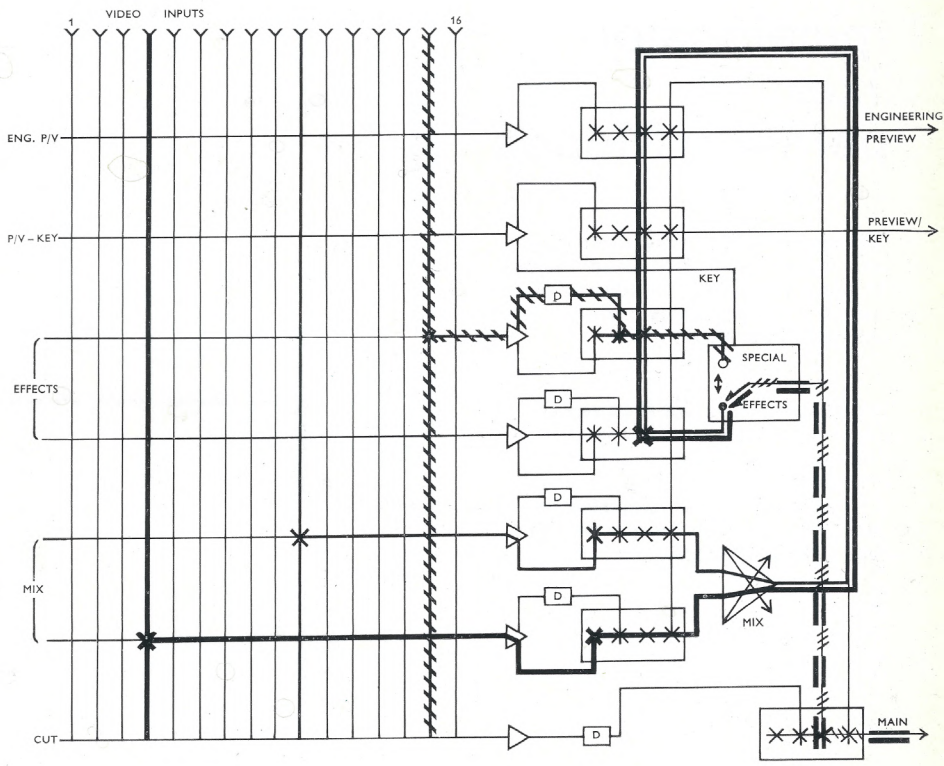
(2) Here input signals 4 and 10 are applied to the electronic switch. The pattern generator of the special effects equipment is used to drive the electronic switch so as to provide the desired shape of WIPE pattern. Fifteen patterns can be chosen by means of the buttons on the main control panel. The WIPE direction is selected by another four buttons, and position by the EFFECTS fader.



(3) The signal at input 16 has been selected on the PREVIEW/KEY row and is being used to control the electronic switch. The outline of the transition between 4 and 10 is thus controlled by the input to 16. This EXTERNAL KEY system is also known as OVERLAY. The level of key signal which will work the electronic switch is remotely variable. (The B3740 special effects also enables INTERNAL KEY or INLAY working.)



(4) The output from the MIX rows is re-entered to the special effects equipment which may be working in any of its usual modes.



Output Processing Equipment

The design of the B3724 enables a wide choice of output processing equipment. For normal use a simple edition of the B4011 Line Clamp Amplifier is excellent and any version of this unit which includes the fader module will be satisfactory.

The line clamp amplifier is described in brochure TD B4011 and it can be obtained with full or partial pulse regeneration for colour or black-and-white signals from poor, non-synchronous sources.

Control panels

These use standard momentary touch push buttons which are illuminated to indicate control state. Each row of buttons has its associated binary encoder, in the form of a single printed board. The cue information returned from each buffer store lights the lamps on the control panel and no relays are used.

The sixteen-input panel shown on the front cover and the eight-input panel shown in Fig.5 are dimensioned to fit the B4313 Studio Control Console. The Marconi service for design and manufacture of custom-built panels is continued for those customers who find our standard panels unsuitable for their situation.

CONTROL PANEL DIMENSIONS

	Height	Width	Depth
Studio 16×7 Control panel	413mm (16·25in)	717mm (28·25in)	238mm (9·375in)
Mobile 8×4 Control panel	257mm (10·1in)	476mm (18·9in)	146mm (5·75in)
Mobile Special effects panel	102mm (4in)	476mm (18·9in)	197mm (7·75in)

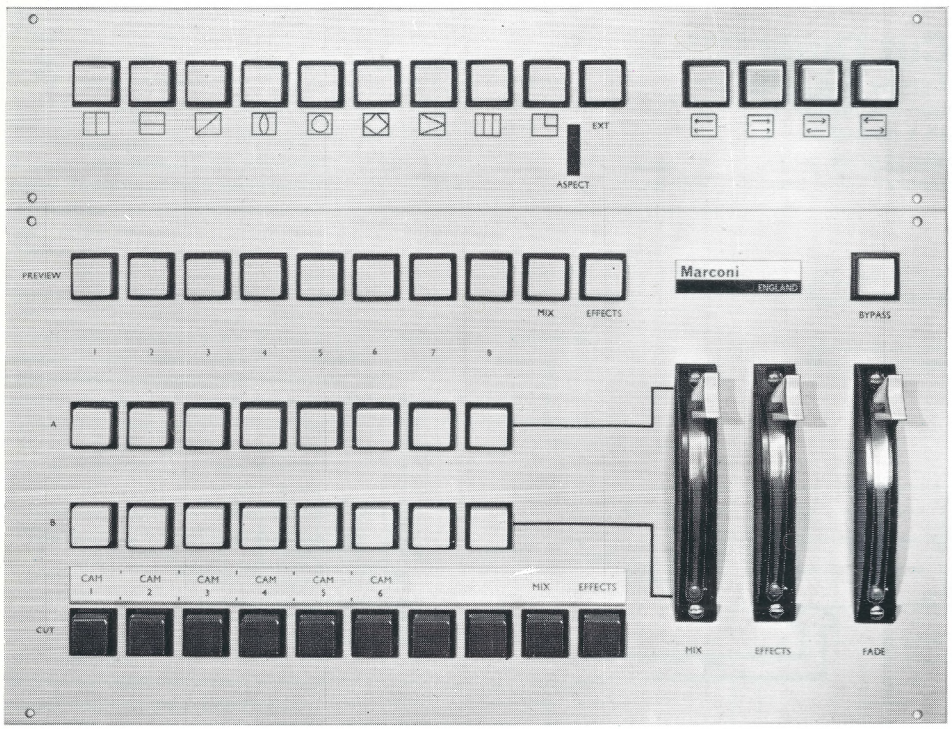


Fig.5 8×4 mixer control panel with special effects.

Ordering Information

To ensure that you are supplied with equipment exactly to your requirements, please state:

1 Television standards employed.
2 Number of spares required.
3 If additional handbooks are required.
4 If servicing extension boards are required.
5 A.C voltage and frequency.
6 If special effects are required (8 input option only).

Data Summary

FACILITIES

A.C input adjustment: 100–125V and 200–250V, 48–62Hz single phase.

Mixed sync input: Standard level 2·0V.

'Non-synchronous inputs': 8 (standard) or 16 (optional).

Rows (16 input): CUT/MIX/MIX/EFFECTS. EFFECTS/PV1–KEY/PV2

Rows (8 input): CUT/MIX/MIX/PV.

Special effects: Standard (optional on 8 input).

Re-entry: Yes, from mix and special effects. No for 8 input.

Black and white, NTSC and PAL colour working: Yes.

Transmission outputs: 3.

Vertical interval cutting at all points: Yes.

PERFORMANCE OF MIXERS WITH B4011 LINE CLAMP AMPLIFIER 600 SERIES

Input and output impedance, nominally 75Ω: Return loss better than 30dB to 2 T_C pulse and bar.

Input level: 1·0V p–p normal. 1·4V p–p max.

Acceptable d.c on input: ±3V max.

Maximum d.c on output: ±50mV.

Matrix row gain adjustment: Preset ±2dB.

Gain variation due to path switching: < ±0·2dB.

Gain stability (overall), over one hour: < ±0·2dB.

Temperature range, normal: 0 to+45°C.

Signal-to-noise ratio, p–p signal: r.m.s weighted noise: > 60dB.

Crosstalk worst path at 4·43 MHz and 3·58MHz: > −52dB. (> −56dB for 8 inputs.)

K rating (a) mix: Better than 1%.

2T Pulse (b) cut: Better than 0·5%.

Linearity:
a) Standard input: 2%.
b) +3dB input: 4%.

Differential gain
a) Standard input level: 2% (1% for 8 inputs).
b) +3dB input level: 4% (2% for 8 inputs).

Differential phase
a) Standard input level: 1·5° (0·5° for 8 inputs).
b) +3dB input level: 3·0° (1·0° for 8 inputs).

L.F response, 50Hz square wave, average tilt is: < 0·2% per ms.

L.F bounce
1st overshoot: 20%.
2nd overshoot: < 1%.

Cross fade linearity: < 2·5%.

Luminance/chrominance
a) Delay inequality: ±20ns.
b) Gain inequality: ±2%.

Cue contact capacity: Either 40V, 0·5A or 10W.

The information contained herein is subject to confirmation at time of ordering.

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