

# Simplified Automation in Television Master Control

## Control

By H. MIRZWINSKI and G. FARNWORTH

The Eight Event Store\* has been developed to permit presetting, checking and storing of a sequence of up to eight events. The preselection of sources can be done during the program preceding a break so that the operator's only function during a break is to transfer the stored sources sequentially to transmission.

The Semi-Automatic Master Switcher (SAMS) which incorporates the Eight Event Store provides a compact and economical switching system for small and medium sized television stations.

### General Description

A simplified operational diagram of SAMS is shown in Fig. 1. A 12-input 3-output relay matrix is used as a married sound and vision switcher. Two of its outputs are used in a preset mode, i.e., each is used alternatively as on-air and pre-

view/prelisten channel. While one output is on the air feeding a transmission line, the other off-air channel is used to preset and preview/prelisten the next event. When the time comes, the preset source can be transferred to transmission by cut, fade, (vision

and sound), or mix (vision only), and the output which was previously on transmission now comes off-air. All vision cut transfers are effected during field blanking period.

SAMS has two modes of operation,

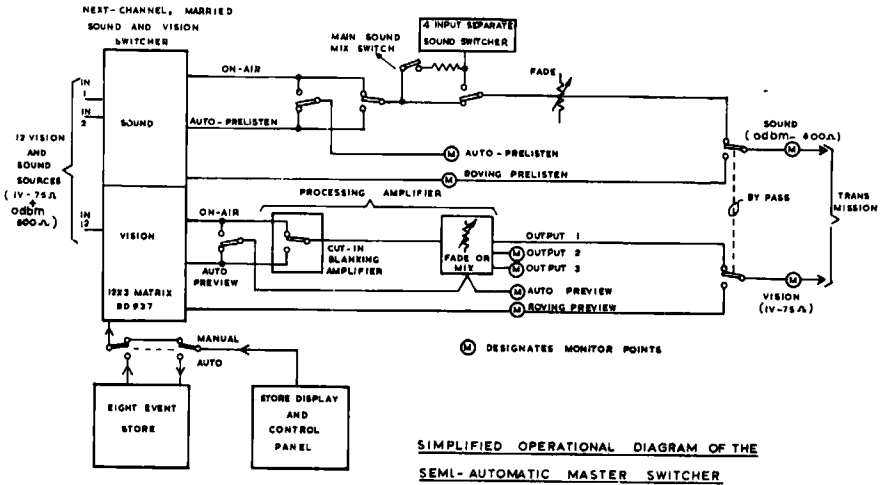


Fig. 1. Simplified operational diagram of Semi-Automatic Master Switcher.

Presented on April 1, 1965, at the Society's Technical Conference in Los Angeles by D. Parkinson for the authors, H. Mirzinski and G. Farnworth, Broadcasting Div., The Marconi Co., Ltd., Chelmsford, Essex, England.

(This paper was received on March 15, 1965.)

\* H. Mirzinski and R. G. Moore, "Store controlled programme switcher," *Int. TV Tech. Rev.*, 4: No. 9, 1963.

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manual and automatic. In the manual mode the Eight Event Store is completely isolated and the preselection buttons operate the off-air channel of the switcher (i.e. auto-preview and auto-prelisten) in the normal way. In the automatic mode the same buttons are used to enter a sequence of events into the store and the store then controls the off-air channel of the switcher.

A 4-channel sound switcher permits a separate sound source such as announcer, tape or disc to be transmitted with a film or slide source. The Main Sound Mix switch allows the main program sound to be superimposed over any of the separate sound sources.

The third output of the matrix is normally used for roving preview/prelisten of

all 12 married sound and vision inputs. During an emergency, however, the "By-pass" switch connects this output to transmission, leaving most of the electronic units inoperative. In this condition only simple relay lap-cutting is available. If the roving preview is not required, this output can be used to feed other equipment such as a video-tape recorder.

The system is fully transistorised and meets NTSC color requirements. All units are fed from regulated 24-V dc power supplies.

#### Eight Event Store

The Store is intended as a simple aid for the master control operator enabling him to spread his activities more evenly. During

the comparatively quiet period between station breaks the operator can preset, check and store a sequence of up to eight events. In case of longer sequences additional information can be entered into the store as soon as the earlier events are switched on the air. Changes of the stored information can be easily carried out, without effecting the remaining sequential operations, until the last moment before a given event goes on the air.

Figure 2 is a front view of the Eight Event Store with the cover removed. The unit is assembled in a dust-proof box occupying 28 in. in a standard 19-in. rack.

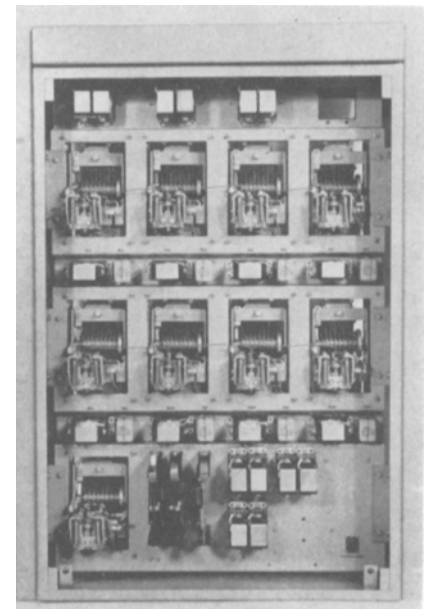


Fig. 2. Eight Event Store with front cover removed.

Standard telephone heavy-duty uniselectors are used as basic memory elements. As compared with other types of memory, uniselectors have several advantages:

- (a) The large number of positions (25) permits simple control of large switchers without the need of complex control coding.
- (b) Eight levels make possible simultaneous routing of several functions.
- (c) Information remains stored indefinitely until it is deliberately canceled by feeding in new data. It is not destroyed by read-out or by power failure.
- (d) Stored information can be easily changed.

Eight uniselectors are used as stores for a sequence of events. One additional un-selector (bottom, left on Fig. 2), known as the "event selector" routes the information from the control panel into the appropriate store selector and from the store into the control lines of the switcher. Out of the eight levels of each store selector one level is used for loading the stored (read-in), one for controlling the switcher (read-out), and two levels are used for lighting the displays. The six relays at the top of the unit are auto/manual relays which route the control panel directly to the switcher for manual operation or connect it to the Store for "auto" operation. A muting relay and a control relay are mounted underneath each store selector. The muting relay

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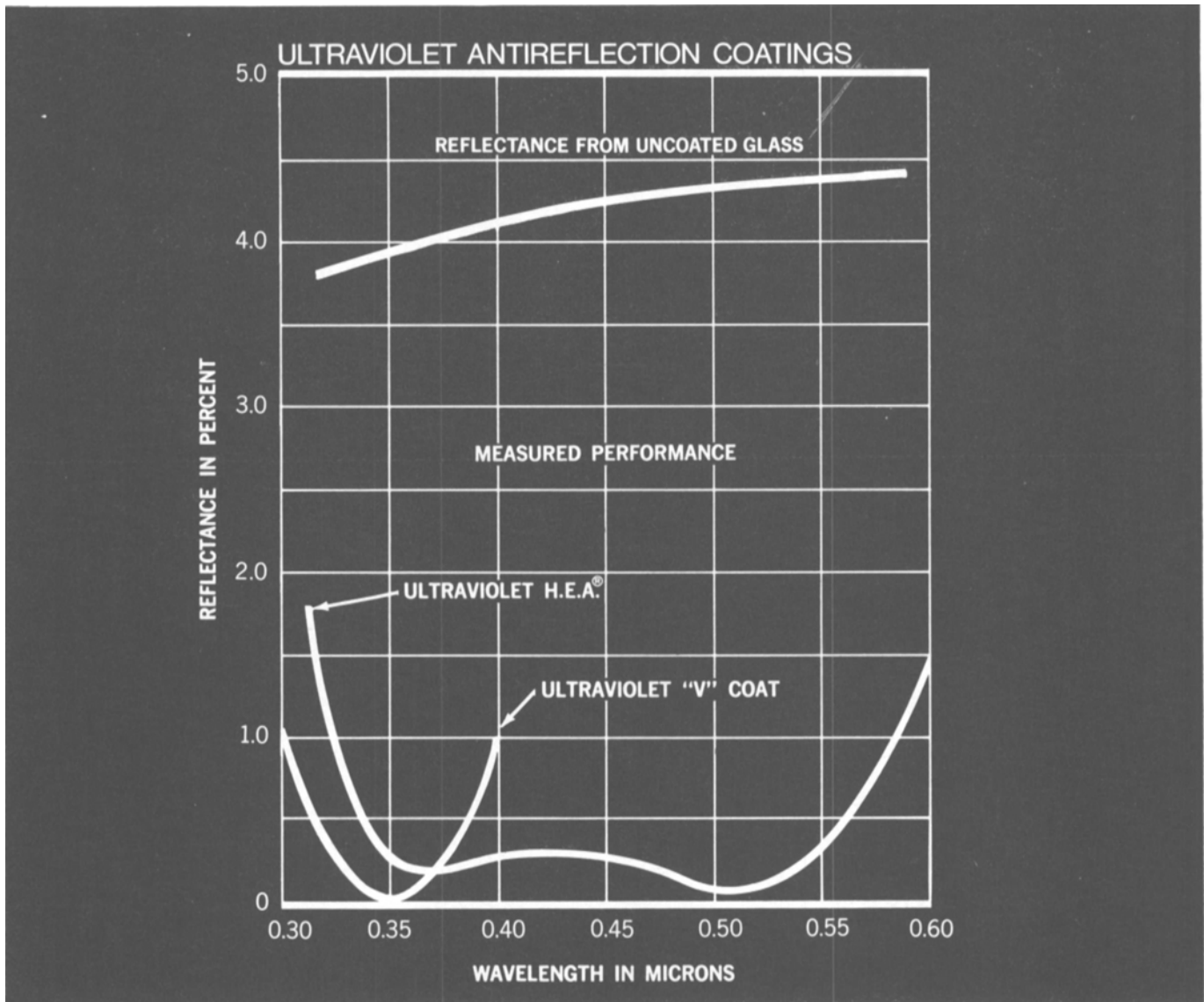
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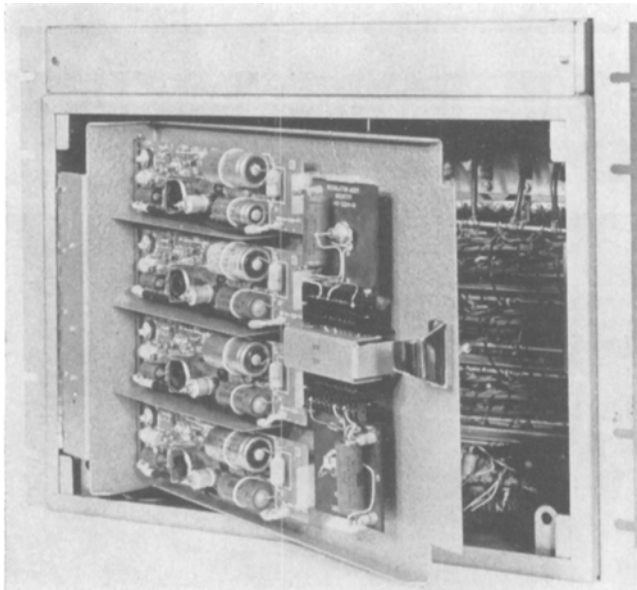


Fig. 3. 12 X 3 relay matrix with front cover removed.

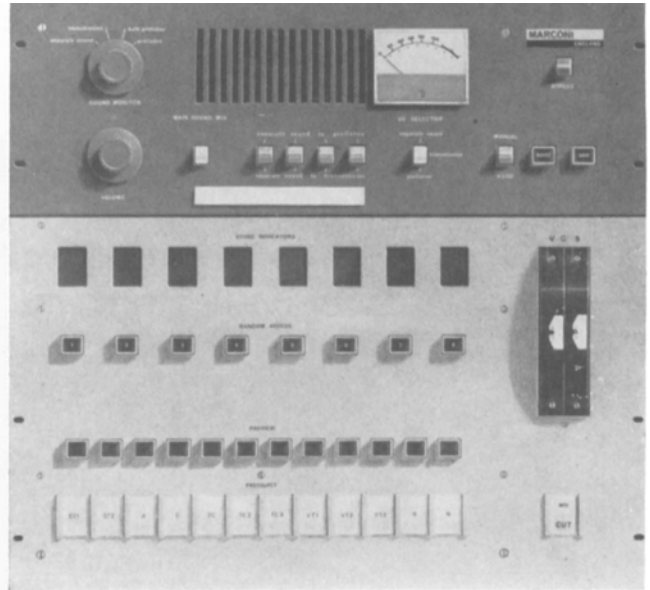


Fig. 4. SAMS Control Panel.

disconnects the display and the read-in and read-out circuits while the uniselector is in motion and mutes the indicator of an event which has been transferred on the air. The three plug-in boards near the event selector are transistor drivers for store selectors, event selector and control relays.

*Vision and Sound Switcher*

A relay Presentation Mixer (Fig. 3) is used

to switch 12 married vision and sound inputs. The heart of the unit is formed by a 12 X 3 relay matrix using plug-in wire contact relays. Each relay switches vision, balanced sound, and provides revertive cues to the control panel. Plug-in buffer amplifiers isolate the vision input lines from the capacity of the matrix and provide high input impedance. All vision inputs can be bridged to other equipment, if

required. Two outputs of the matrix are used in a preset type of configuration. The third output is used as a roving preview/prelisten. A hinged cover over the relays carries the output amplifiers and two regulator boards for amplifier supplies. The unit is housed in a dustproof box suitable for rack mounting.

*Processing Amplifier*

The outputs of the switching matrix are connected to the Processing Amplifier, which consists of two cut-in-blanking amplifiers, sync and burst separator, A/B mixer, clamped output amplifier and two universal sound amplifiers. All plug-in modules are mounted in a single 7-in. frame for installation in a 19-in. rack.

The first cut-in-blanking amplifier provides cutting during the field blanking period between the two main vision outputs of the preset type switcher. The second cut-in-blanking amplifier gives clean transitions between the cut line and the output of the A/B mixer for fading or mixing. During fading the output of the sync and burst separator is connected to the second input of the A/B Mixer. During mixing this second input is fed with the auto-preview signal. The amplitude of sync and color burst is maintained constant during both fade and mix. In the output amplifier any bounce due to cutting or mixing is removed by clamping and three 75-ohm outputs are provided. For monochrome, the output amplifier includes a peak white clipper and bottom of sync clipper. The two universal sound amplifiers provide isolation between the switching matrix and the output line during normal and bypass conditions.

*Control Panel*

The control panel (Fig. 4) can be mounted into a 19-in. console or fitted into a desk.

At the bottom of the panel are 12 self-illuminating momentary-touch buttons used to preselect the next source. A single button of the same type, designated MIX/CUT, is used to transfer the preselected source to on-air. The light in the top half of this button shows when the "mix"

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condition is selected. The buttons are designated by transparent film inserts with black letters.

Change of source allocation can easily be carried out by simple rewiring of store indicator levels and change of button inserts. A sheet of film containing various designations is provided.

Above the preselection row are two rows of smaller self-illuminating buttons, one for roving preview/prelisten selection and the other for random access to the Eight Event Store. The designation of sources preset in the Store is shown on the alpha/numeric indicators, situated above these buttons. To the right are the vision and sound faders, designated respectively V and S.

At the top of the panel are mounted the prelisten loudspeaker, VU meter and various controls for sound monitoring and separate sound switching. In the top right-hand corner are the sound and vision Bypass switch and the controls for store operation (Auto/Manual Switch and Reset and Skip buttons).

#### Operation

*Manual Mode:* Operating one of the 12 preselection buttons on the control panel causes the selected vision source to appear on the auto-preview monitor. Similarly the married sound source is available for monitoring to both a VU meter and the prelisten loudspeaker. The selected button then shows a green light. This source may

be now transferred to on-air by a vision cut, fade, or mix and sound by either a cut or a fade.

When the "cut" button is pressed, the preselected vision and sound signals are taken on-air via the cut-in-blanking amplifier and a sound relay respectively. The source which was on-air will now revert to the auto preview/prelisten condition. The preselection button corresponding to the on-air source shows a red light.

To obtain a fade of vision and sound both faders are moved down. At the bottom of the vision fader travel a microswitch is operated, which effectively replaces the "cut" button. The preselected vision and sound sources are transferred to on-air as for a cut but, with the faders down, no outputs are available. As the faders are moved up the new source is faded up and fed to transmission. The sound fader can be operated independently from the vision fader although the actual program switching can occur only at the bottom of a vision fade. This permits the use of the sound fader with separate sound inputs without accidentally switching the vision output.

Any one of the four separate sound inputs may be fed to on-air by pressing the appropriate sound switch downwards. Upwards operation will make the source available for prelisten.

The "Main Sound Mix" switch allows the superimposition of the married sound source on the separate sound source.

To preselect "mix" the vision fader is pushed upwards against a spring pressure, the top half of the "Cut" button then lights to indicate that mix is selected. Moving the two faders down will then produce a vision crossmix between the on-air and auto-preview pictures and a fade down on on-air sound. At the bottom of the vision fader travel a micro switch is operated which restores the vision path to the cut condition by passing the A/B Mixer, and produces the cut to the new sound source. Returning the faders up will fade up the new sound source but no change in vision will be produced.

The sound monitor selector switch allows separate sound, transmission, auto-prelisten and roving prelisten to be monitored on the prelisten loudspeaker. Similarly, separate sound, transmission and auto-prelisten can, by operation of the VU selector switch, be monitored on the VU meter. A separate amplifier and loudspeaker will be used for a quality sound check of the transmission sound.

*Automatic Mode:* This mode of operation has all the facilities of the manual mode. It is particularly useful for switching sources during a commercial break covering a number of events. During the program preceding the break the operator can feed the switching sequence information into a memory. The Eight Event Store is set to the first event by using the "Reset" button. Event 1 random access button will light to show this condition. One of the random access buttons will always be illuminated to show the next event to be loaded during read-in, or the next event to be put on-air during read-out. Pressing the appropriate preselection button will then put the required source into the first store position of the memory. The store automatically

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steps onto the second event which can be filled using the source preselection button appropriate for this event. Eight events can be stored in this way at which point the memory automatically returns to event 1 ready for read-out. If less than eight events are needed, the "Reset" button can be used to return to event 1.

The alpha-numeric event indicators show the chosen sequence for the break and this can be checked against the program schedule. Corrections or changes can be made in the store at any time during the read-in, waiting, or read-out periods. Changes can be made to any event including the one already preselected. These changes are made by operating the random access button for the event to be changed and simultaneously pressing the preselection button of the new source required.

At the start of the break the first event is monitored automatically. The actual transfer is achieved in exactly the same way as for the manual operation already described. Once the first event has been transferred to transmission the second event is automatically preselected and available for vision and sound monitoring. Similarly, once this event is transferred the third event is automatically preselected and so on through the entire sequence. If more than eight events are required for a particular break, the ninth and tenth events, for example, can be inserted in the first and second positions of the memory by using the random access facility immediately after the earlier events have been taken. At the end of the eighth event, the store will automatically return to the first event and the sequence can be continued in-

definitely. In this way, although the memory can only store eight events at one time, unlimited sequences can be handled with ease. A "Skip" button is included in case it is desired to reject an event already entered into the memory.

At any time when the schedule is changed at the last minute and there is no time for corrections the operator can go to the manual mode, and carry on with switching according to the new schedule.

#### Machine Control

The basic equipment described does not include machine control because for this facility it is very difficult to formulate common requirements that will result in a standard design. The present system can be used with an additional machine control panel from which telecine and video-tape machines are remotely controlled. Alternatively, a more sophisticated system can be designed on a custom-built basis.

All buttons necessary for machine control could be incorporated on the switcher control panel with three preselection buttons for each multiplex telecine so that each projector can be treated as a separate source. Any machine or projector which is selected as the next event can be started by a single "Start" button. If the runup times of all the machines are equalized by, for example, adding suitable lengths of leader on film and tape, then an automatic transfer to on-air can take place after a fixed delay following the operation of the "Start" button. If this method of equalization is not convenient, then two separate delay circuits can be provided, one for telecines and another for video tape machines. Normally any projector will "show" as soon as the "Start" button is operated, provided that no other projector of the same multiplex machine is running, in which case showing would be delayed to coincide with the transfer of this projector to on-air. Additionally, a non-locking "Still" button would permit preview of a still frame of any next event source. The on-air machine stops automatically when it is taken off the air.

#### Conclusions

Due to present-day complexity of presentation techniques, a certain degree of automation is a desirable feature in master control areas. For the majority of smaller stations where a fairly rigid time schedule is not possible a fully automatic system may not be economically justifiable. In such cases a simple non-clock system as described, which allows a sequence of events to be preset but with the timing under the operator's control, offers the best solution.

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