SPLIT SCREEN EFFECTS UNIT UN4/502 SERIES

Introduction

The UN4/502C is a unity gain device forming part of a television studio mixer, e.g., the MX1/502A. It accepts two video inputs and switches between them to provide an output signal which gives a picture split into two parts, each showing part of one of the two input pictures. It normally operates on the 625-line standard but can also operate on 525-line or 405-line standards. The unit contains its own keying waveform generator which produces twelve basic switching waveforms patterns. It also contains pulse processing units for providing black-edged caption and colour-difference overlay facilities. It is remotely controlled from the main mixing position and provides main and monitoring outputs, each 1 volt across 75 ohms.

The unit consists of twelve CH1/12 sub-chassis as listed below, mounted in 2PN3/23 chassis. Another version, the UN4/502B, is electrically similar but the sub-chassis are mounted in two PN3/21 chassis bolted together. The corresponding ' black and white ' versions are UN4/502 and UN4/502A, but these do not have the overlay facility.

The sub-chassis are as follows:

GE1/507A	Line Sawtooth Generator
GE1/506	Field Sawtooth Generator
GE1/511	Sawtooth Generator
GE2/505	Clamp Pulse Generator
GE2/506A	Switch Pulse Generator
GE2/507A	Line Pulse Generator
GE2/509	Iris Pulse Generator
GE2/515	Line Bar Generator
GE2/516	Field Bar Generator
PS2/503A	Power Supplier
UN9/514	Video Switch
GE2/526	Caption Pulse Generator

In addition there is an NE1/516, consisting of a single fibre-glass panel mounted behind the other units.

General Description

A block diagram is given in Fig. 1. The basic element of the UN4/502C is the fast acting video switch in the UN9/514. The switch is fed with two clamped video signals having normally identical black-level potentials and driven by signals from the GE2/506A. The driving signals are originated and formed in other units of the UN1/502C or are developed from video caption or colour difference signals. The mode of operation, i.e., split screen or overlay is set by means of relays in the NE1/516 under control of keys on the associated mixer. Overlaid letter captions or other material, may be infilled with signals from another source.

The split screen effects are produced by a number of relays which switch the various generators in and out of circuit. The relays themselves are controlled by a diode matrix system operated from the main mixer control panel. The matrix system is indicated diagrammatically in Fig. 2. The selection of the various wipe patterns is by means of 16 push button keys, one for each pattern. (N.B. only 12 patterns are shown in Fig. 2, but patterns 1, 3, 5 and 6 each have a right to left and left to right key.)

The two sources feeding the video switch may be interchanged by operating a relay in the NE1/516. The direction of wipe, normally up and to the right (see insert on Fig. 1) can be reversed by the operation of relays in the GE1/507A and GE2/506A.

Change of standards is effected by the operation of relays in the GE1/511.

General Method of Operation

The Corner Insert

A line sawtooth with syncs and a superimposed d.c. potential (controlled by the line-d.c. control) is produced by the GE1/507A and fed to the GE2/507A. This produces the line-rate pulses (see Fig. 1) the lagging edge of which can be moved by the line-d.c. control to occur at any point during the line period. It is this edge which determines when the video switch operates and changes over between sources.

Similarly, the GE1/506 generates a field sawtooth. This waveform is mixed with sync pulses and the field-d.c. control potential in the GE2/507A

and then passed to the GE2/506A which produces the field-rate pulses, timed with the leading edge always occurring during a line-blanking period. These field-rate pulses, along with the line-rate pulses, are applied to the line/field gate which only permits the line pulses to pass during that part of the field when the gate is opened by the field pulses. The output of the gate drives the video switch in the UN9/514 via the NE1/516 and thus forms the corner insert.

The insert can be positioned in the top or bottom, right or left corners by changing over the polarities of the field and line d.c. potentials by operating the appropriate pattern keys. The actual size of the insert depends on the magnitude of the d.c. potentials which are set either by the group faders or by a joystick control on the associated mixer, depending on whether the mixer is in the wipe or insert mode.

Any available video signal source may occupy the background and insert spaces and these are interchanged if RL5 is operated (see Fig. 2) to reverse the polarities of the switching pulses to the UN9/514. The video sources may also be interchanged by operation of a key in the NE1/516.

Line and Field Splits (Patterns 1 and 3, Fig. 2)

These are special cases of the corner insert. A vertical split is obtained by suppressing the field input to the line and field gate by RL2; a horizontal split is obtained by suppressing the line input by RL3. It should be noted, in passing, that if a source is wiped in from, say, the left by moving the group faders over their complete travel to the stop position then, when the faders are returned to their starting position, the original picture will also be wiped in from the left. To wipe continuously left to right, right to left, the faders must be held away from their stop positions so that the various changeover relays shall not be operated.

Diagonals (Patterns 5 and 6, Fig. 2)

The diagonals are formed by adding a field sawtooth to the mixed line sawtooth and d.c. control potential. This is done by the operation of RL1B in the GE2/507A. Field rate pulses are not required and are suppressed by RL2 at the input to the line and field gate.

A reversed slope diagonal is obtained by inverting the sawtooth output from the GE1/506 by RL4.

The Iris (Pattern 7, Fig. 2)

Mixed syncs and field drive to the GE1/511 generate sawtooth line and field waveforms; amplitude adjustment is provided for both. These two waveforms are integrated in the GE2/509 to form line and field parabolas. After clamping, the parabolas are mixed together and the mixture used to drive a Schmitt type trigger circuit having very small hysteresis. The threshold voltage of the trigger action is set by the line-d.c. control so that the trigger operates at a selected point of the complex waveform. The action produces a pulse train which, when driving the video RL7, etc., forms a circle of adjustable diameter.

Line Bar (Pattern 2, Fig. 2)

The line sawtooth from the GE1/511 is converted to a triangular waveform in the GE2/515. This waveform, along with the d.c. control potential, is applied to a Schmitt trigger. The point during the line at which the trigger operates depends on when the triangular waveform crosses the threshold potential. The output is a pulse train having adjustable mark/space ratio. This waveform, when applied to the line and field gate and thence to the video switch, forms a line bar of adjustable width with its centre at the centre of the line.

Field Bar (Pattern 4, Fig. 2)

The field sawtooth waveform from the GE1/511 is converted to a triangular waveform and then clamped to remove noise. Differentiated mixed syncs are added to the triangular waveform along with the field d.c. control potential and the resulting complex waveform applied to a Schmitt trigger. The mixed-sync edges ensure that the trigger circuit operates at the end of a line so that the field bar width changes line by line and not during a line. The time during the field at which the trigger operates depends on when the triangular waveform crosses the threshold voltage of the trigger circuit and this depends on the adjustment of the d.c. control potential. The output from the trigger circuit, when applied to the video switch via the line and field gate, produces a field bar of adjustable width and with its centre line at the centre of the field.

The Box (Pattern 8, Fig. 2)

The box is formed by connecting the line and field bar waveforms together to the line and field gate.

Key Waveform Blanking

The key waveform blanking is fed permanently

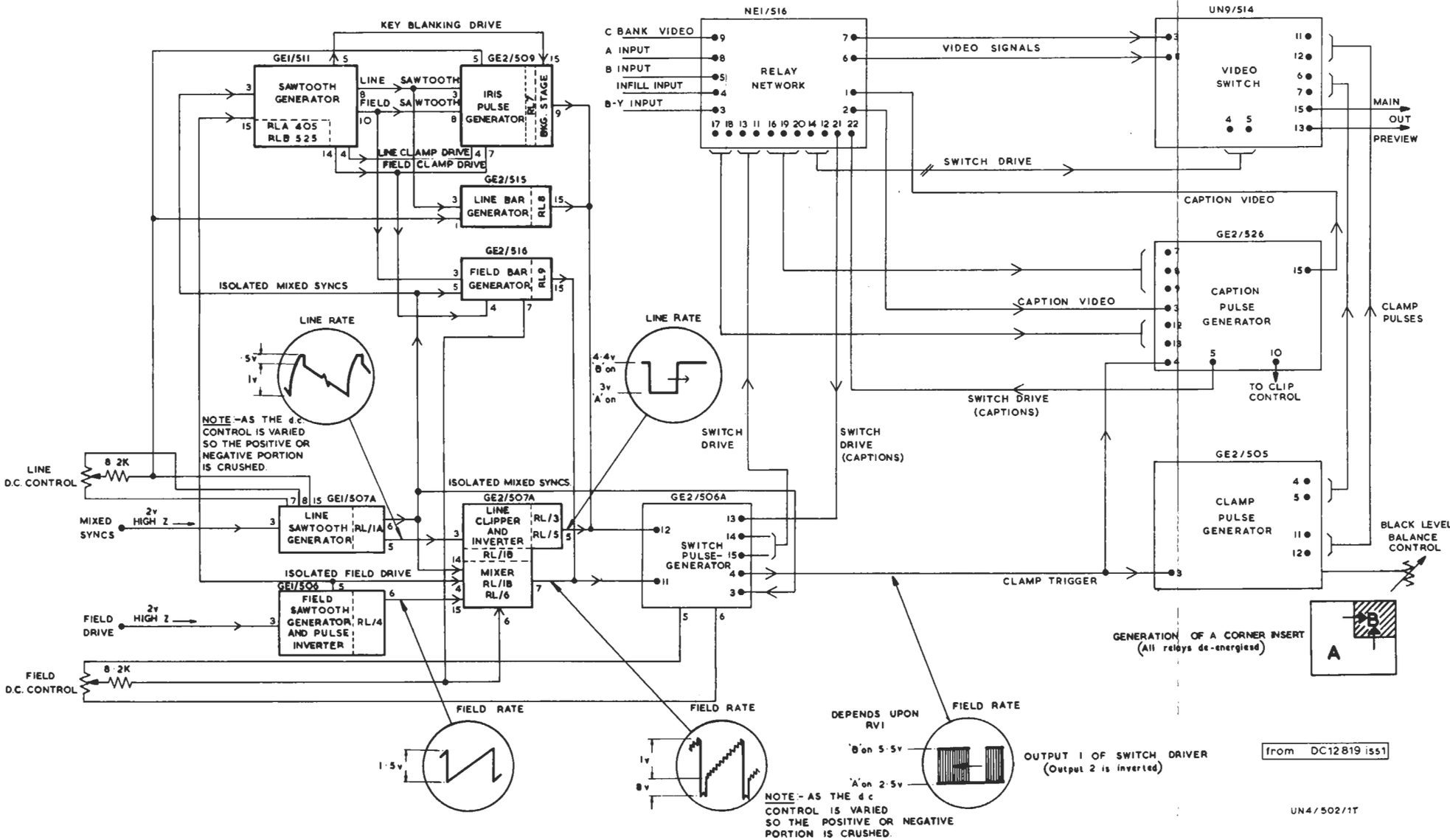

Fig.1 Split-screen Effects Unit UN4/502 Series

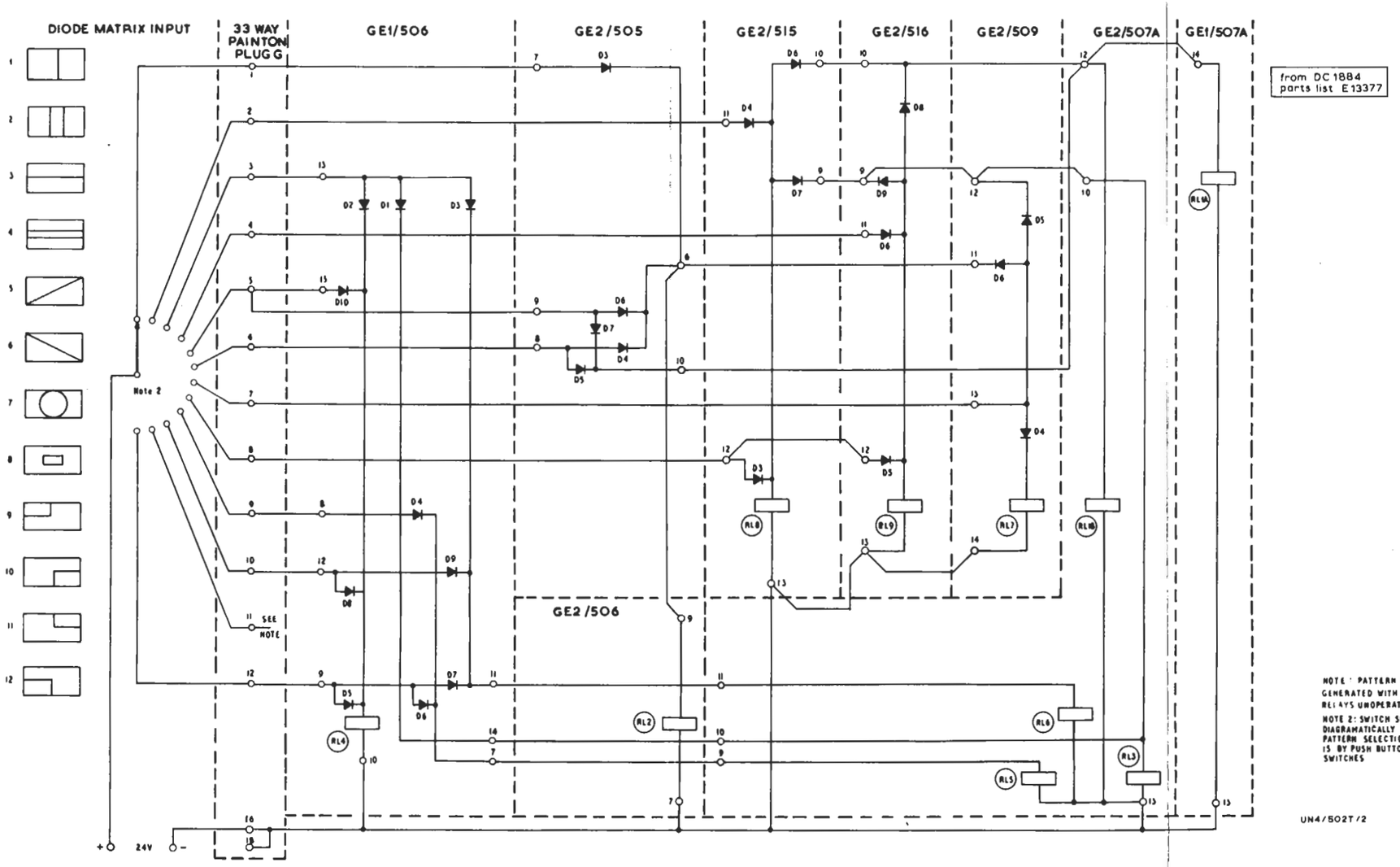

Fig.2 Diode Matrix Circuit for the UN4/502

from the GE2/511 to the input of the line and field gate. It is just narrower than system blanking and prevents switching between sources during the back porch or field blanking periods. This ensures that the blanking reference level is not changed during the picture and thus obviates streaking.

Caption Overlay and Black Edge Effects

The switching pulses to the UN9/514 video switch are produced either in the keying pulse generator circuits, as described above, or in the GE2/526 Caption Pulse Generator, depending on the NE1/516 relay network. When the pulses from the GE2/526 are switched through to the GE2/506A, the action of the line and field gate is inhibited so that only the switching signals from the GE2/526 are passed through.

The GE2/526 is driven by the caption signals and the switching pulses produced just fit the caption letters (or figures) which then completely fill the holes punched in the background picture. Alternatively the switching pulses can occur just prior to, and persist until just after the letters, thus forming a black edge before and after the vertical strokes of the letters. The driving caption signals must be white on a black background, but the white letters may be infilled with other signals

References

1. UN1/502C Designs Department Specification No. 8.317(68).
2. UN1/502 Designs Department Specification No. 8.99(63).
3. Designs Department Technical Memorandum No. 8.144(63).

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