ENGINEERING TRAINING
information sheet

VISION MIXER WIPE PATTERN GENERATION

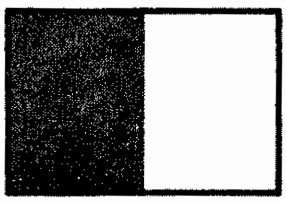
INTRODUCTION

This information sheet is intended to introduce the reader to the techniques used in current wipe pattern generators. The first part deals with the basic wipe patterns usually available and discusses the waveforms and circuitry needed to produce them. The second part of the information sheet deals with the various modifications that can be made to the basic patterns, e.g. soft edges, and the methods used to introduce them.

1. WIPE PATTERNS - WAVEFORMS REQUIRED

In order to produce the range of wipe patterns in use a set of standard waveforms is required. This section deals with the waveforms required to generate a given pattern, together with a simplified explanation of how they are generated in a typical mixer: All wipes are produced by slicing a suitable analogue waveform in a voltage comparator. In many cases two waveforms may be combined to produce wipe transitions with both horizontal and vertical components.

1.1 Line Split



This requires a sawtooth at line frequency. The position of the split is controlled by a reference d.c. fed to one input of a voltage comparator.

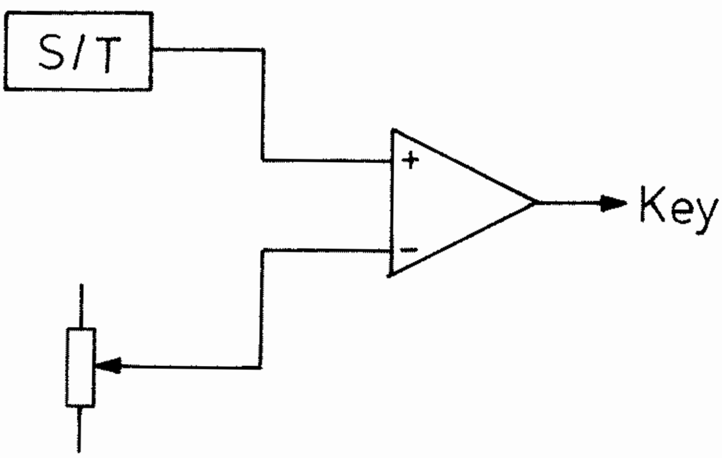


Figure 1: Generation of a line split

The sawtooth is generated by charging a capacitor by a constant current source. The capacitor is discharged each time by a line trigger pulse.

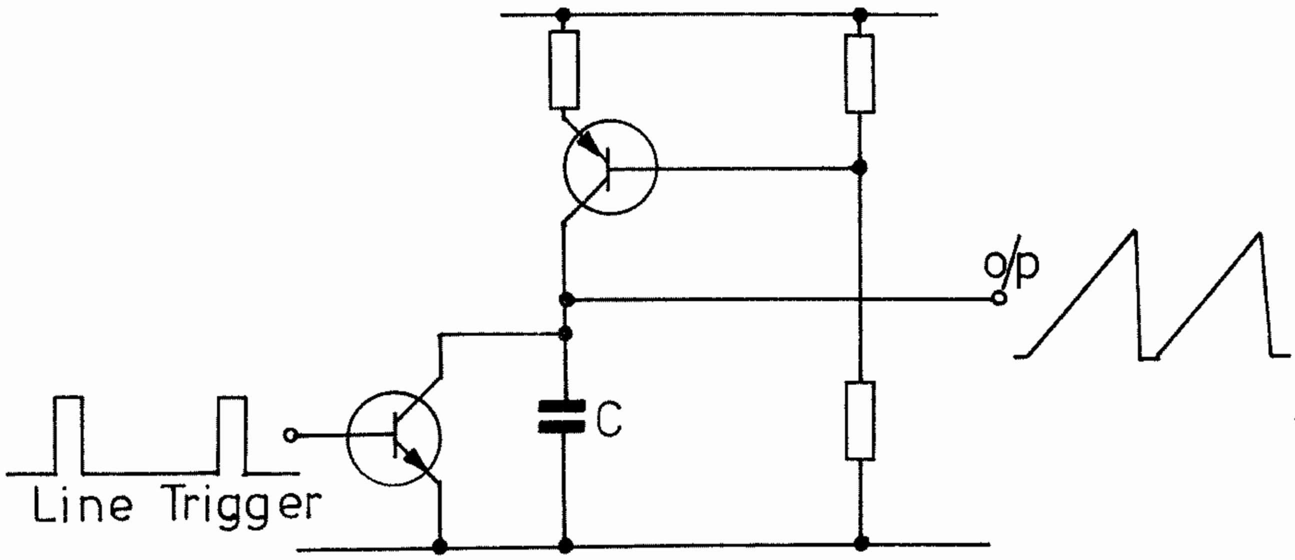
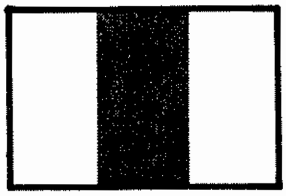


Figure 2: A typical sawtooth generator

1.2 Field Split

This is essentially the same as the line split, except that a field sawtooth is required.

1.3 Line Bar



This requires a triangular waveform at line frequency, but operates in the same manner as the line split.

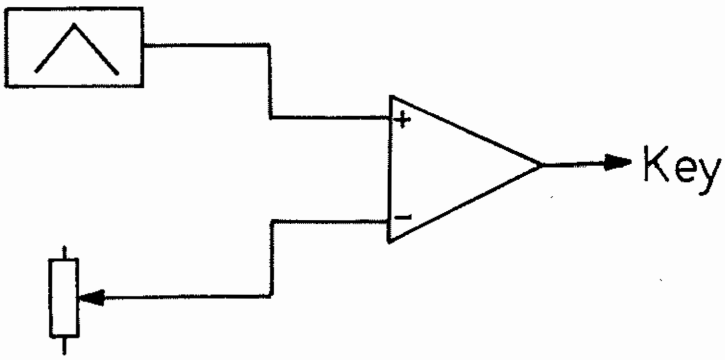


Figure 3: Generating a Line Bar

The triangular waveform is generated by alternately charging and discharging a capacitor through constant current sources.

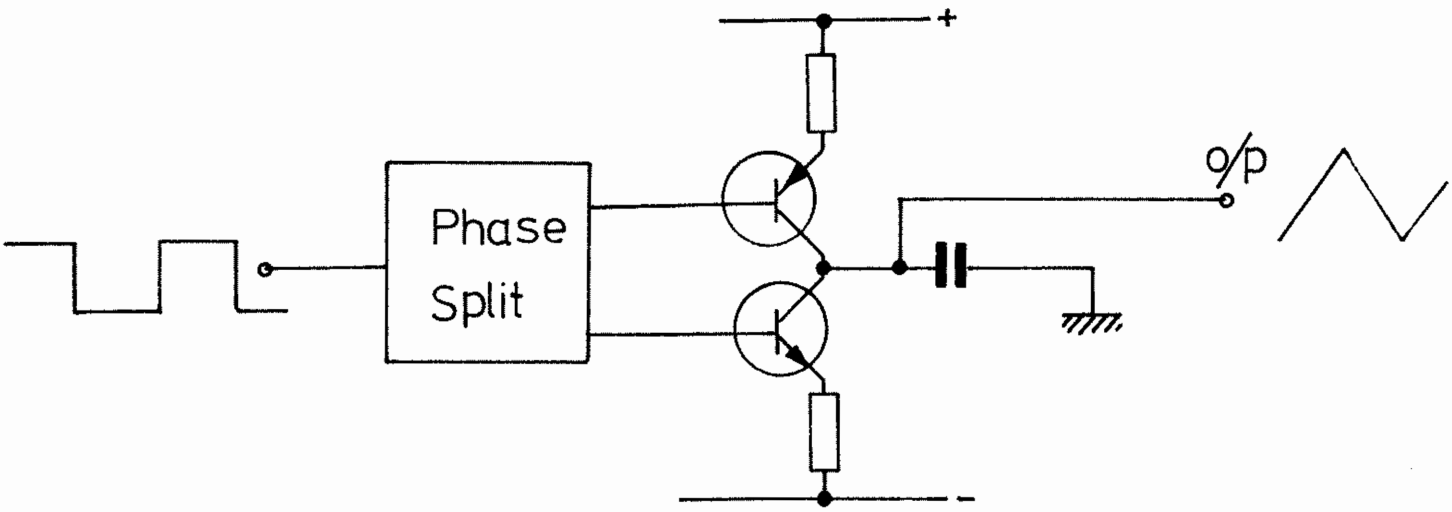


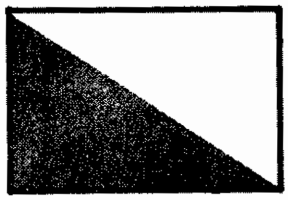
Figure 4: A Triangle Waveform Generator

VISION MIXER WIPE PATTERN GENERATION

1.4 Field Bar

This is generated as for the line bar, but using a field frequency triangular waveform.

1.5 Diagonal



This is produced by adding a line sawtooth to a field sawtooth before the voltage comparator.

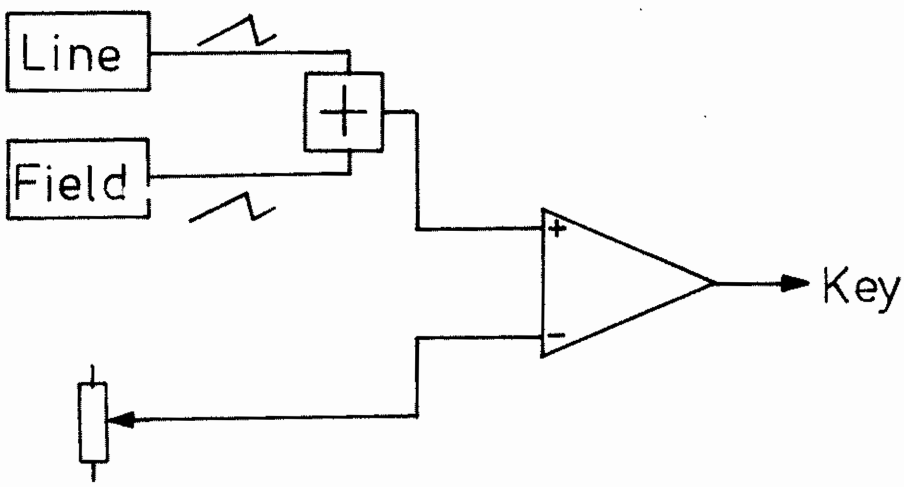


Figure 6: Generating a Diagonal Wipe

A simplified description of waveforms is shown in figure 7.

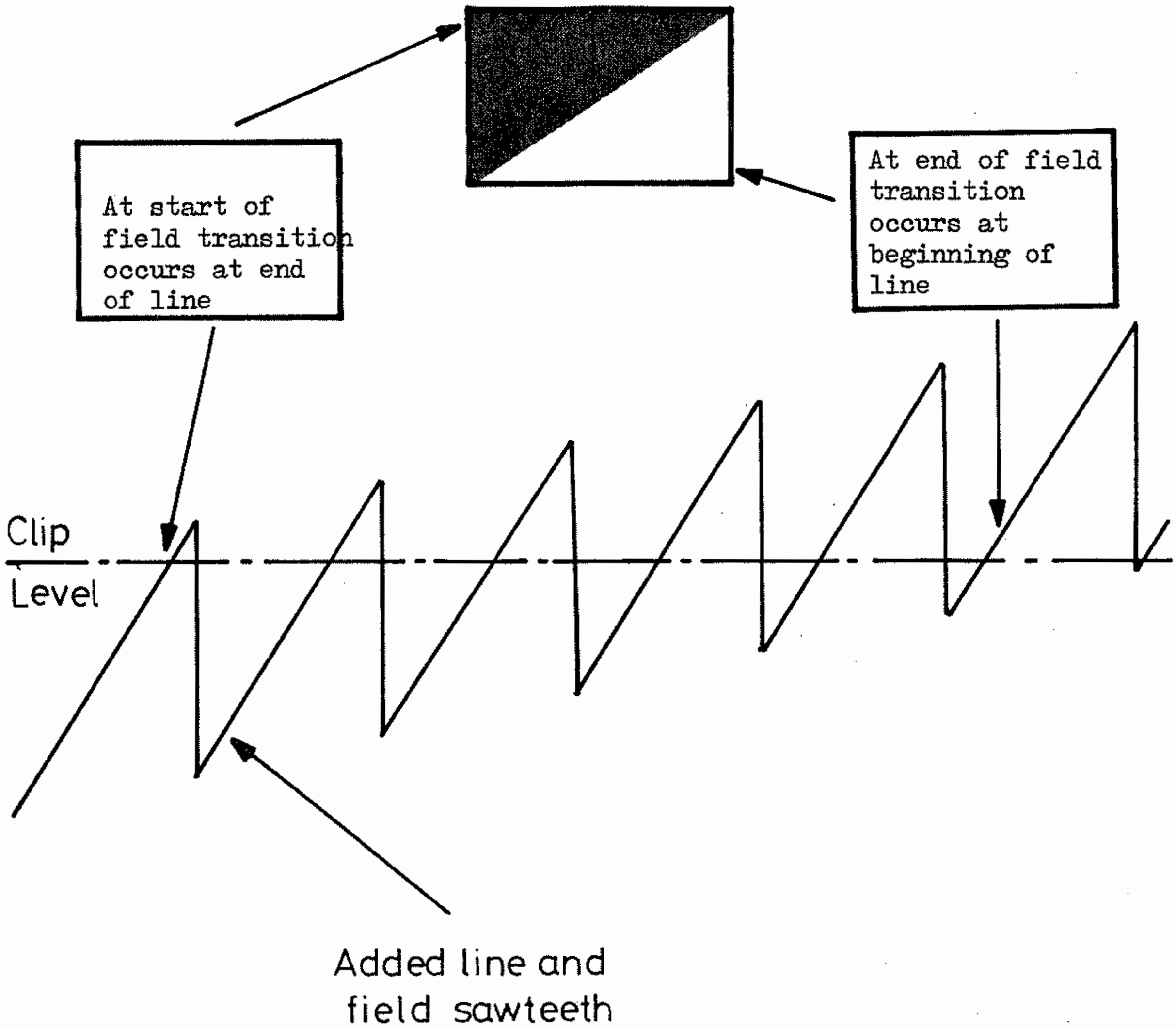
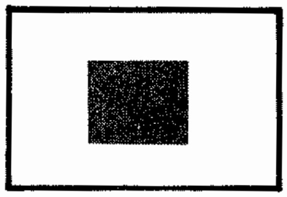


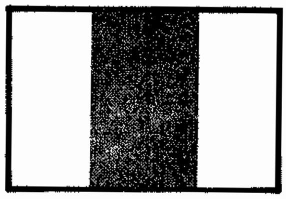
Figure 7: How a diagonal wipe is generated

Inversion of the line and/or field waveforms will enable the four diagonals to be produced.

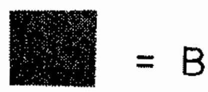
1.6 Box



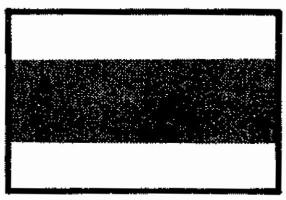
This is produced by combining in an AND gate the line and field bar keying waveforms such that only when:



selects input B



AND



selects input B will input B be selected.

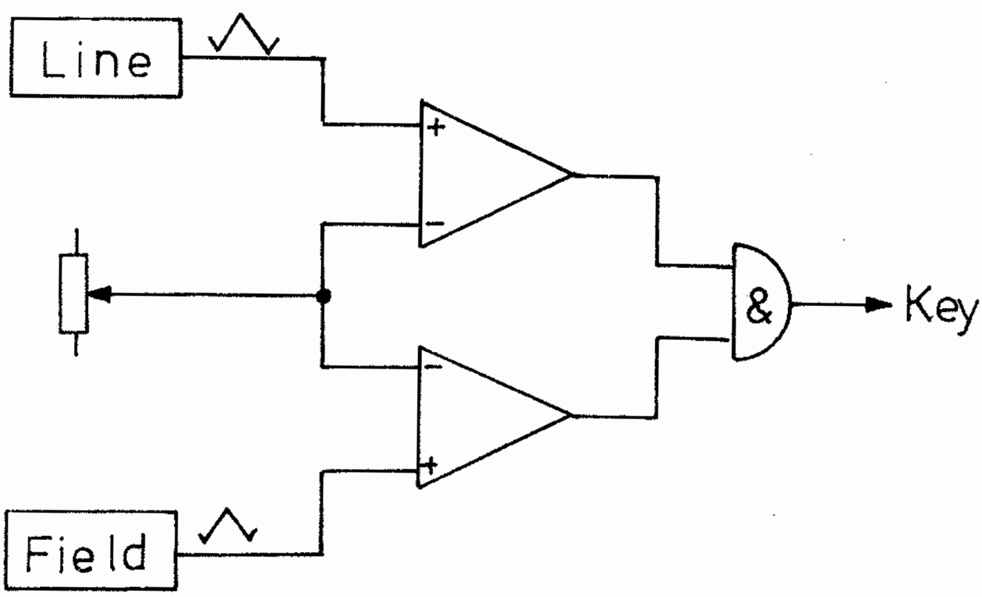
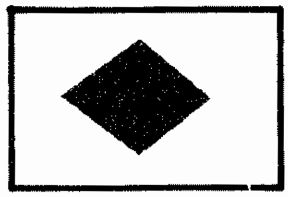


Figure 8: Generating a Box Wipe

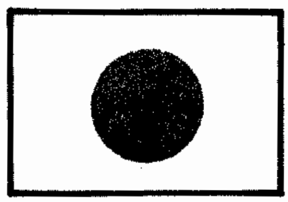
If line and field sawtooth waveforms are used in place of the triangular waveforms a corner wipe is produced.

1.7 Diamond



This is similar to the diagonal wipe only line and field triangular waves are added.

1.8 Circle



This is produced by adding line and field parabolas before the voltage comparator.

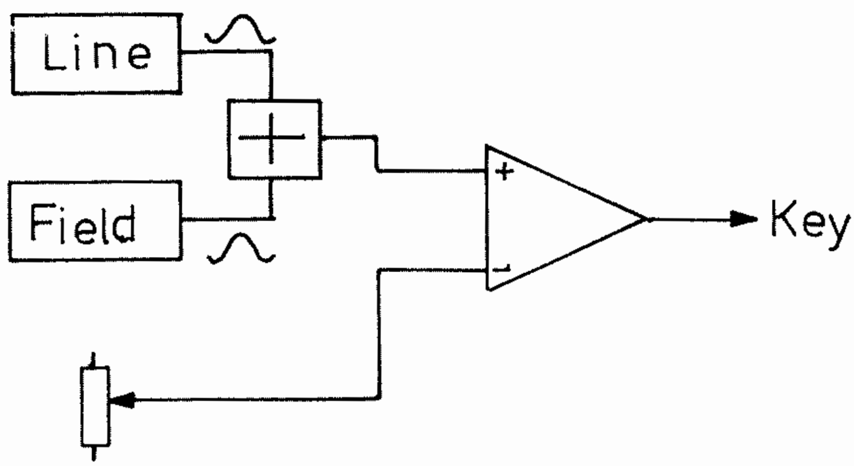
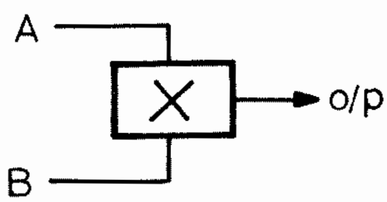


Figure 9: A circle wipe generator

The parabola waveforms are generated from the triangular waveforms in multiplier stages:-



O/P = A x B

if A = B then O/P = A^2

$\therefore$ Generator =

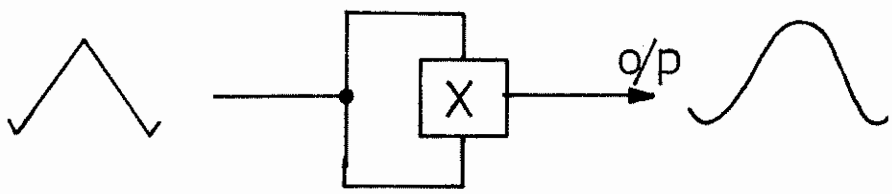


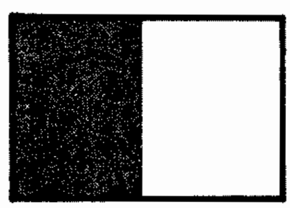
Figure 10: Production of a parabola

2. WIPE VARIATIONS

2.1 Multiples

The wipe generator circuitry permits the generation of up to 8 multiple wipes in both the line and field directions. This is achieved by triggering the basic waveform generators from an oscillator locked to line (or field) frequency but operating at a multiple of line (or field) frequency.

Consider the simple line split:-



This is produced by a line sawtooth and a comparator.

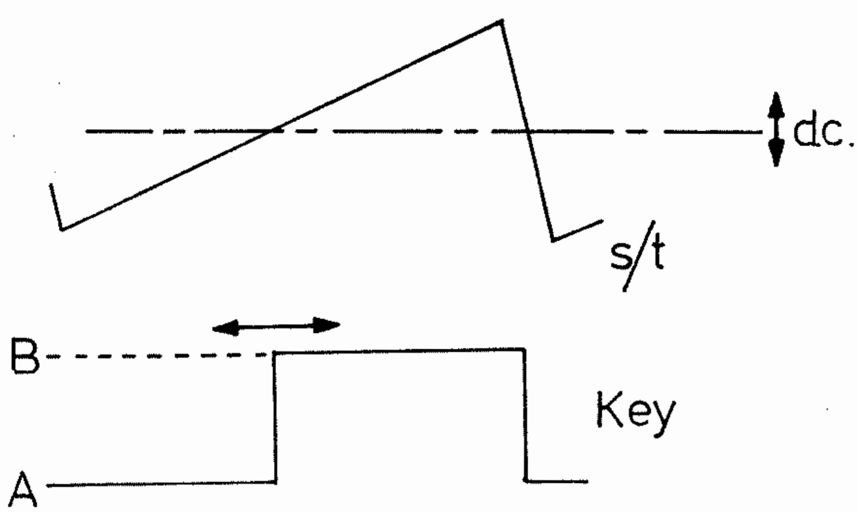
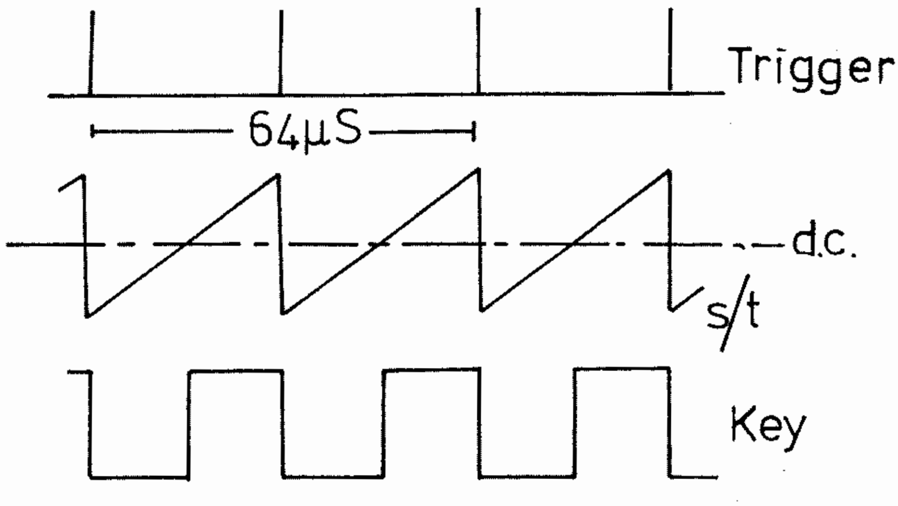


Figure 11: Production of line rate wipe pattern

If the S/T generator is triggered twice per line:-



the display becomes:-

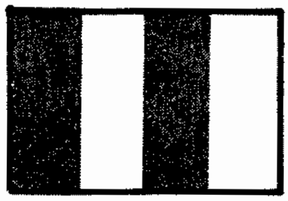


Figure 12: Generating 2 wipes per line

This can be repeated for 4x and 8x line frequency.

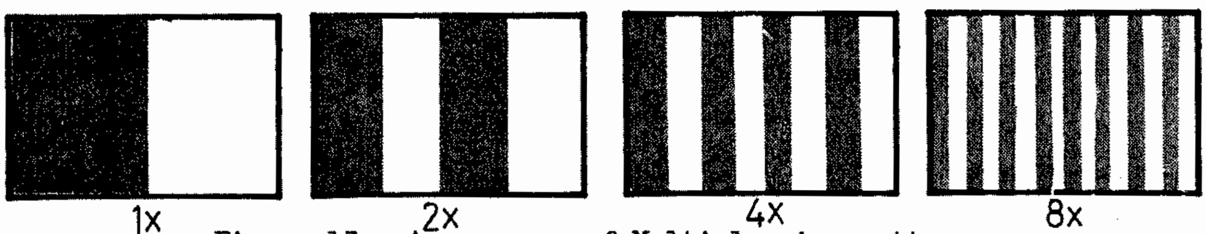


Figure 13: Appearance of Multiple wipe patterns

This can also be carried out at field rate, and on the triangle as well as sawtooth waveforms. (Consider an 8x multiple diamond!)

The only real complication resulting is that the sawtooth and triangle generators have to generate constant amplitudes irrespective of the operating frequency.

2.2 Shift Centre

The shift wipe centre facility is effected by phase shifting the line and field reference pulses which trigger the line and field waveform generators.

The phase shifting process is carried out by means of a ramp and comparator, in a similar manner to the technique employed for the line split:-

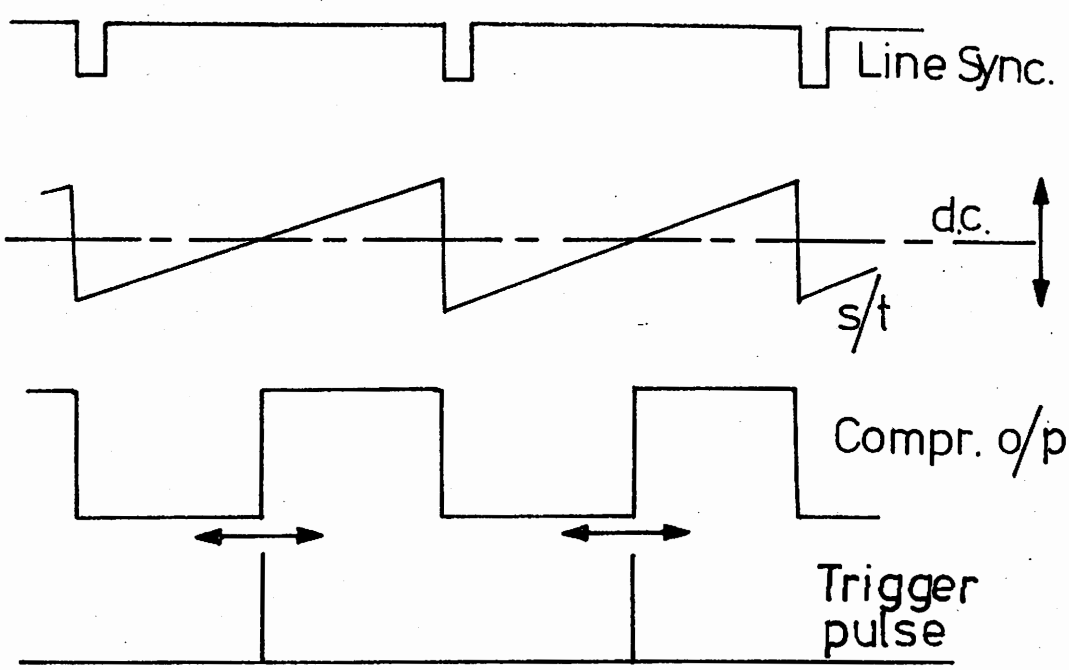


Figure 14: The shift centre process

This trigger pulse is delayed by half line and used to trigger the line timing circuits.

A similar technique is used for the field wipes.

A circuit to achieve this is shown in figure 15:

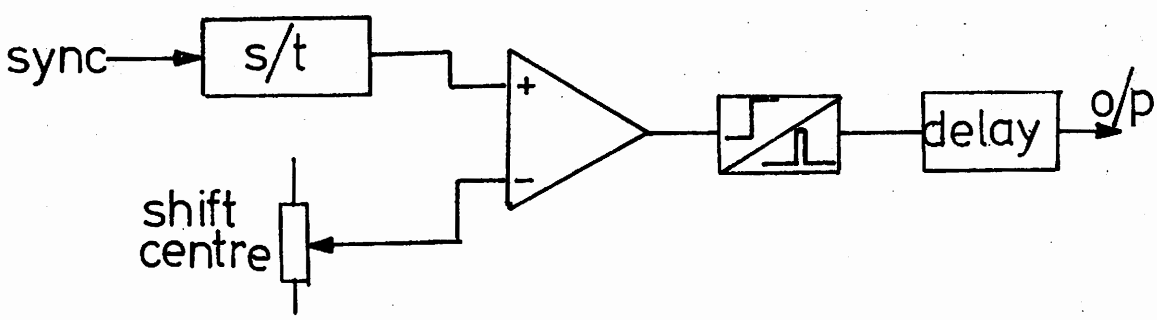


Figure 15: A shift centre circuit

2.3 Modulated Line Ripple

This enables vertical transitions to be modulated by a sinusoidal LF waveform:-

Figure 16: Comparison of normal and modulated edge wipes

The process is also carried out by means of a voltage comparator and sawtooth generator. The reference input of the comparator consists of a fixed d.c. on which is superimposed a sinusoidal ripple, of variable amplitude and frequency.

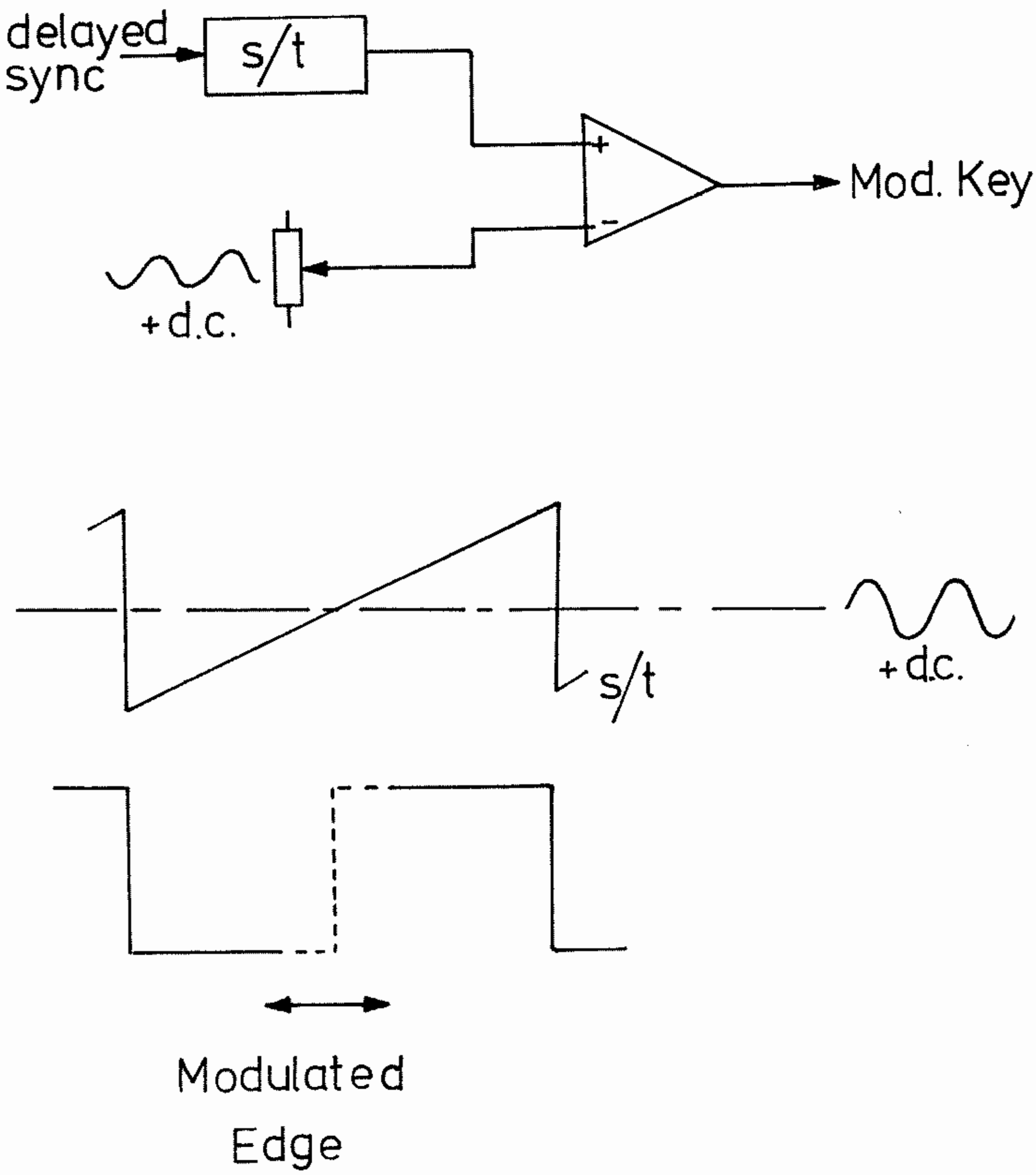


Figure 17: Production of modulated edge

With no ripple component selected the reference d.c. occurs half-way along the sawtooth, thus the circuit can be used to introduce the additional half-line delay required by the shift-centre circuits.

2.4 Soft-Edge Wipes

Two essential elements are required in order to produce a soft-edge wipe. One is that the split screen switch has to consist of a pair of fading elements, so connected that a rapid cross-fade occurs at the point of the switch transition.

The speed of the cross-fade depends on the rise time of the signal controlling the faders.

Thus in order to produce a soft-edge wipe the keying waveforms must have a slow transition speed between the A and B states:-

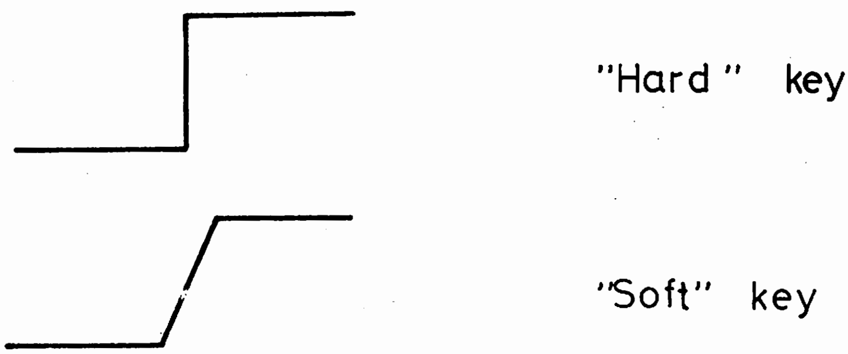


Figure 18: Difference between "Hard" and "Soft" key signals

The soft edge key is generated by a suitable voltage comparator.

A conventional voltage comparator exhibits extremely high voltage gain so that only a very small change in input voltage is required to cause the output to change state.

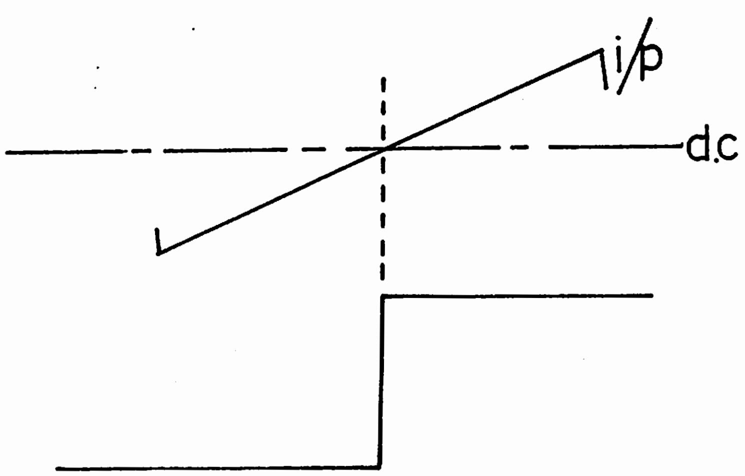


Figure 19: Operation of a "Hard" comparator

The soft edge comparator consists of a relatively low-gain long-tail pair amplifier. The low gain results in the comparator exhibiting a "window" area, over which linear amplification of the input signal occurs:-

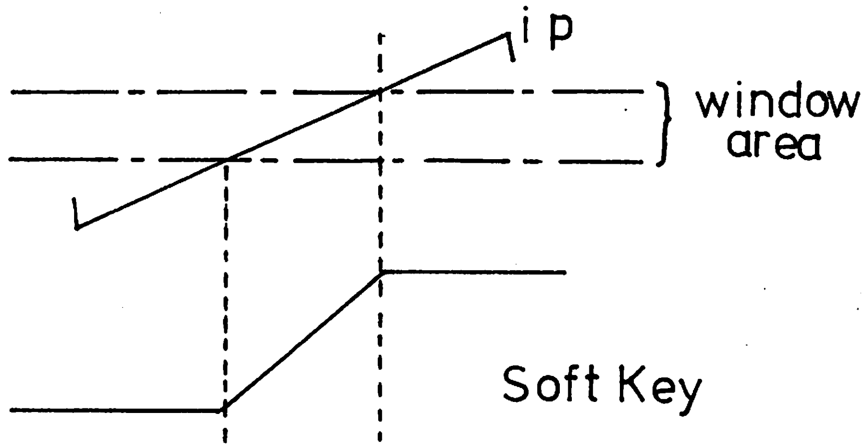


Figure 20: Operation of a "Soft" comparator

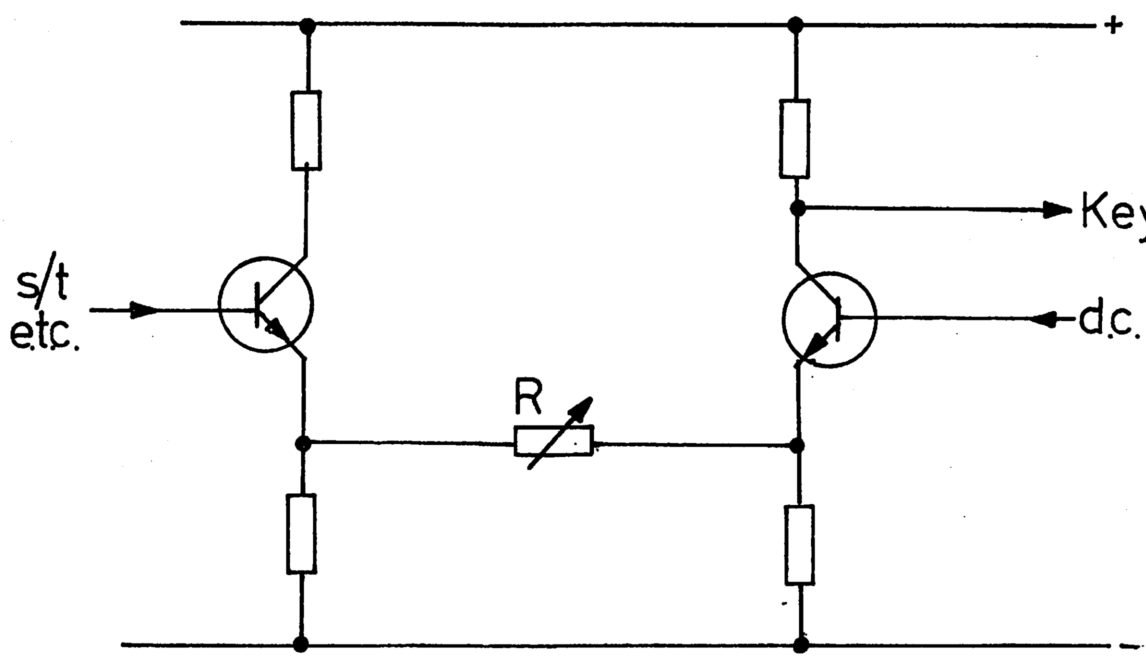


Figure 21: A typical Soft Edge Comparator

Changing the value of R changes the gain of the stage and hence the "window" area. If R is very small then the gain of the stage is high, and the comparator operates in a similar manner to a hard comparator.

M.B. Tancock/VC
24th January 1978