

Kentech Instruments Ltd.

Slow Sweep Unit
STREAK CAMERA

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PLEASE READ THIS MANUAL CAREFULLY BEFORE USING
THE SWEEP UNIT.

Serial Number XXXXXXXXXX

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DISCLAIMER

This equipment contains high voltage power supplies. Although the current supply capacity is small, careless use could result in electric shock. It is assumed that this highly specialised equipment will only be used by qualified personnel.

Kentech Instruments Ltd. accept no responsibility for any electric shock or injury arising from use or misuse of this equipment. It is the responsibility of the user to exercise care and common sense with this highly versatile equipment.

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1 INTRODUCTION

This manual describes the operation and use of the Kentech Sweep unit. The manual gives the mechanical and electrical specifications and describes the setting up procedure.

1.1 SPECIFICATIONS

Trigger delay sweep unit	~40ns on the fastest setting, see timing graphs
Number of sweep speeds	four
Supply	Universal
Sweep Trigger input	Normally 10volts, rising in 1ns for minimum delay 8 Volts and 6ns fwhm is just enough to trigger the unit, but good jitter will require a larger signal.
Sweep hold off time	approximately 20ms
Repetition rate	10Hz.

2 CIRCUIT DESCRIPTIONS

The sweep circuit has two separate ramp generators one for the two faster speeds and a second for the two slower ones. The fast unit is based on two high voltage avalanche step generators unique to Kentech. These two generators provide balanced steps of amplitude +/- 1.5kV into 100W loads, with a rise time of <1ns. These generators are fed into the sweep leads via 50W reverse terminating resistors, which reduces the amplitude to > 0.75kV. When this edge reaches the open circuit end at the sweep plates it doubles up to > 1.5kV. The reverse pulse is absorbed by the reverse terminating resistors. A block diagram of the unit is shown in [figure 5](#).

Different sweep rates are obtained by the switchable pulse forming LCR network and selected by the two most clockwise positions of the sweep rate switch (see [figure 6](#)). The sweep leads form part of this network and their length must therefore not be changed.

For the two slower speeds a FET based ramp generator using a Miller integrator is used. This is switched to directly by the sweep speed selector. The four sweep speeds are selected with the speed selector which switches resistors in the Miller integrator network. This type of ramp generator is more linear than an avalanche unit and so it is unnecessary to achieve such high voltages. A result is that the start position has to be closer to the screen edge than the avalanche unit.

A further function of the sweep unit is to provide the required bias voltages to define the start of the sweep (see [figure 8](#)). There are three positions, "FOCUS", "SYNCH" and "OPERATE". In Focus mode the trigger is inhibited and the bias voltages set to zero. In Synch. mode the trigger is enabled and the bias voltages are set by the bottom preset on the rear panel. A value should be chosen that puts the unswept image just on the screen edge. In operate mode the trigger is enabled and the bias is set by a preset on the rear panel, one for each sweep speed. These have been factory set to the position that ensures optimum linearity and lack of flyback onto the screen due to oscillations in the ramp generator circuit.

The sweep unit supplies a monitor output pulse which may be used for synchronisation.

3 DATA SHEETS

3.1 SWEEP CIRCUIT

This sweep circuit has been set up for non standard sweep rates.

Sweep speeds, nominal.

Speed 1	20	V/ns
Speed 2	40	V/ns
Speed 3	76.3	V/ns
Speed 4	256.5	V/ns

3.2 TRIGGER DELAYS

The time between a fast trigger signal arriving at the trigger input of the sweep generator and the ramp voltage reaching the voltage which corresponds to screen centre is given below. Further allowance needs to be made for the time of flight of x-rays from the target to the cathode, for the flight time of photoelectrons from the cathode to the sweep plates and to any extra cabling between the sweep plates and the leads provided. These figures should be used as a guide only. They are only valid at the factory set bias settings.

Unit 1

Sweep 1 54.8ns

Sweep 2 46.8ns

Sweep 3 43ns

Sweep 4 39.6ns

For Unit 2 subtract 1ns from the above

For Unit 3 subtract 3ns from the above

3.3 BIAS VOLTAGES

Bias SYNCH user to set for a tube with a round screen and a deflection requirement of ± 407 volts full screen we suggest a bias of around ± 150 volts.

Bias OPERATE

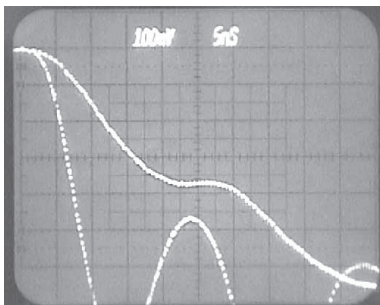
Sweep Speed 1 300 volts

Sweep Speed 2 350 volts

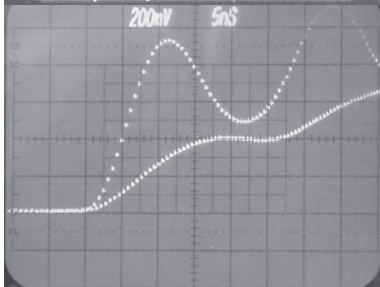
Sweep Speed 3 436 volts

Sweep Speed 4 700 volts

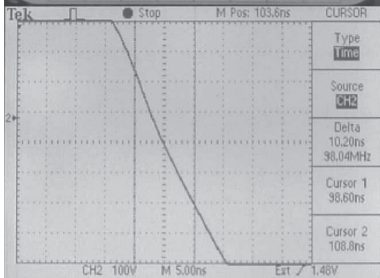
With these settings the trigger delays above correspond to the time for the ramp to reach the bias voltage, i.e. screen centre.



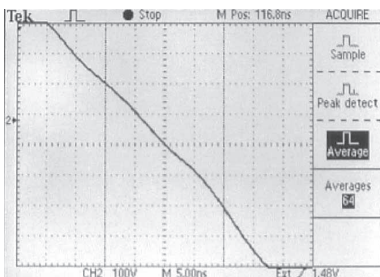
Sweep speeds 3 and 4
 76.3 and 256.5 V/ns
 218V/div, 5ns/div
 The steps and oscillations are due to the reflections round the 2 meters of cabling.
 It is important to keep the bias low enough that the oscillation on sweep speed 1 does not retrace the screen.



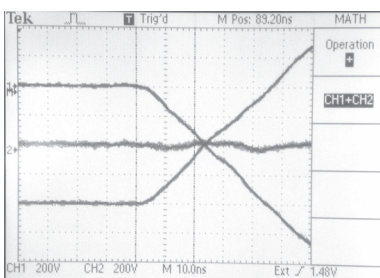
Sweep speeds 3 and 4
 76.3 and 256.5 V/ns
 436V/div, 5ns/div



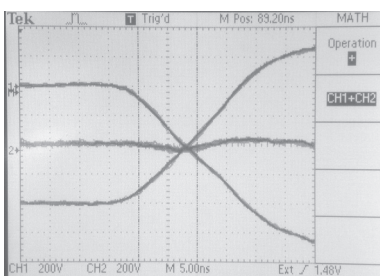
Sweep speed 2
 40 V/ns
 100V/div, 5ns/div



Sweep speed 1
 20 V/ns
 100V/div, 5ns/div
 Wobbles are due to transit times around the 2 meters of cable.



Sweep speed 1
 ramp balance



Sweep speed 2
 ramp balance

Figure 1 The ramp speeds

Sweep +ve Ramp

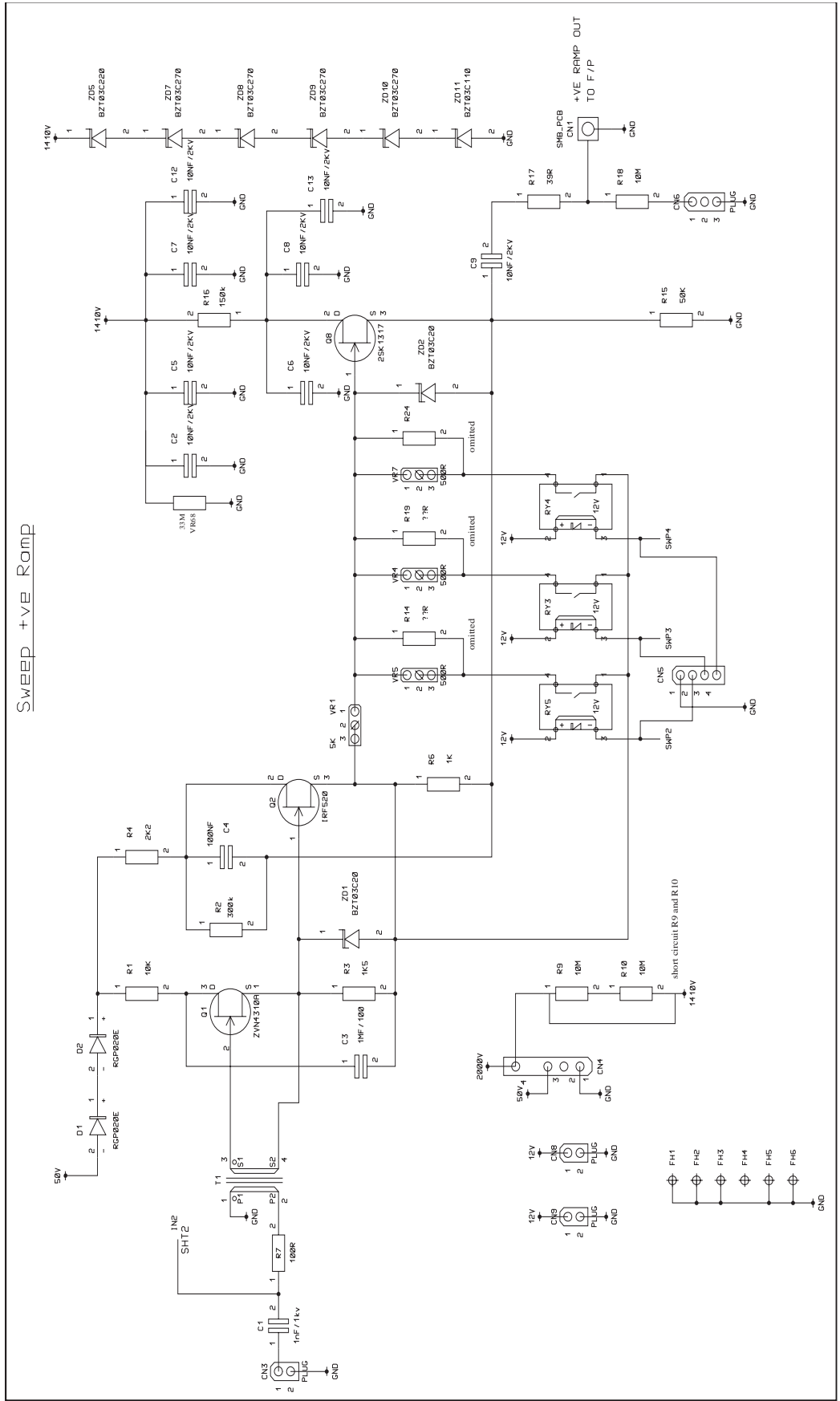


Figure 2 Positive slow ramp generator

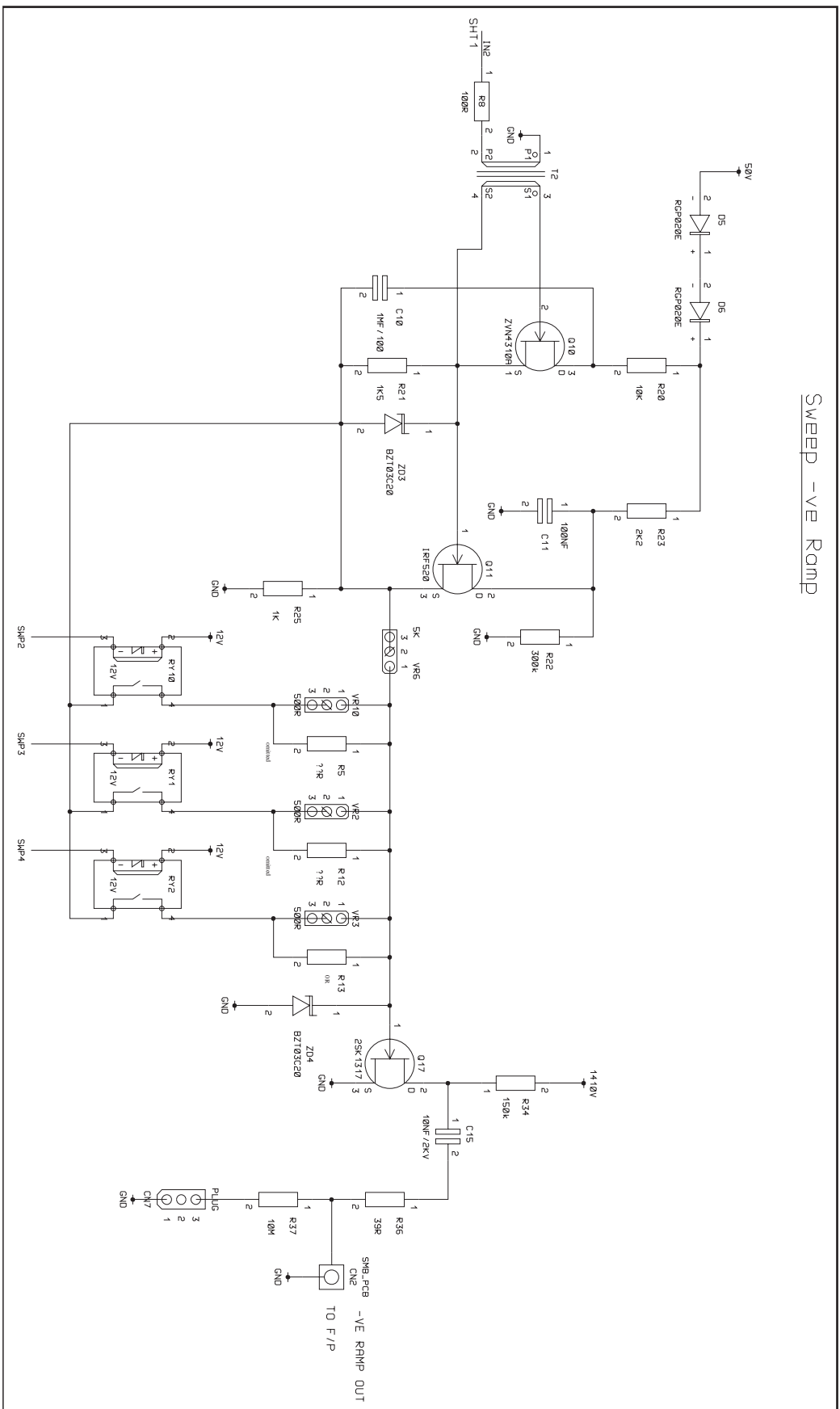


Figure 3 Negative slow ramp generator

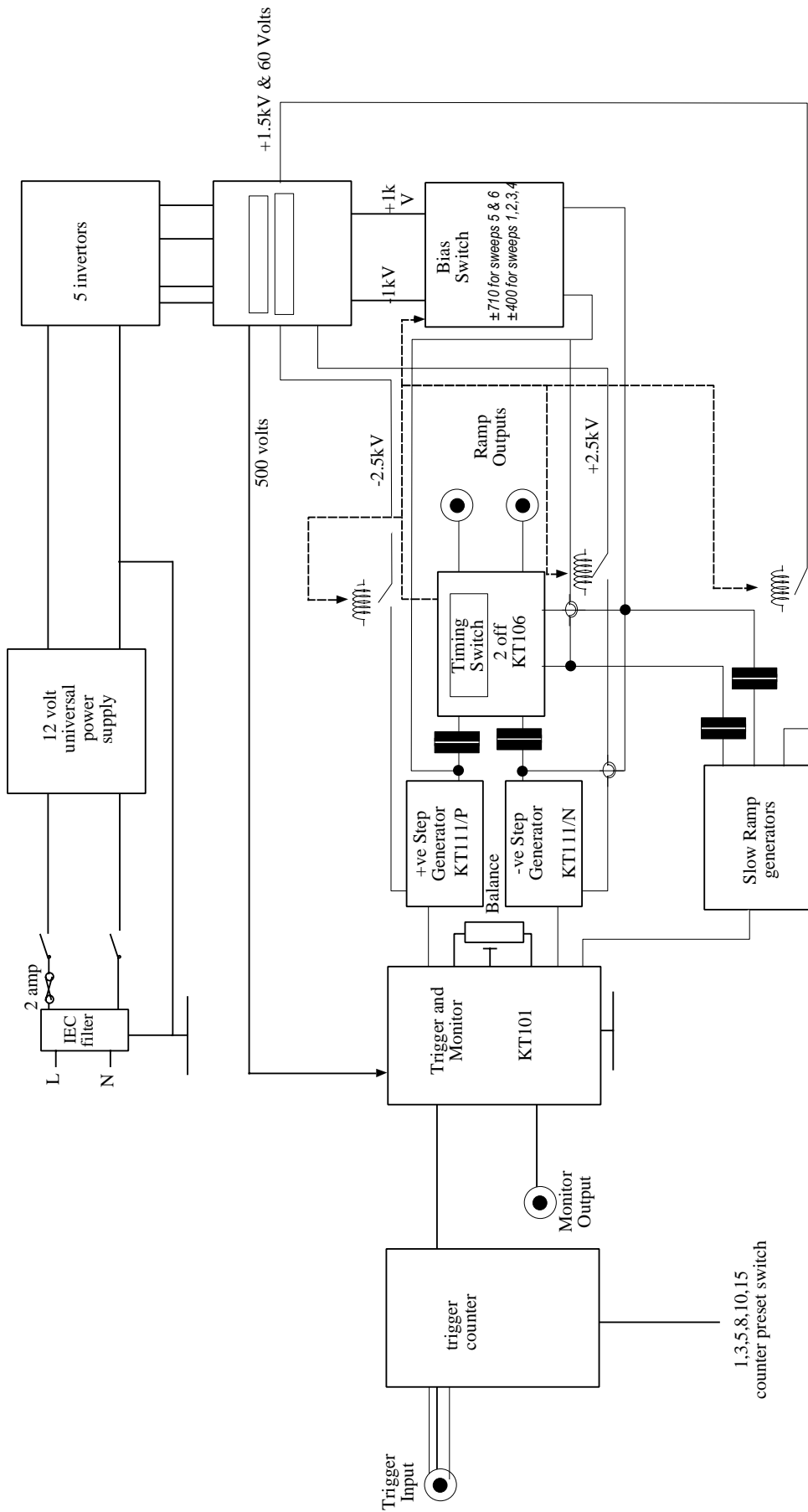


Figure 4 Sweep unit, block diagram

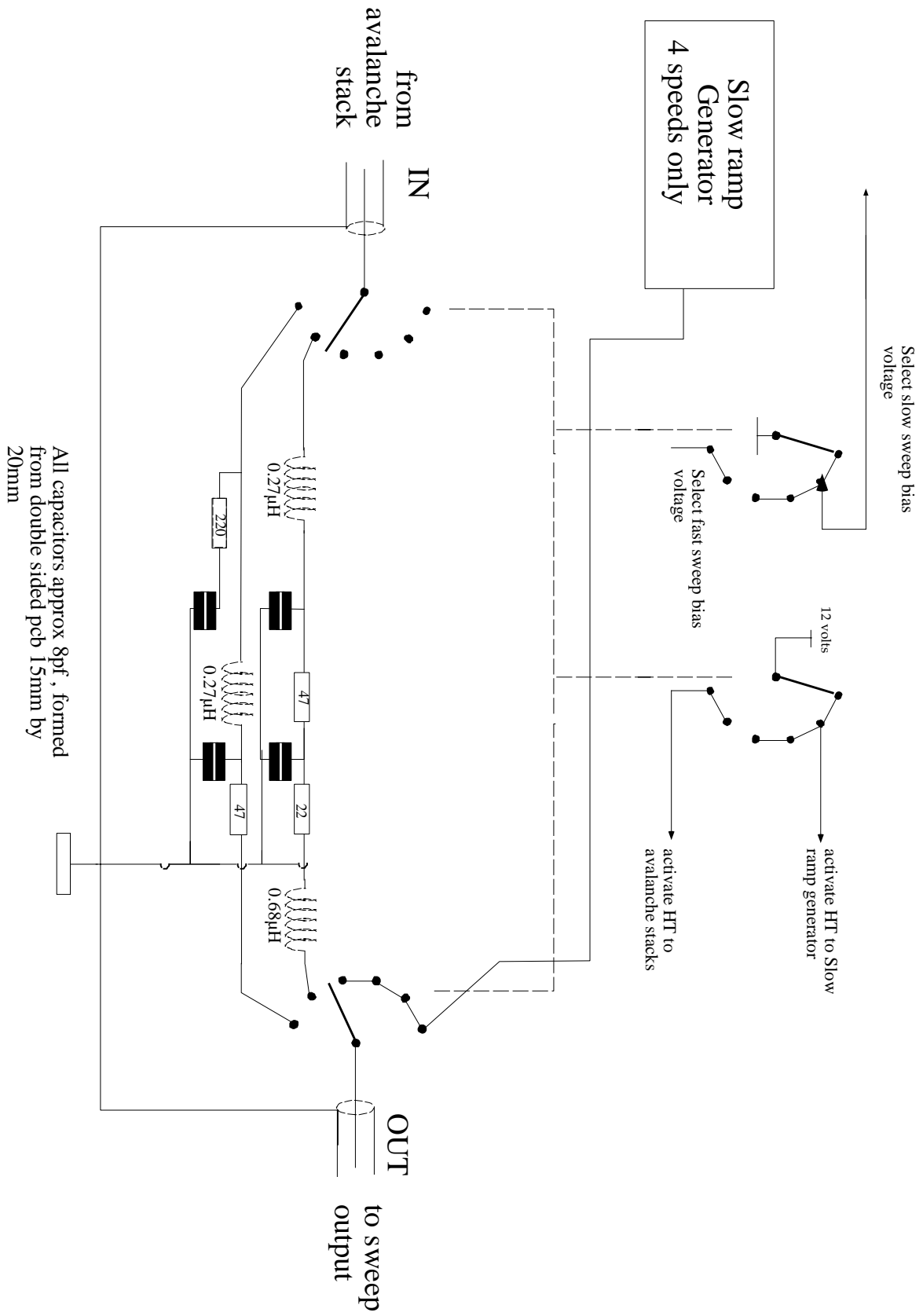


Figure 5 Sweep unit timing switch (KT106/modified rates)

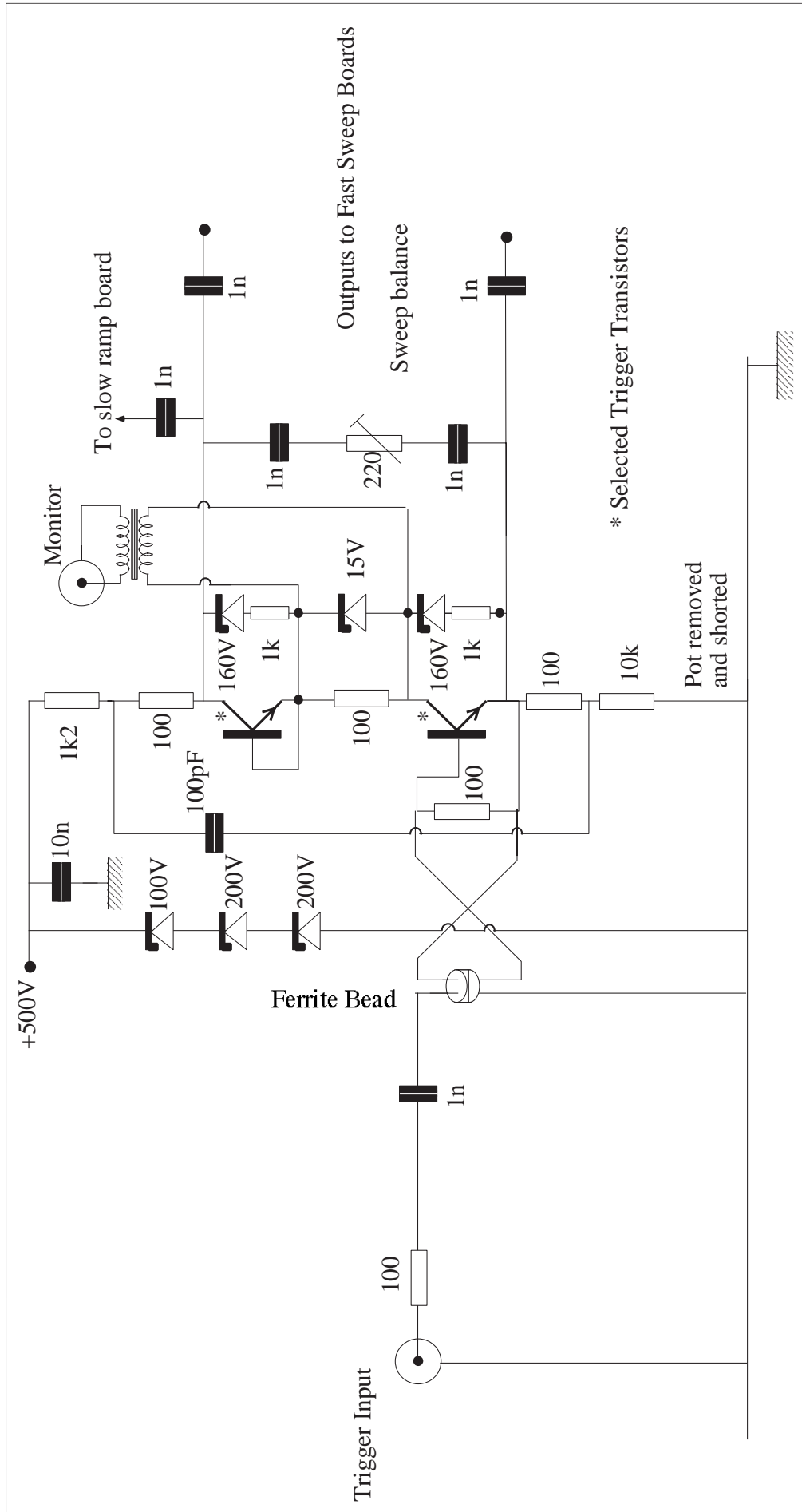


Figure 6 Sweep unit Trigger board (KT101)

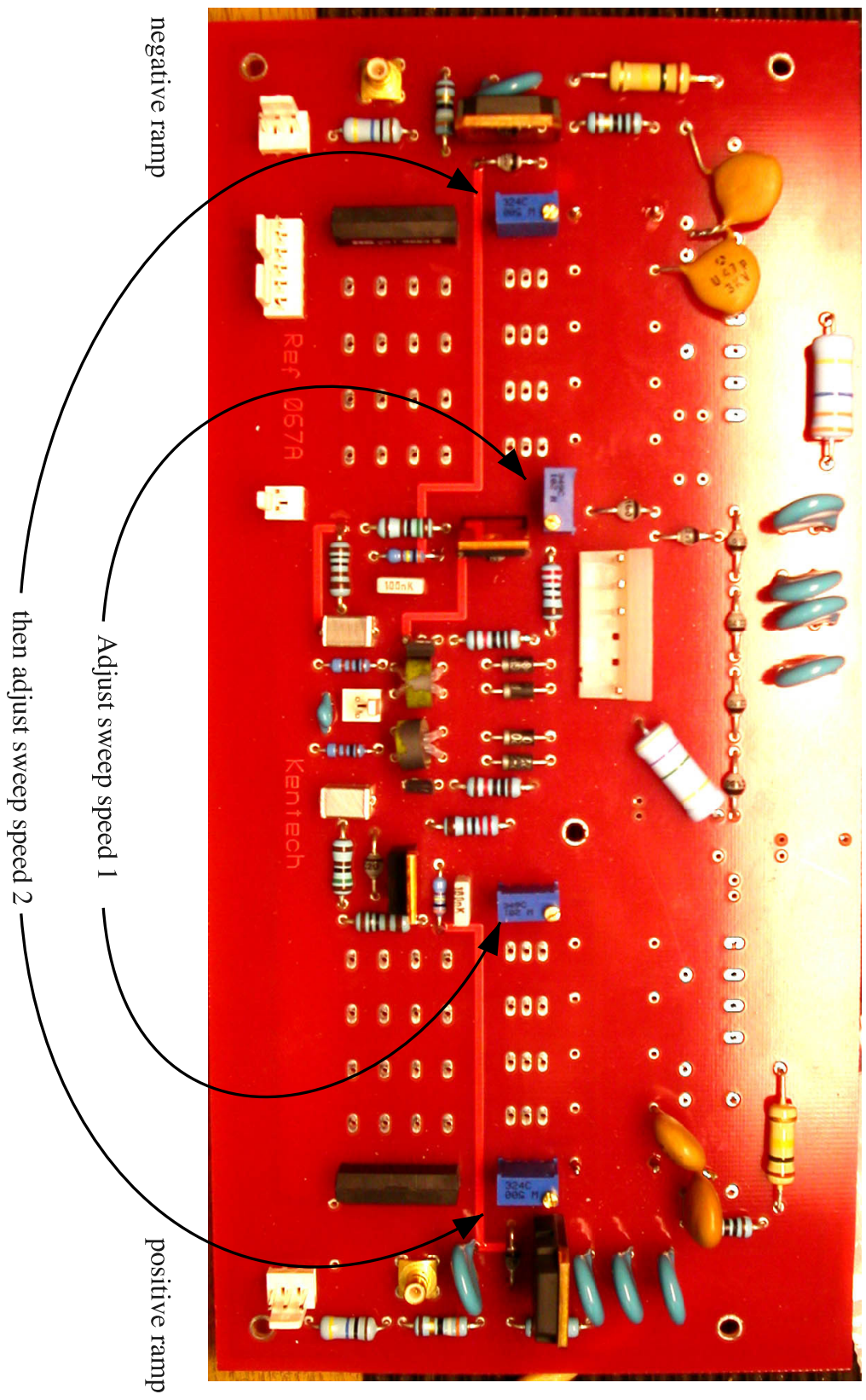


Figure 7 Slow ramp board showing adjusters

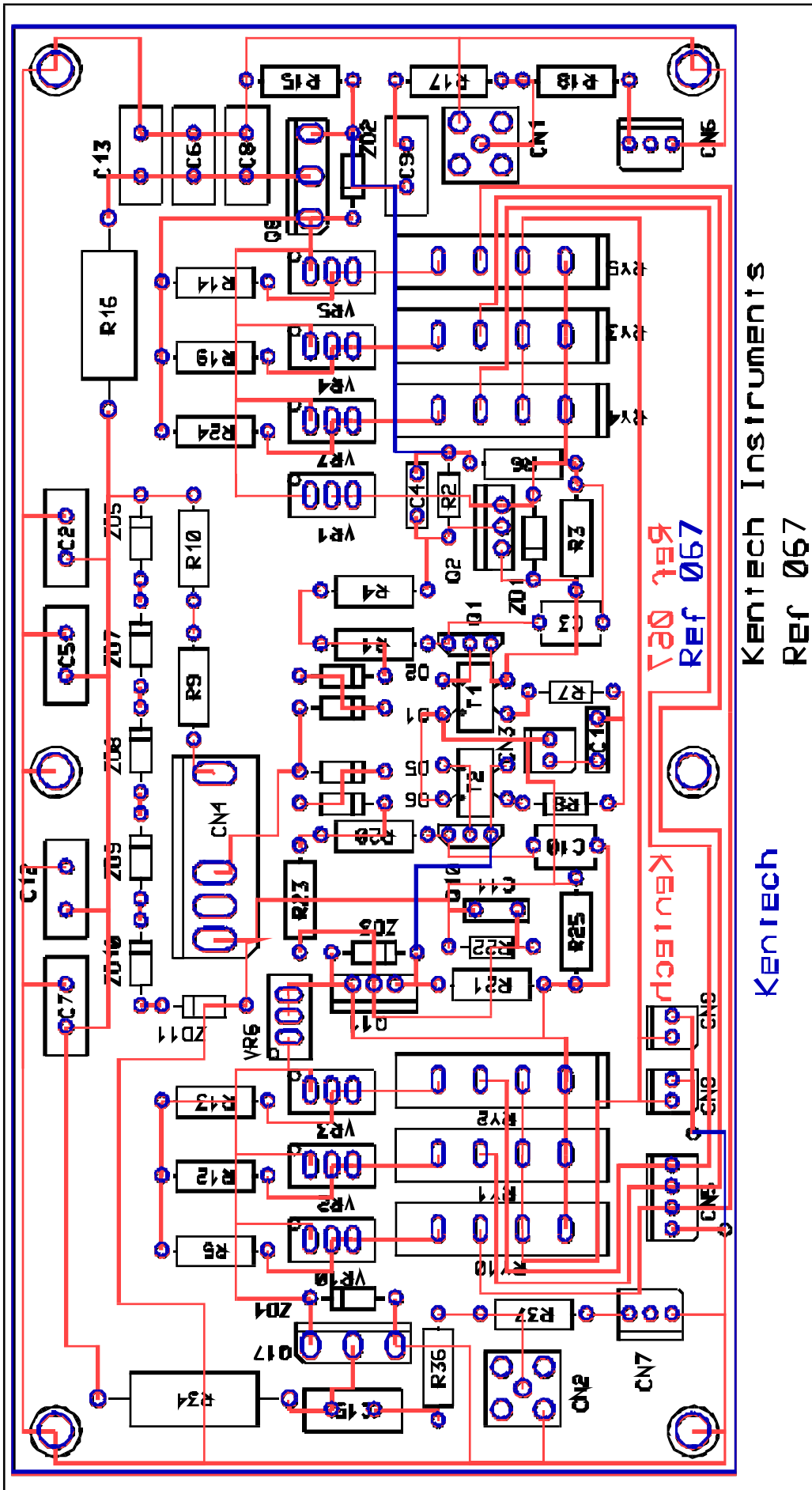


Figure 8 Slow ramp layout