Kentech Instruments Ltd.

40kHz 5ns f.w.h.m. 900 Volt pulser for Driving a Pockels Cell.

11th. July 20001

Serial Number J00*****/2

PLEASE READ THIS MANUAL CAREFULLY BEFORE USING THE PULSER.

DISCLAIMER

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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 pulser is designed to drive a pockels cells positioned between crossed polarisers. It can be triggered at a repetition rate up to 40kHz. It includes a 50Ω terminator into which the pulse should be fed after driving the pockels cell. This means that the RC time constant for charging the cell is 25C seconds (with C in farads). For a typical cell of 20pF this gives 500ps. Several RC times should be allowed for in calculating the optical rise time. The pulser rise time is around 2 ns and fall time around 3.5ns with a FWHM of around 5ns. Obviously the optical rise time cannot be a lot faster than this.

2 GETTING TO KNOW THE INSTRUMENT

The pulser uses FETs as the main output switch. These are driven very hard for a short time to turn them on quickly. The falling edge is generated using a non linear capacitor through which the output pulse has to flow. The non linearity can be adjusted with a bias current although this adjustment has not been made accessible to the user. Increasing the bias current will increase the pulse amplitude at the expense of fall time, i.e. the pulse will get larger and longer with increasing bias current. Similarly reducing the bias current will allow a slightly smaller and shorter pulse to be obtained.

In order to achieve 900 volts at the output, two 450 volt pulsers each driving 25Ω are added together in series to deliver 900 volts into 50Ω. In addition there is an amplitude control which is stepped in ~30 volt increments over a range from ~700 to ~970 volts.

The power supply uses 36 small inverters, with 32 of them in series to obtain the 960 volts, lower voltages are obtained by switching off one or more of them.

There is a fault detection circuit that will turn off most of the unit and turn on a red fault light, should the inverters draw too much current for too long. This is only resettable by turning off the unit. Should the fault condition be activated, the unit should be allowed to cool and the trigger source stopped, before switching back on. If the fault light comes on immediately on turning back on, return the unit for repair.

This fault trip can be activated by running the unit above 40kHz; we recommend that this be avoided. In the event that the internal fuse blows an amber light on the front panel will come on. The unit is also fused through the main inlet socket on the rear panel. Faults in these are not detected. The power switch is integrated into this inlet.

The trigger requirement is 5 volts for longer than 10ns into 50Ω. A triggered light (blue) will flash when the unit is triggered.

3 SPECIFICATION

Output	1 channel 900 volts at ~5ns fwhm into 50 ohms
Repetition rate	Up to 40kHz.
Voltage adjustability	Approximately 700 to 930 volts in nine steps.
Trigger input	5 volts into 50Ω for at least 10ns 2 volts into 50Ω for 20ns Note that the maximum trigger pulse length should be such that the average trigger power is less than 0.1 W.
Jitter	Approximately 20ps peak to peak
Terminator input	This is a 50Ω terminated input designed to dump the pulse.

Note that the output of this unit is around 18.5kW peak and around 8W continuous. Very few attenuators will be able to withstand this voltage and power level. Note that Barth™ 142 series attenuators are only rated at 2 watts continuous although they will handle around 500kW peak power.

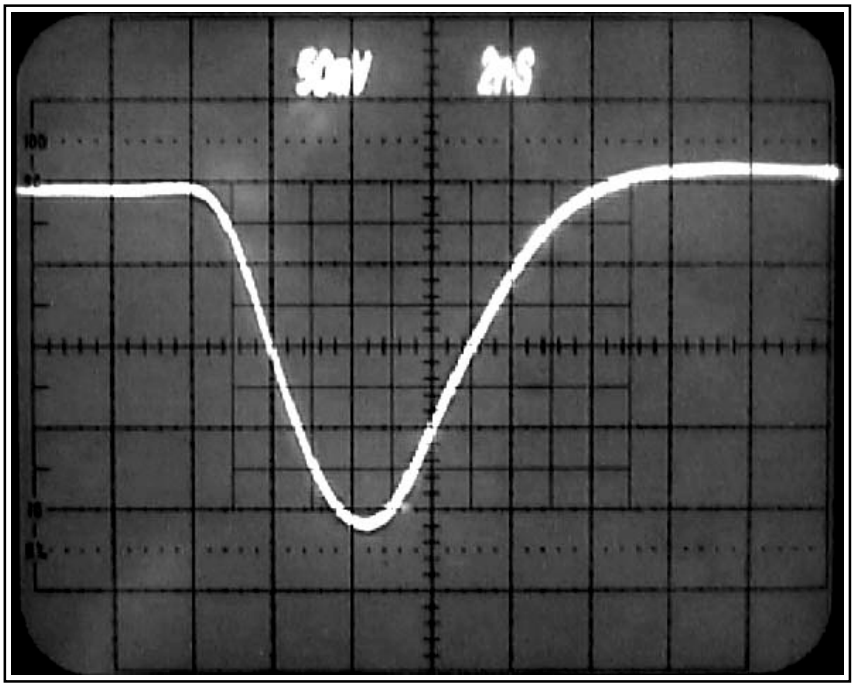


Figure 1 Output waveform into 50 Ω 237.2 V/div, 2 ns/div

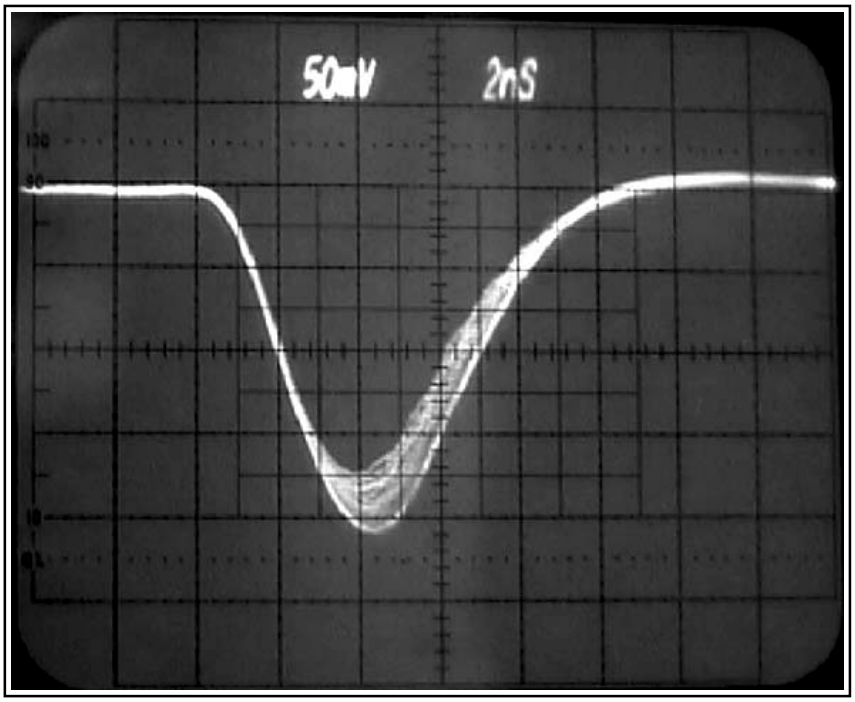
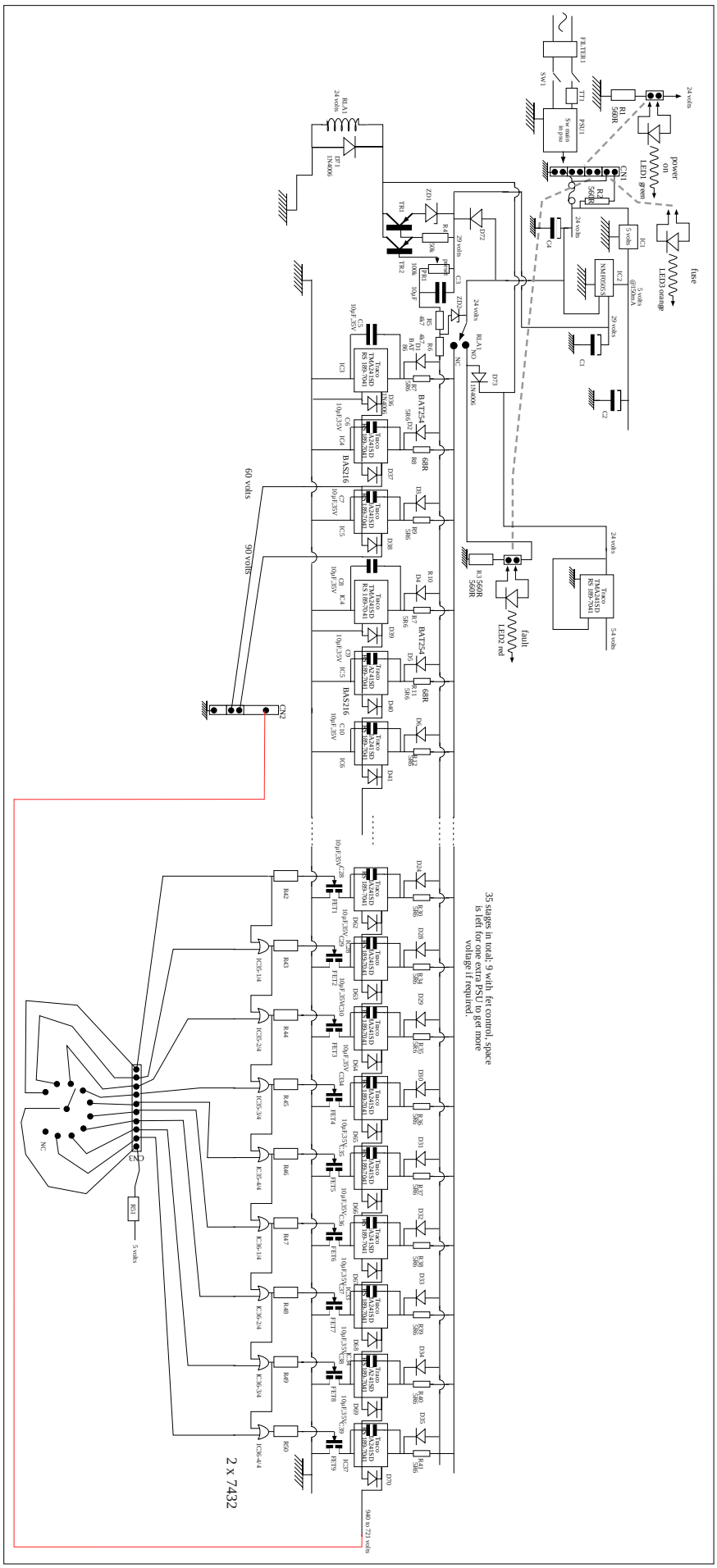


Figure 2 Output waveform range into 50 Ω 237.2 V/div, 2 ns/div

Figure 3 The power supply



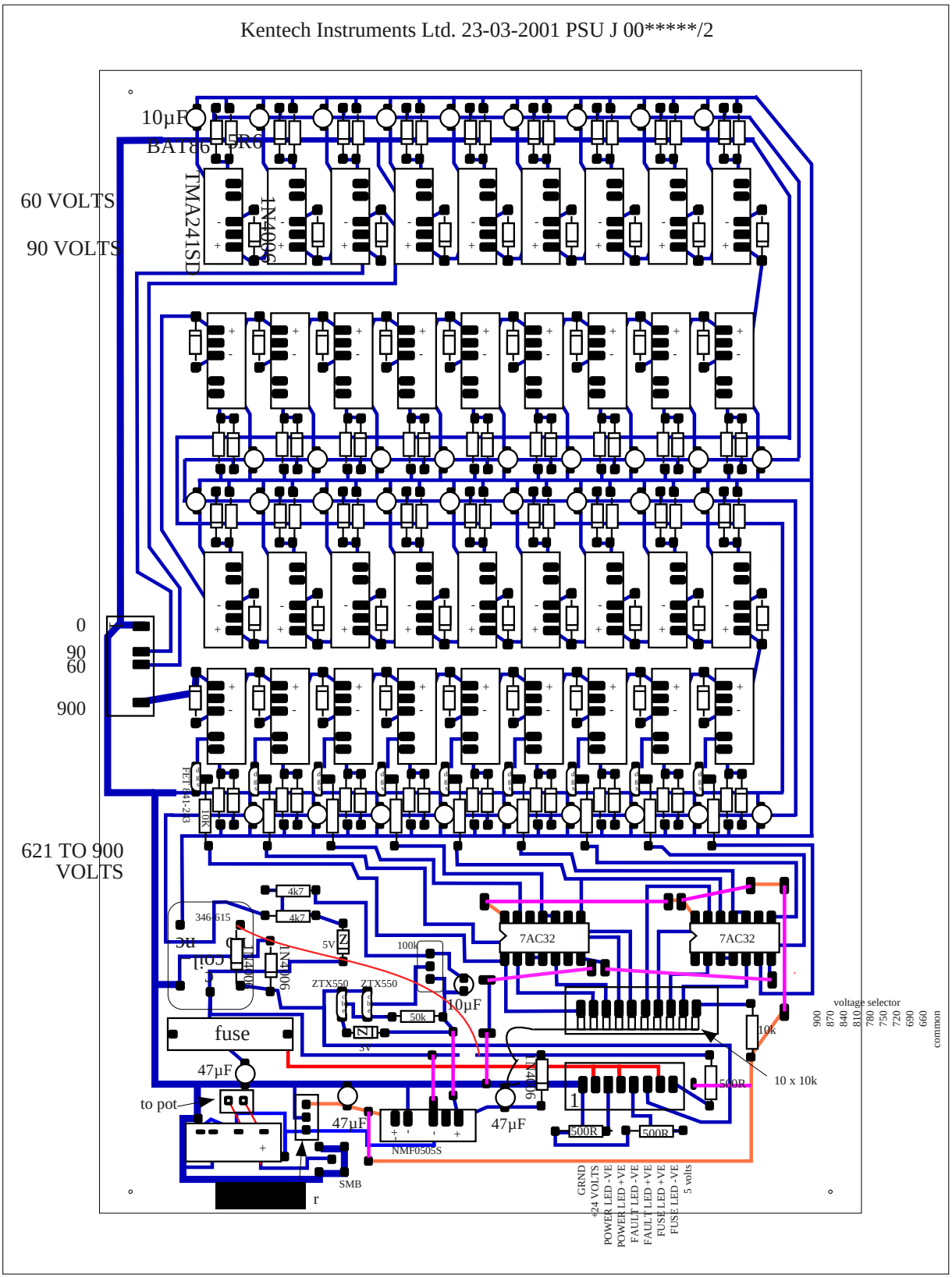


Figure 4 Power supply layout

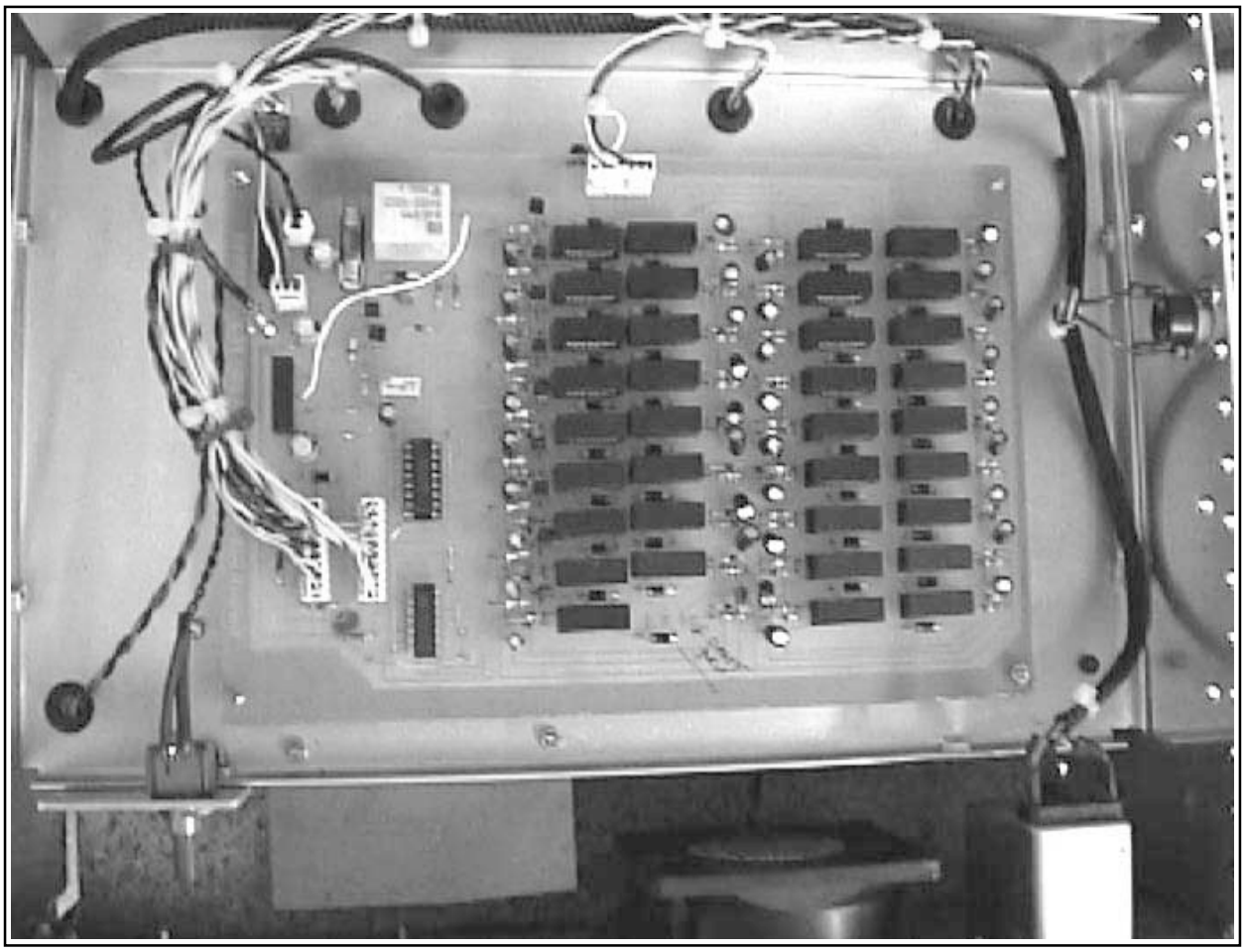


Figure 5 The power supply

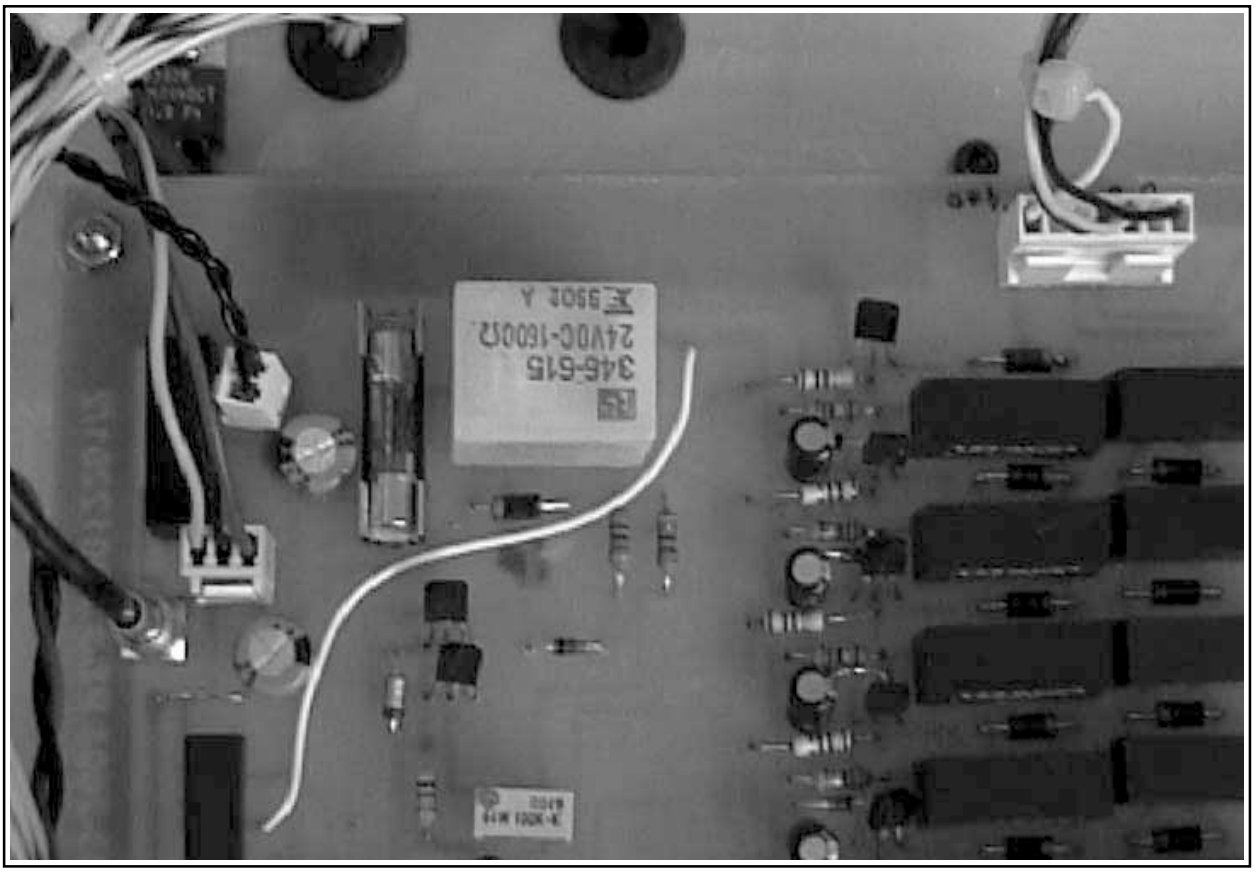


Figure 6 The internal fuse

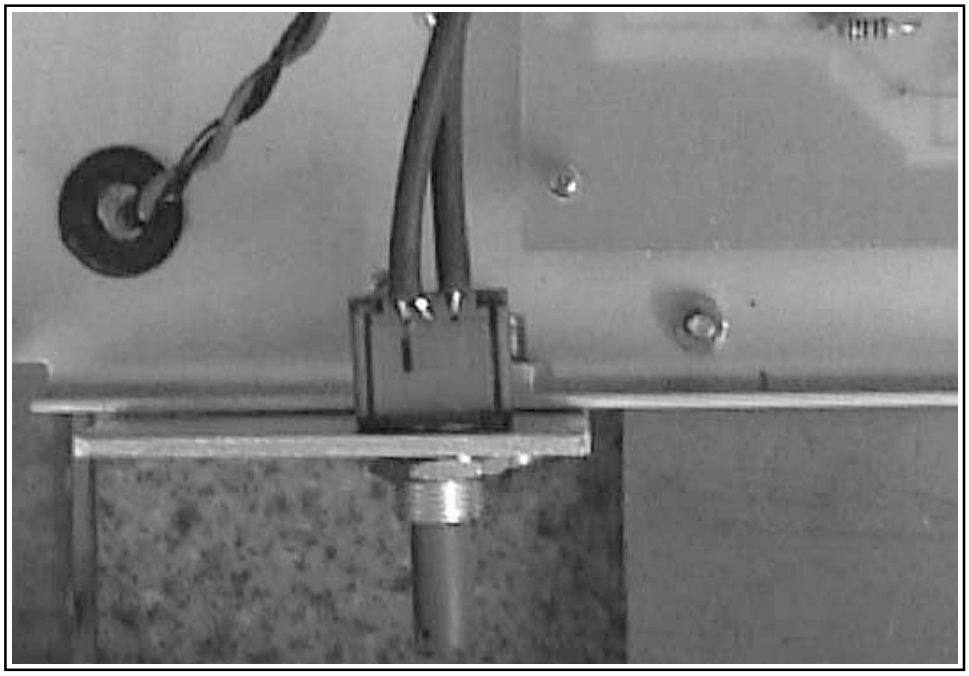


Figure 7 The bias adjustment, only adjust this after contacting Kentech Instruments Ltd. to discuss the issue.

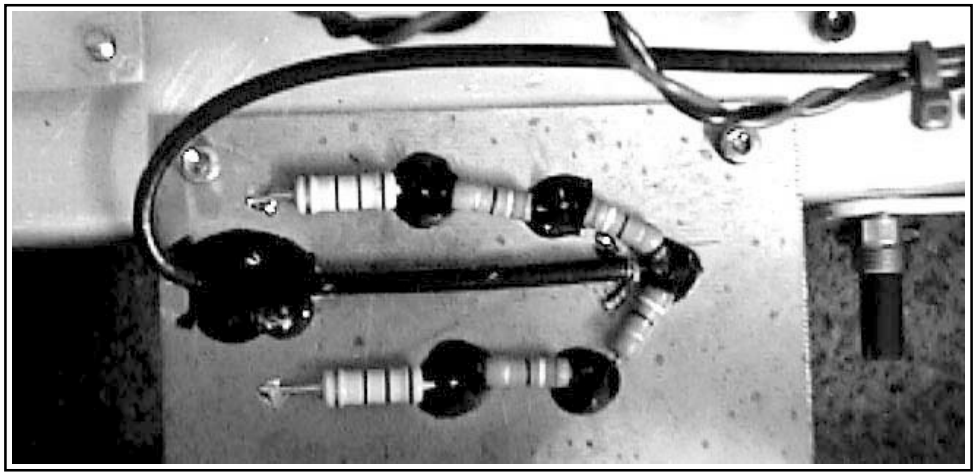


Figure 8 The terminator

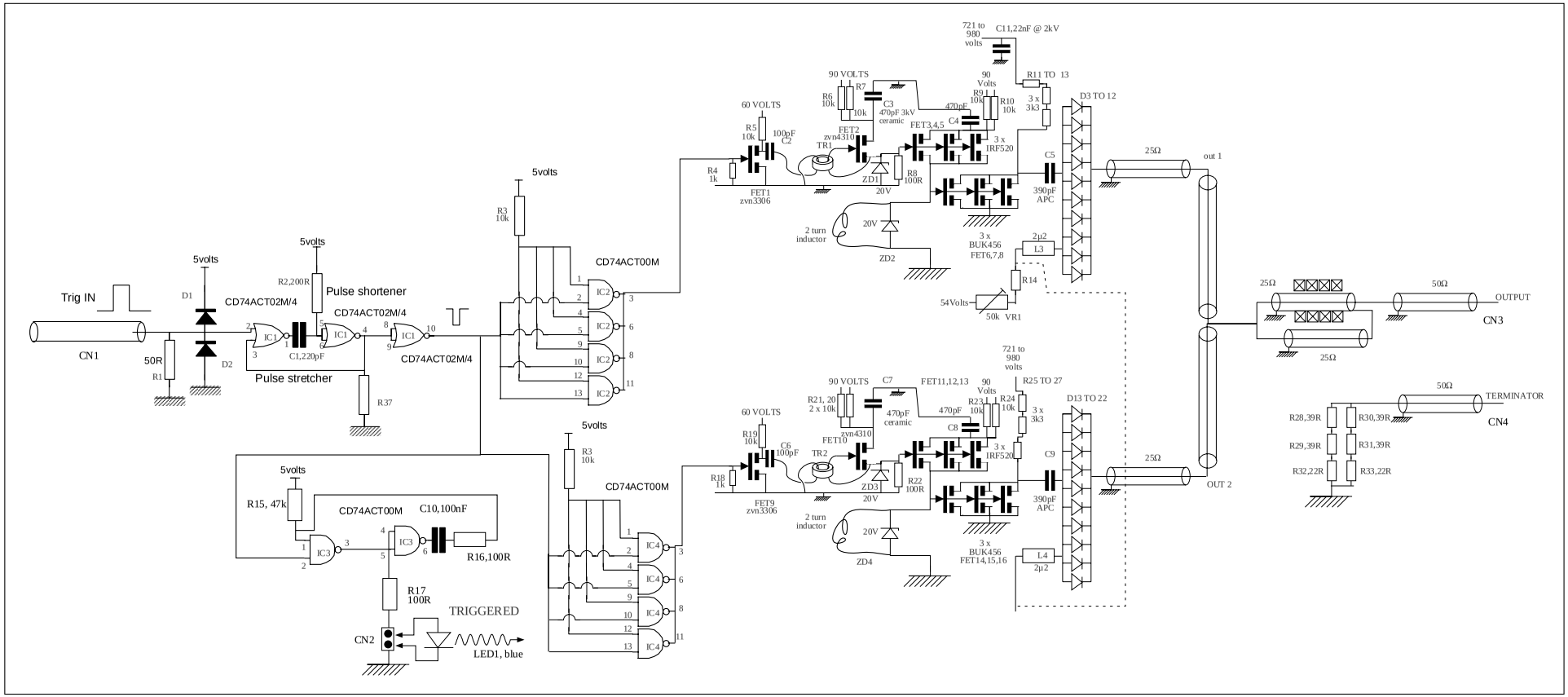


Figure 9 The pulser circuit

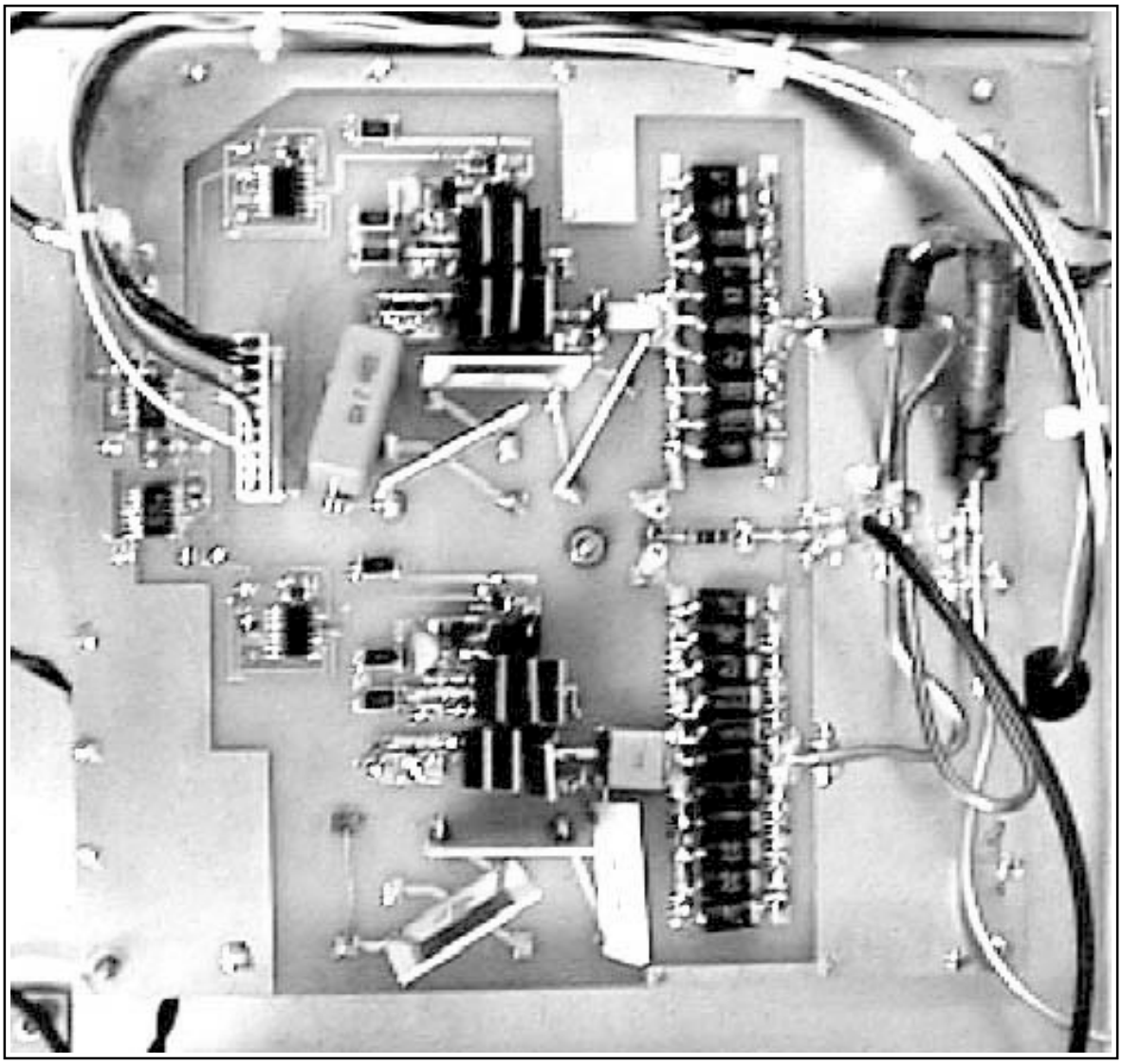


Figure 10 The pulser.

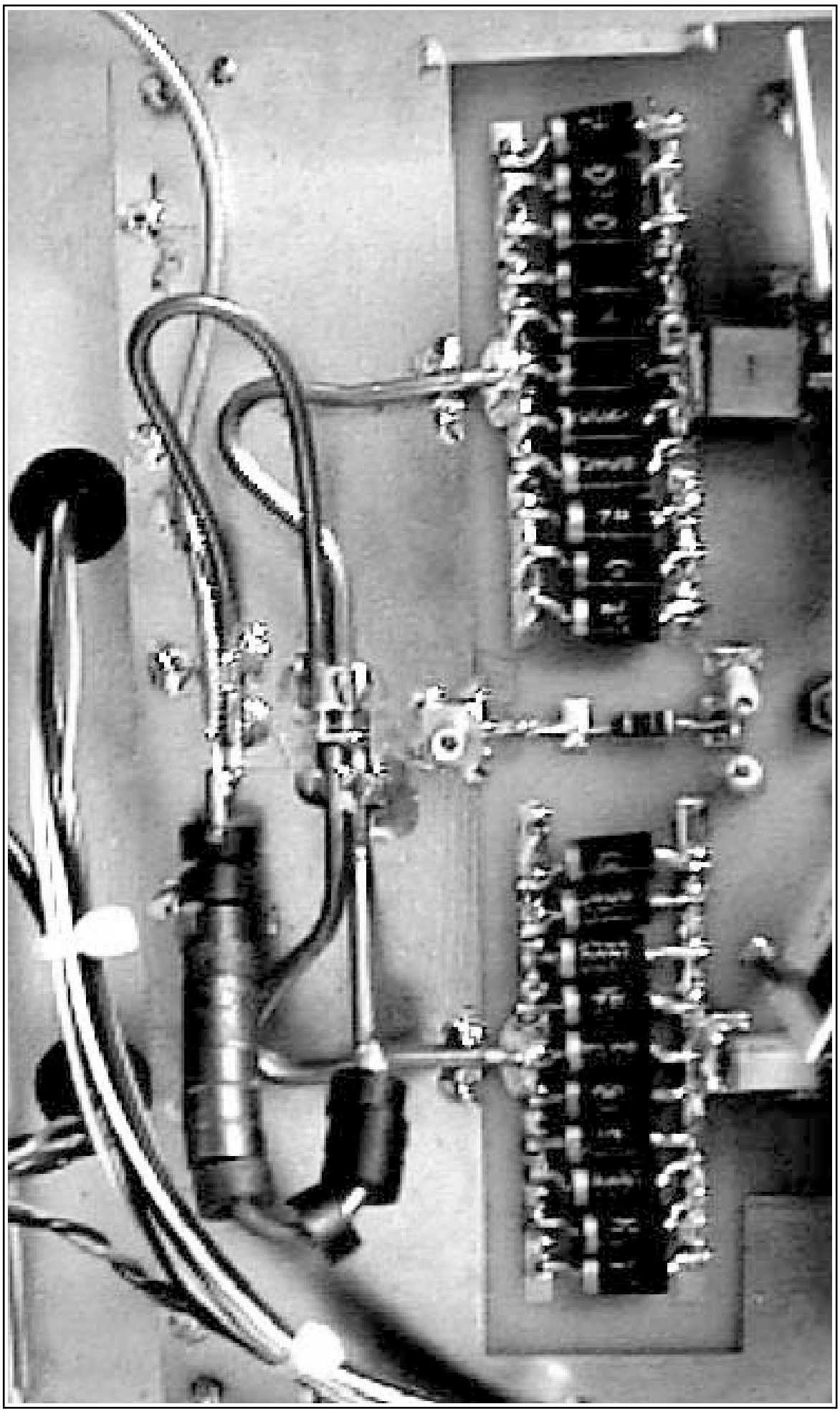


Figure 11 The output transformer

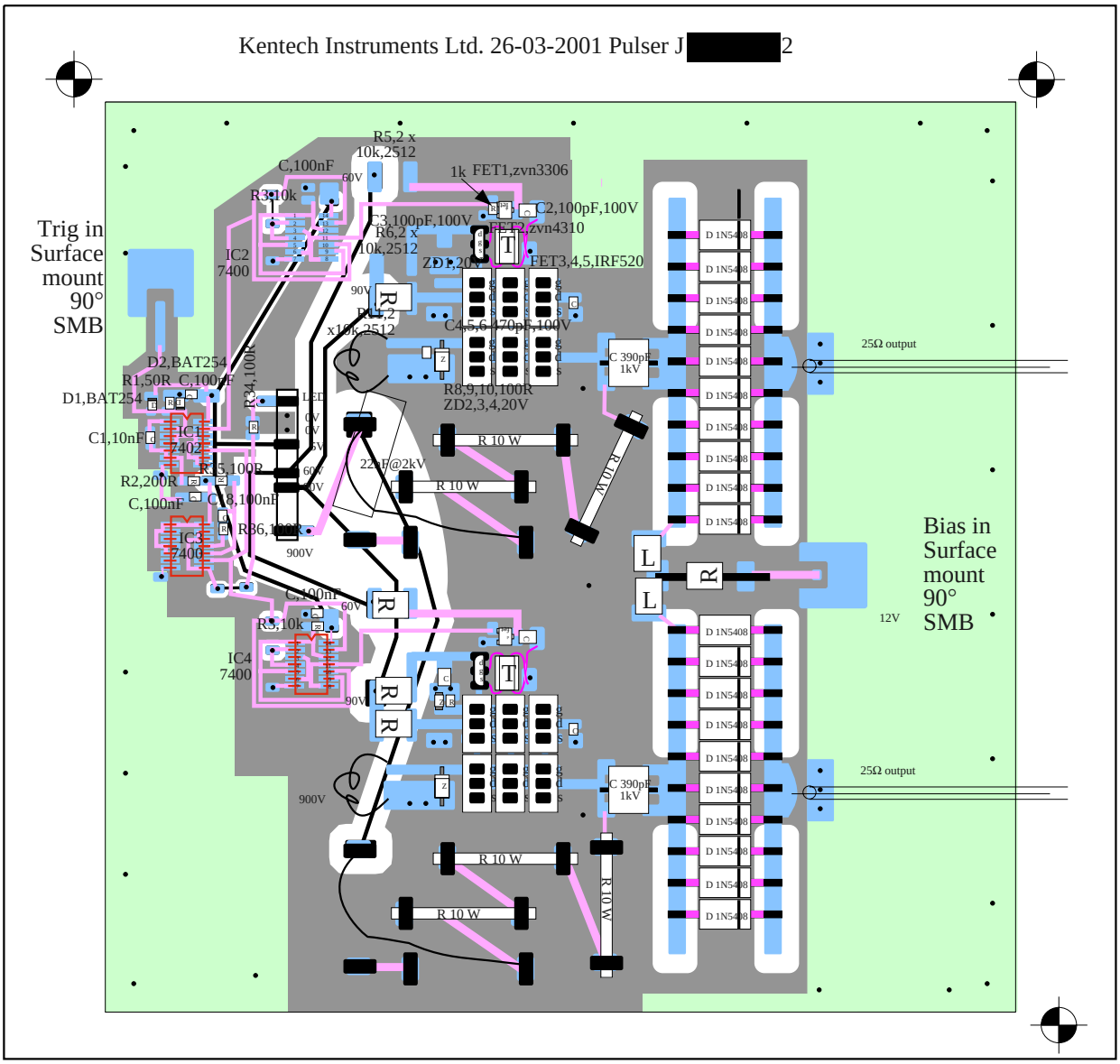


Figure 12 The pulser layout