Notes on the use of

Kentech Instruments Ltd.
CPS1 pulser
Serial No. xxxxx

4th July 2002

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CAUTION

With an appropriate load, this unit is safe for use by an educated user in a laboratory environment. You are warned however that the radiation from the system with an antenna or inappropriate load attached can damage sensitive equipment and corrupt data stored in computer and microprocessor based systems. It can cause terminal failure of vital medical electronic systems such as pacemakers. This equipment is be supplied on the understanding that the user will analyse these risks, accept responsibility for them and take appropriate precautions in the use of this instrument.

The output from this pulse generator will destroy many types of power attenuators and electronic test equipment. It is the users responsibility to ensure that any apparatus connected to the output is suitably rated.

Kentech Instruments Ltd accepts no responsibility for any damage or liabilities incurred in the operation of this equipment.

Please read the manual before applying power.

There are high voltages (4kv) present in this pulser when the unit is operating. Do not remove the covers, return to Kentech Instruments Ltd or its appointed agent for servicing.

The accessible terminals of this instrument are protected from hazardous voltages by basic insulation and protective grounding via the IEC power input connector. It is essential that the ground terminal of this connector is earthed via the power lead to maintain this protection.

If cleaning is necessary this should be performed with a soft dry cloth or tissue only.

RF emissions and EC directive 89/336/EEC

This equipment includes circuits intentionally designed to generate short high energy electromagnetic pulses and the EM emissions will be highly sensitive to the load applied by the user, for example the radiation just from some types of output cable may exceed EC permitted levels.

The level of RF radiation generated by the circuit boards within the instrument is inevitably high but the emissions are largely contained by the instrument enclosure. It is therefore very important that all fasteners are securely fastened, do not operate the pulser with the covers removed.

The emissions from this pulser may exceed the limits specified in EN55011 "Emissions Specification for Industrial, Scientific and Medical equipment" and the unit may cause interference with other equipment in its immediate environment. It is suitable for use only in a laboratory or a sealed electromagnetic environment, unless it is used in a system that has been verified by the system builder to comply with EC directive 89/336/EEC. Use of this apparatus outside the laboratory or sealed electromagnetic environment invalidates conformity with the EMC Directive and could lead to prosecution.

We recommend the following precautions to minimise emissions from the load:-

1) that any load is fully contained within a conductive metal screened box, with all joint surfaces gasketed or fitted with conductive fasteners at less than 5cm intervals.
2) that the load is connected to the pulser output with semi-rigid cable, the cable outer must be carefully connected to the N type output connector at one end, and must be connected directly to the screened box containing the load at the point of entry. Flexible cables should only be used with caution, and generally will need additional screening.

Introduction

Our range of solid state pulsers (ASG, SPS, HMPS and PBG series) allows very high voltage, fast rising pulses to be obtained from compact bench top units. Voltage pulses as short as 100ps FWHM, in excess of 4kV peak voltage into 50Ω, and with a pulse repetition frequency (PRF) >1kHz can be produced. The performance of our compact, convenient and reliable pulsers is to our knowledge exceeded only by laser driven photoconductive switches in terms of voltage switching speeds. These pulsers will find applications in many fields such as high speed camera research, electro-optic switching, triggering systems and radar.

A large range of output pulse lengths can be provided by the incorporation of internal passive pulse forming networks. There is very little jitter in the output of the pulsers and two independent pulsers can be used in parallel to drive low impedances. This aspect makes the pulsers particularly useful for driving microchannel plate systems. Transformers with output impedances as low as 5Ω are available.

The standard drivers and speed-up modules have a life of $>10^{10}$ pulses and have a PRF of ≥1000Hz, although special units with a PRF >50kHz can be supplied. The high repetition rates allow sampling oscilloscopes to be used to characterise a system and verify the pulse shape.

The pulsers can feed into a short circuit load without damage. This allows them to be used in sub-nanosecond pulse chopping systems by feeding through a pockels cell into a shorting stub. Variations on the standard driver are available.

Use

The pulser requires A.C. power and a trigger signal to operate. The trigger signal should be >5volts into 50Ω with a fast rising edge (<5ns) to maintain the low jitter of the system. When triggered the triggered light on the front panel of the pulser will flash.

The output of the pulser is a 2.5kV positive pulse with a fast rising edge and exponential decay which appears at the output front panel connector (N type). The pulse width is approximately 2ns (FWHM).

If it is necessary to monitor or characterise the pulse output then suitable attenuators should be used.

Caution

The output of this unit will damage or destroy many types of high voltage and high power attenuators. We recommend the use of a high voltage, high speed attenuator manufactured by Barth™ as the first in a series. Consult the attenuator manufacturer before using any other configuration.

The output may be observed with a high bandwidth oscilloscope. This may either be a fast (>3GHz) direct access type or a sampling type.

The trigger delay from the pulser front panel trigger input BNC to main output is approximately 12ns.

The jitter is ~20ps RMS with a suitably reproducible and fast rising trigger signal.

SPECIFICATIONS

Pulse generator S.N. J0203271/1

General:

Output amplitude	≥2kV into 50Ω
Output polarity	Positive.
Pulse shape	Fast rise, exponential decay.
Pulse width	~2ns FWHM.
Rise time	<150ps
Trigger	>5V into 50Ω, <5ns rise time.
Jitter	<20ps RMS
Trigger delay	~12ns (BNC trigger input to main output)
Repetition rates	≥1kHz
Power supply	90-240V AC 50-60Hz Maximum power <20W

Outputs:

Pulse output	N type ≥2kV pulse.

Inputs:

Trigger input	BNC >5V into 50Ω

Controls:

Power	Switches AC power in the pulser.

Indicators:

Power	Shows that AC power is applied and the unit is on.
Triggered	Illuminates while the unit is being triggered.

Environmental:

Ambient temperature	5 to 35°C
Humidity	< 95% non-condensing
Altitude	< 3000m

Test data

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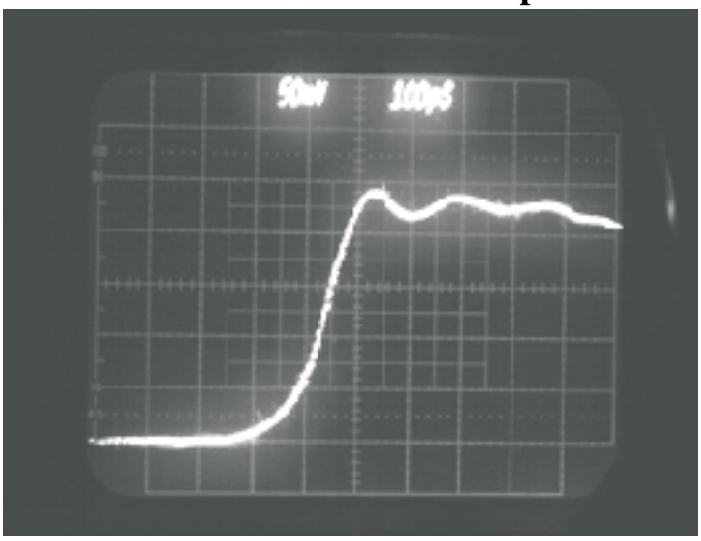
Test equipment Scope: Tektronix 7834 mainframe, 7S11 + S4 head, 7T11
Attenuators: First two: BARTH 142 (x10)
Second two: Radial SMA
(Total attenuation: x10000)

Trigger source: Kentech APG1

Output waveforms

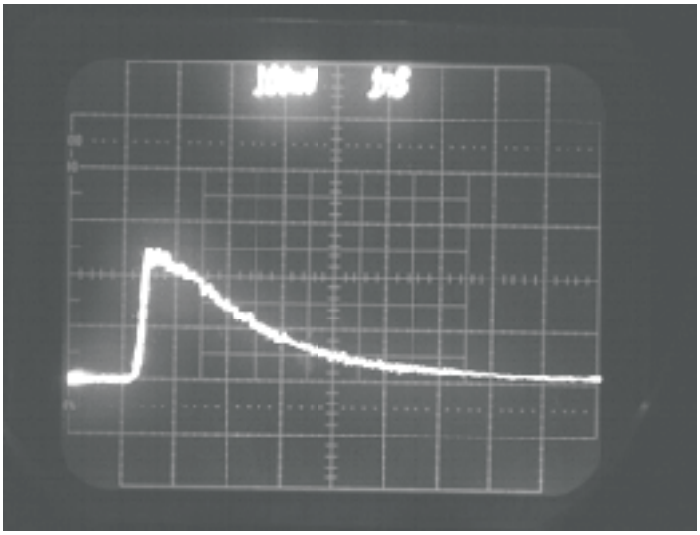


Risetime and Jitter

Vertical: 500V / div.

Horizontal: 100ps / div

Rep. rate: 1kHz



Pulse shape

Vertical: 1kV / div.

Horizontal: 1ns / div

Rep. rate: 1kHz