Kentech Instruments Ltd

8-Channel MCP Pulser

Operating Manual

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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 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 (1kV) 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 is a research tool that has been 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 pulser may still interfere with sensitive equipment at short range.

We believe that with this type of unit it has to be the system builders responsibility to verify that his pulser/load system complies with the EC directive unless the system is used in a screened electromagnetic environment.

We are not able to guarantee compliance with arbitrary loads but to minimise emissions we recommend:-

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 outputs with 25Ω cable, the cable outer must be carefully connected to the SMA 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 may require additional screening to control emissions.

Introduction

The 8-channel microchannel plate (MCP) pulser is a high voltage pulse generator capable of producing eight short parallel pulses with peak voltages of 1kV into 25Ω. The pulse duration can be adjusted from ~5ns through to 200ns and is slaved to an external trigger. The device has a maximum repetition rate of 1Hz.

The front panel of the device features full range control of the output voltage via the ten turn potentiometer. Along with the high voltage MCP output, each channel features a monitor output and individual trigger input.

Additionally, a short pulse width ‘boost’ switch has been added to the front panel. When the switch is set to Short mode (up position), the output of all channels will be boosted by 20%, allowing peak voltages of 1.2kV into 25Ω for short pulse durations. Note that in this mode, the output will not be source terminated.

The monitor output a 50Ω signal suitable for connection to an oscilloscope and provides a high fidelity 400:1 replication of the MCP source terminated output.

Operation

The pulser requires 110V-240V AC power supplied to the rear panel along with activation of the mains switch on the front panel. Each channel can operate in stand-alone or slave mode.

In stand-alone mode, each channel *MCP output* is controlled by the individual channel *Trigger input*. The trigger requires a 5V TTL signal into 50Ω via a BNC cable. Leave the channel *Trigger output* unconnected. The *monitor output* port can be connected to an oscilloscope.

To operate the channel in slave mode, connect the channel *Trigger input* to its channel *Trigger output* using the short BNC cables provided. All slaved MCP outputs can then be triggered via the master *Trigger input* on the far left of the device. This trigger also requires a 5V TTL signal into 50Ω via a BNC cable. The *Triggered* LED will pulse while the device is triggering in slave mode.

The amplitude of the output voltage is controlled via the front panel potentiometer. This has a ten point course, ten point fine adjustment allowing for full modulation of the voltage amplitude from 0% to 100%.

CAUTION

The *MCP output* channels 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 BarthTM 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.

SPECIFICATIONS

General:

No. channels	8
Maximum output voltage	1kV into 25Ω (Normal mode) 1.2kV into 25Ω (Short pulse boost mode)
Output polarity	Negative
Pulse shape	Rectangular
Flatness	±5%
Rise time (pulse front edge)	3ns (20-80%), 5ns (10-90%)
Fall time (pulse back edge)	5ns (20-80%), 7ns (10-90%)
Jitter	0.3ns
Repetition rate	1Hz
Power supply	100-240V AC 50-60Hz Max power <60W

Outputs:

MCP output amplitude	0V → 1kV into 25Ω
MCP output FWHM duration	10ns → 200ns
Monitor output	1V into 50Ω replication of MCP output signal
Trigger output	5V into 50Ω replication of master trigger

Inputs:

Master trigger input	2.5V → 5V into 50Ω BNC <5ns rise time
Pulse module trigger input	3.0V → 5V into 50Ω BNC <5ns rise time

Control:

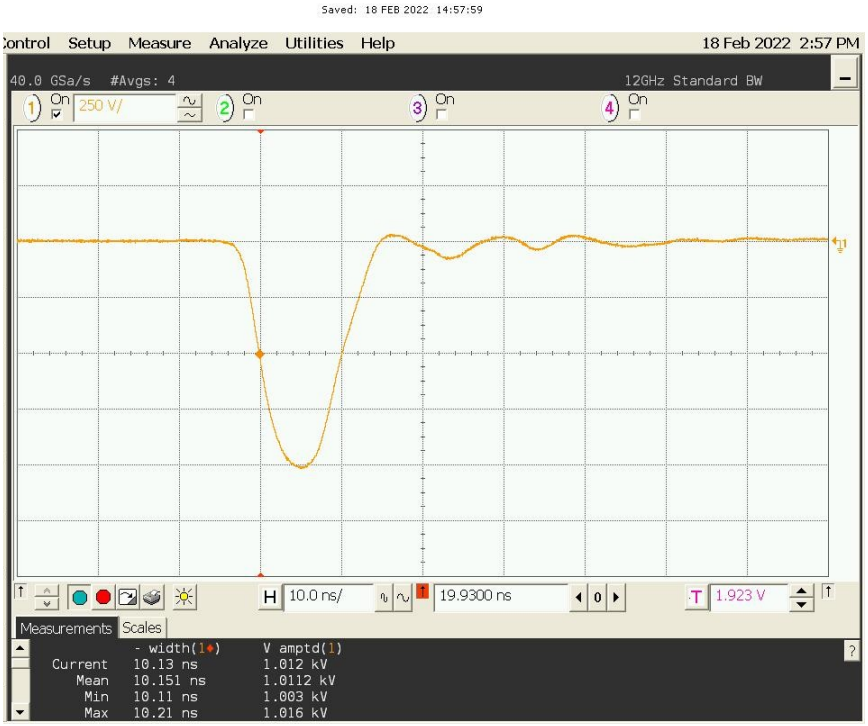
Power	Switches AC power into the pulser
Amplitude	Controls the amplitude of MCP output voltage
Pulse width	Selects Short (boost) mode or Normal mode

Indicators:

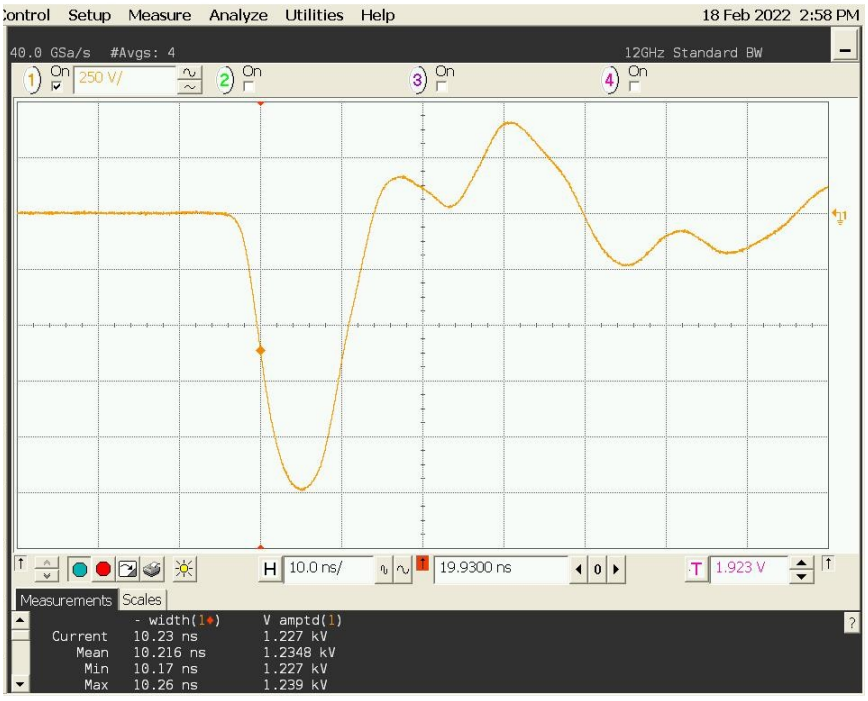
Power	Indicates AC power is supplied to the pulser
Triggered	Indicates that the pulser is triggering under master configuration

Test data for 8-channel MCP pulser

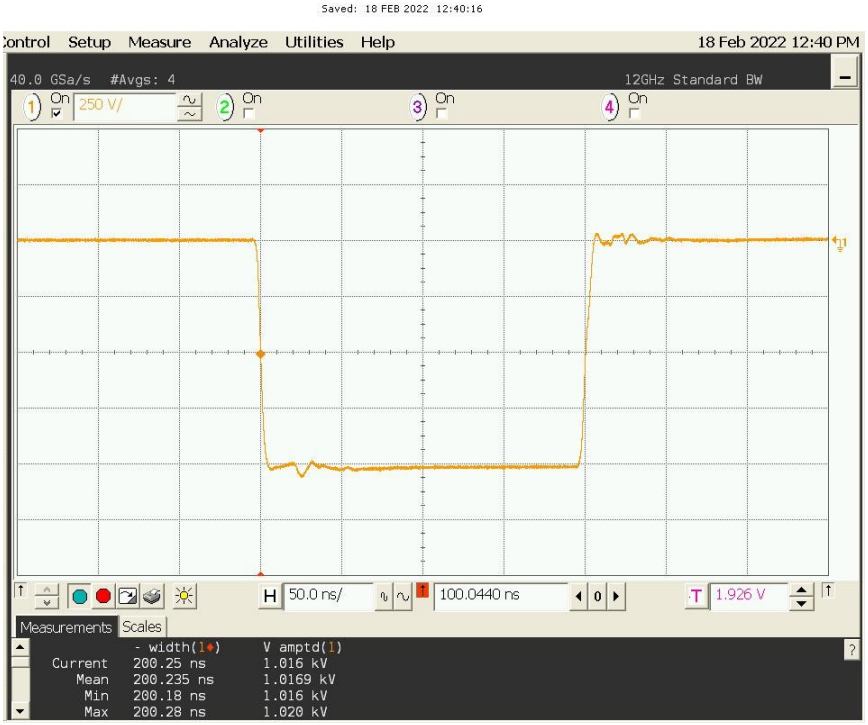
1) 1kV, 10ns FWHM pulse, Normal mode



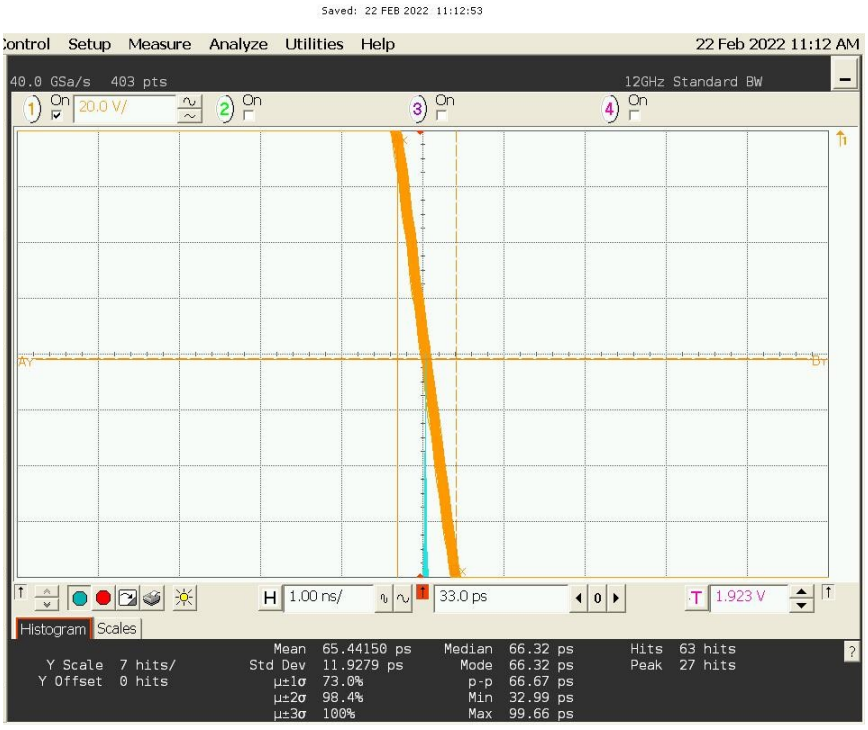
2) 1kV, 10ns FWHM pulse, Short (boost) mode



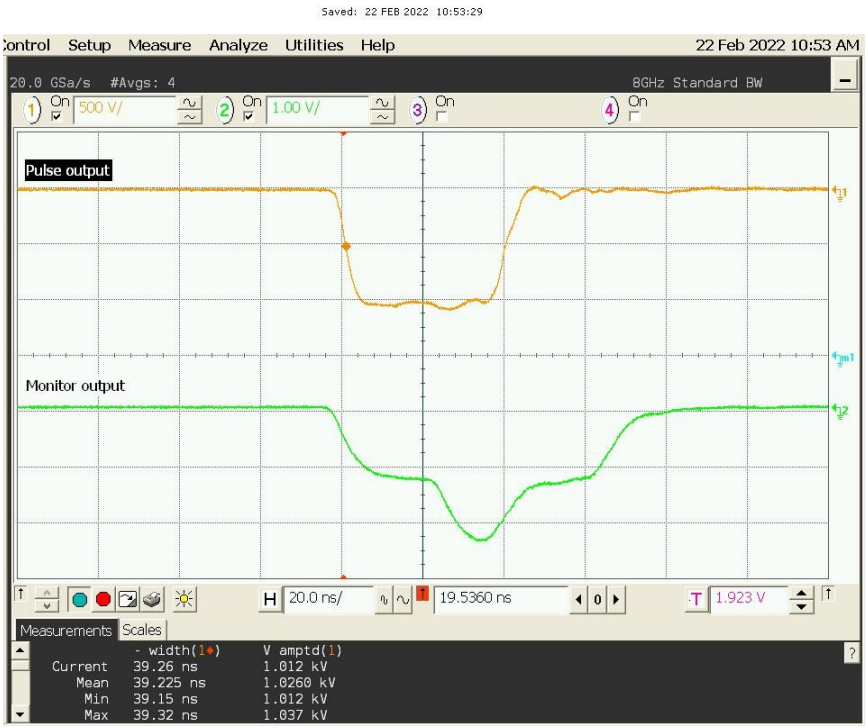
3) 1kV, 200ns FWHM pulse



4) Jitter, falling edge



4) 1kV pulse with monitor output



5) Fall time and Rise time 10%-90%