

Notes on the use of

Ringling Waveform Generator



Made in England by
Kentech Instruments Ltd.
www.kentech.co.uk

Kentech Instruments Ltd., Isis Building, Howbury Park,
Wallingford, Oxfordshire. OX10 8BA
(Tel: +44 1491 821 601; fax: +44 1491 821 602)

VAT Registration Number: 394 5266 20

Registered in England No.: 1742794

Registered office: Office 6a, 1st floor, Popin Business Centre,
South Way, Wembley. HA1 1TG

Directors
P.A. Kellett BA,
J.D. Hares PhD.
A.K.L. Dymoke-Bradshaw PhD.

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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 responsibility of the user 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 (5kV) present in this pulser when the unit is operating. Do not remove the covers, but return to Kentech Instruments Ltd., or its appointed agent for any repairs or 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 builder's 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 minimize 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 output with coaxial cable, the cable outer must be carefully connected to the output connector at one end, and must be connected directly to the screened box containing the load at the point of entry. Flexible cables may need additional screening to control emissions.

INTRODUCTION

Our range of solid state pulsers (ASG, SPS, HMPS and PBG series) allows very high voltage with fast rising pulses to be obtained from compact bench top units. These pulsers will find applications in many fields such as high speed camera research, electro-optic switching, triggering systems and radar.

Various configurations are available; providing fixed and adjustable pulse lengths. Pulse lengths from 100ps to 100ns are covered by our range of avalanche and FET pulsers. There is very little jitter in the output of the pulsers and in some cases two independent pulsers can be used in parallel to drive low impedances. We are able to make impedance transformers with output impedances below 5Ω . This aspect makes the pulsers particularly useful for driving micro-channel plate systems. Integrated pulse/HV PSU systems are available for such applications.

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

The output of this unit will damage or destroy many types of high voltage and high power attenuators. Consult the attenuator manufacturer before applying the output signal to an attenuator other than that provided in the instrument itself.

SPECIFICATION

Attribute	Value
Amplitude	Typical 550V peak from PFM
Load	50 ohms
Pulse shape	Decaying sinusoid (dependent on PFM)
Trigger	External TTL, 5V in 2k2 Single shot push button
Monitor	TTL, leading edge has fixed timing with respect to the start of each output waveform
Amplitude control	16 amplitude steps, approx 10:1 range
Trigger jitter	<100ps rms
PRF	10Hz
Physical	19" rack, 3U
Cooling	Forced air
AC power	100-240V ac, <100VA
Controls	
Amplitude	16 step rotary
AC Power	Rocker
Connectors	
AC power	IEC (rear panel)
Trigger	BNC
Monitor	BNC
PFM connection	Custom
PFM output	N type
Indicators	
Power	LED
Triggered	LED

Pulse forming modules:

- 350MHz, ID number = 0
550V peak, >4 cycles at 350MHz nominal into 50 ohms
- 257MHz, ID number = 1
550V peak, >4 cycles at 257MHz nominal into 50 ohms

See waveforms in test section

Items supplied

- Pulser
- AC power lead
- 2 x PFM modules
- Manual

OVERVIEW

The ringing waveform generator driver is designed to drive a ringing network with a high current step pulse in order to generate ringing waveforms. PFMs (pulse forming modules) are available over the frequency range 100MHz - 400MHz. The driver is shipped with two PFMs operating at 350MHz and 257MHz nominal frequency. Others can be provided however it may be necessary to return the driver to the factory for calibration purposes.

The output waveform is typically 550V peak amplitude and rings for a minimum of 4 cycles. Output waveforms are illustrated in the test data section.

The generator requires only an AC power supply to operate and can produce single output pulses in response to a front panel manual trigger button. In addition there is a TTL trigger input for electrical triggering at up to 10Hz PRF.

OPERATIONAL NOTES

The ringing waveform generator plus a suitable pulse forming module will generate ringing waveforms at a peak amplitude $\geq 550V$ into 50ohms. Dampened sinusoids in the frequency range 100MHz - 400MHz can be produced with the frequency being set by the plug in module. The generator is supplied with two pulse forming modules (*figure 1*):



The driver must always be used with a pulse forming module. The module mounts on to the front panel of the generator using the four chassis mounted studs, and careful alignment of the extruding card with the mating socket, as seen below in figures 2, 3 & 4:

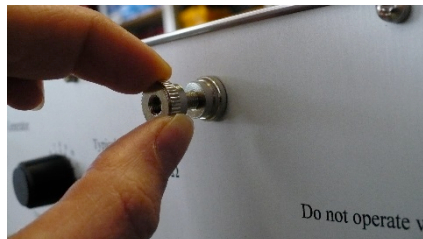
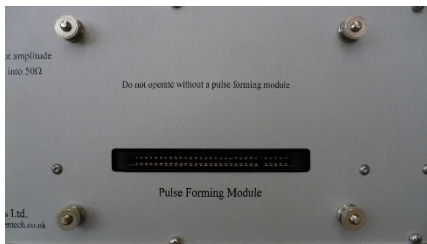


Figure 2: Mounting area for PFM



Figure 3: Unscrew securing nut from chassis mounted studs.

Figure 4: Line up PFM board with mating socket on front panel.

Once the PFM is aligned correctly, give the module a firm, but careful push towards the generator. This will ensure the PFM card is seated firmly in the socket. Then secure the module using the four threaded securing nuts provided; nothing in excess of 'finger tight' will be required. (*Figures 5 & 6*).

Figure 5: Securing the PFM with the nuts



Figure 6: PFM secured in place

The driver requires A.C. power and trigger signals to operate. The trigger signals applied to the front panel trigger input (BNC) should be 5V into 50 Ω with a pulse width between 50ns and 1 msec.

The A.C. power is fed into the I.E.C. connector on the rear panel.



The pulse amplitude is set by the amplitude control which varies the peak voltage over a range of approximately 10:1. This control has 16 steps.

The pulser can be triggered electrically or manually via a push button. The manual trigger button can be used to trigger individual output pulses.

The maximum trigger rate for the pulser is 10Hz and an internal rate limit circuit will skip trigger pulses which occur more frequently than this.

There is a TTL monitor output pulse which can be used to trigger external equipment such as an oscilloscope.

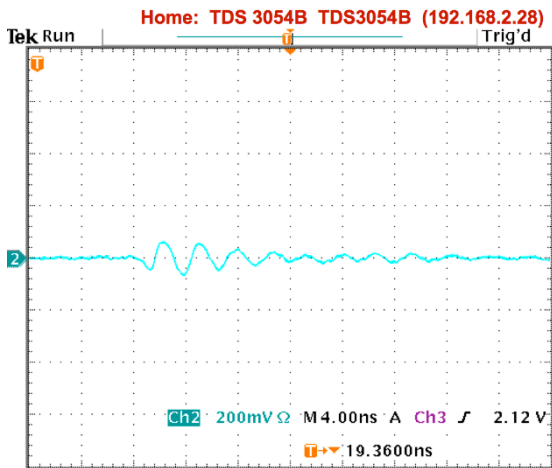
! Remove the AC power supply when changing the PFM.

! Do not operate the pulser without a PFM fitted.

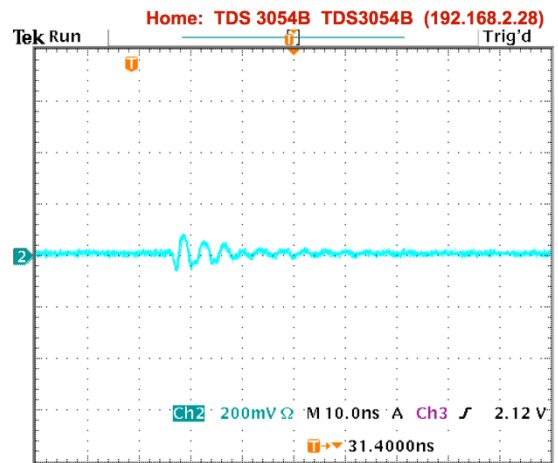
TEST WAVEFORM PICTURES

Modules at various amplitude settings:

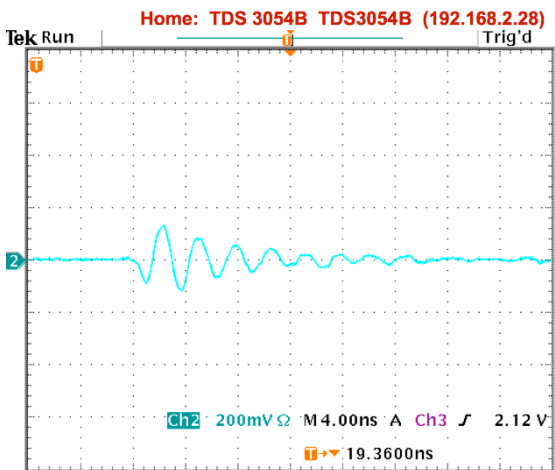
Module 0, 350MHz; amplitude 1



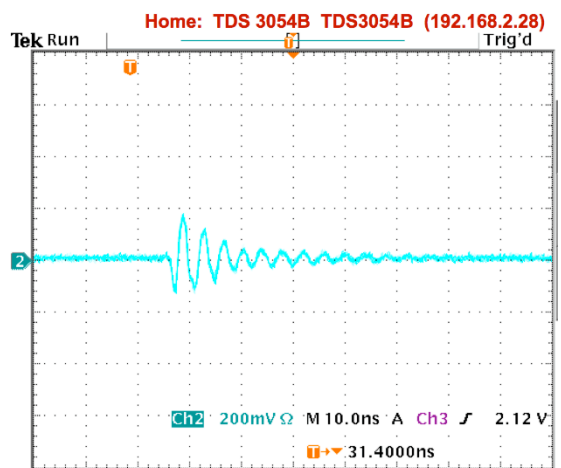
Module 1, 257MHz; amplitude 1



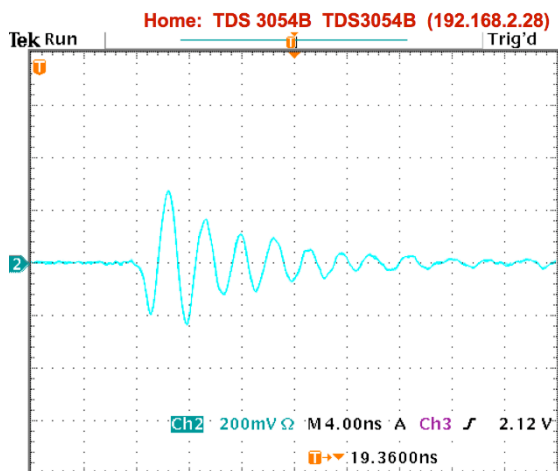
Module 0, 350MHz; amplitude 4



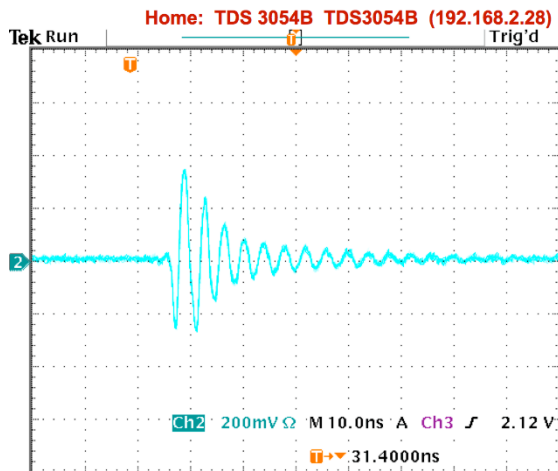
Module 1, 257MHz; amplitude 4



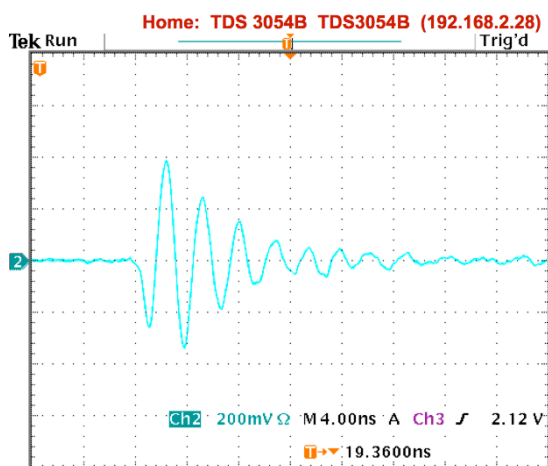
Module 0, 350MHz; amplitude 8



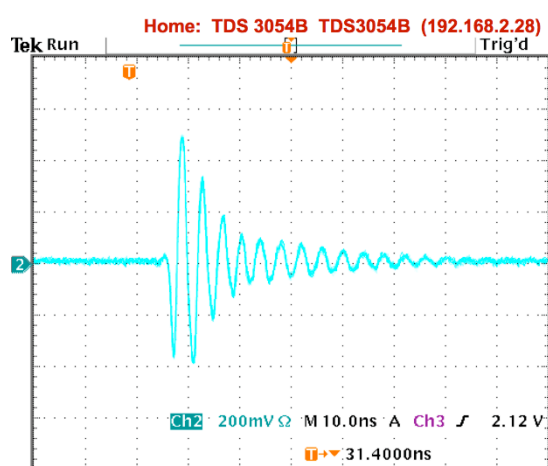
Module 1, 257MHz; amplitude 8



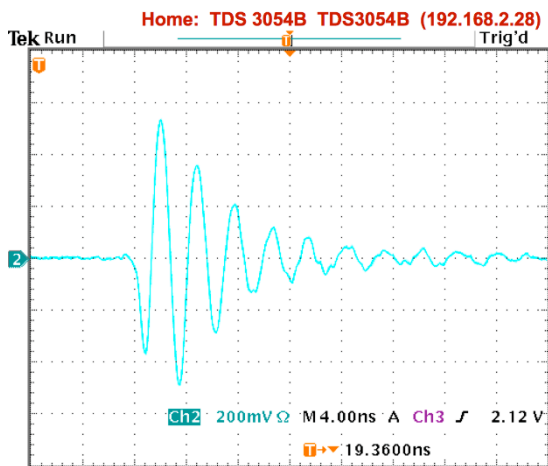
Module 0, 350MHz; amplitude 12



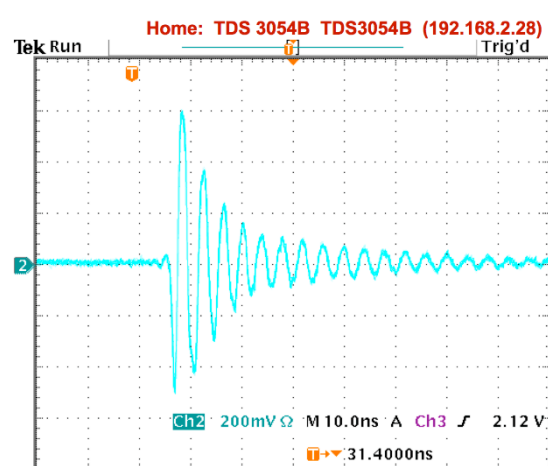
Module 1, 257MHz; amplitude 12



Module 0, 350MHz; amplitude 16

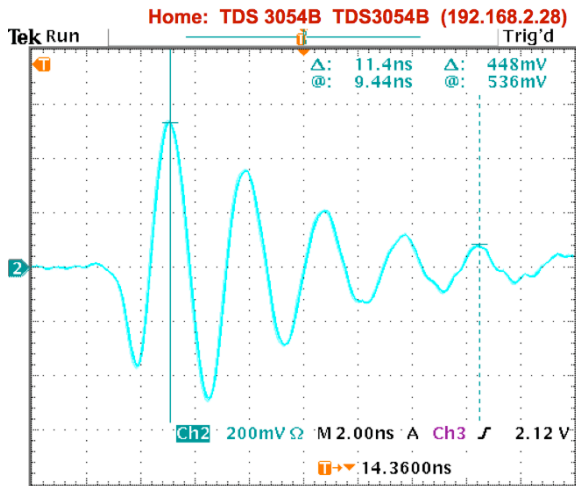


Module 1, 257MHz; amplitude 16

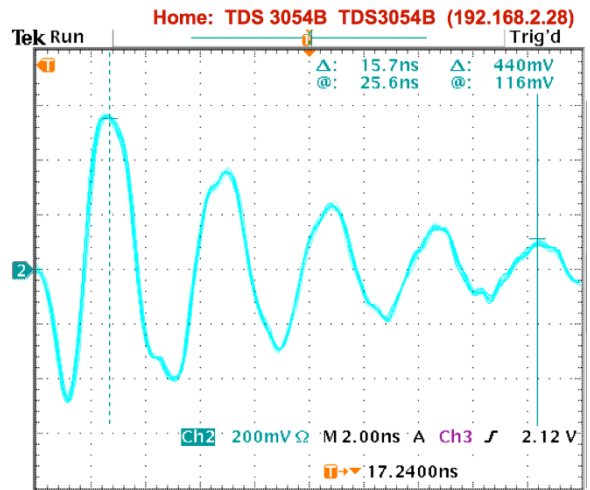


Frequency measurements

Module 0, 350MHz; amplitude 16

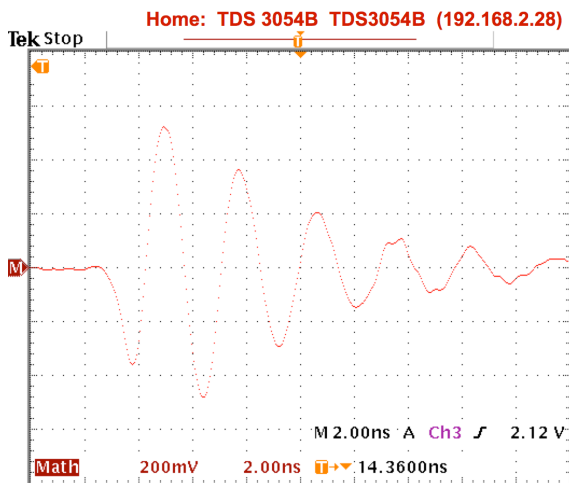


Module 1, 257MHz; amplitude 16

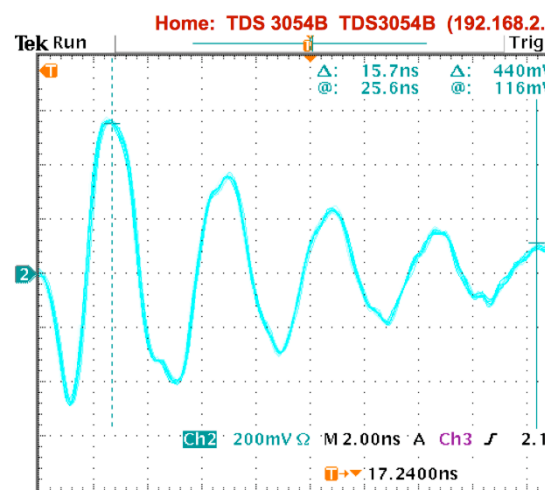


Baseline noise reduced by background subtraction

Module 0, 350MHz; amplitude 16



Module 1, 257MHz; amplitude 16



Declaration of Conformity

We, Kentech Instruments Ltd., Isis Building, Howbery Park, Wallingford, OX10 8BA

Certify that this apparatus conforms to the protection requirements of European Community Directives:-

- 2006/95/EC Low Voltage Directive
- 2004/108/EC Electromagnetic Compatibility Directive
- 93/68/EEC CE Marking Directive

The following harmonised standards have been applied:-

- BS EN55011:2009 Emissions Specification (Group 2 Class A).
Industrial, Scientific and Medical equipment
- BS EN50082-2 Generic Immunity Standard - Part 2 Industrial
- BS EN 61010-1:2010 Safety Requirements for Electrical Equipment for
Measurement, Control, and Laboratory Use

The following documents contain additional relevant information:-

Kentech file reference "0010-0066 Ringing Waveform Generator"

Name: A. K. L. Dymoke-Bradshaw

Signature:



On behalf of Kentech Instruments Ltd

Position: Director Issued: 25th March 2015

End