Kentech Instruments Ltd.

Fast camera systems

up to 10kHz @ 50ps gate

up to 100MHz @ 300ps gate

High Voltage Solid State Pulsers

Gated X-ray Detectors

X-ray Streak cameras

Precision, jitter free delay units

Under Developement

Single shot transient recorders

10 Giga samples/second, 3GHz bandwidth, 16μs record length.

Visit Our Web Site at : http://www.kentech.co.uk

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High Rate Imager

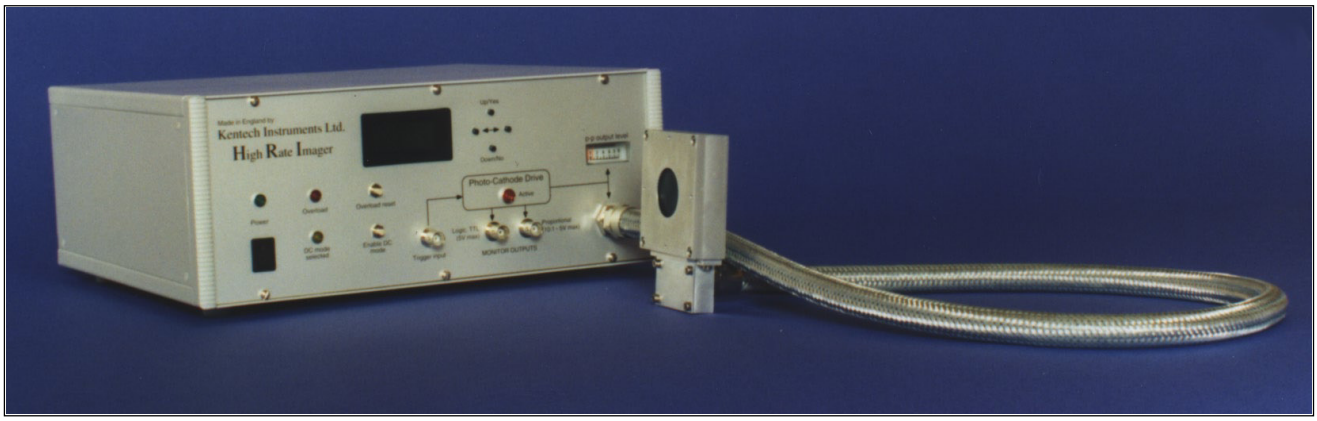
The High Rate Imager is a very high trigger rate gated intensifier intended for applications such as fluorescence lifetime imaging, lidar and time resolved spectroscopy. Its gate pulse driver has a bandwidth of 800MHz and it has internal pulse forming circuitry to provide gate widths to less than 500ps at trigger rates from single shot to greater than 100MHz. It features an internal microcontroller with a front panel LCD display and keypad for all functions (except analogue input attenuation level). In addition it has an RS232 interface to allow remote operation. It is able to provide RF modulation of the intensifier gain at frequencies up to 800MHz.

The intensifier is provided in a remote housing with a flexible connection to the power supply. The input and output faces have mounting holes for the user to attach various optical accessories.

The output format is a flat fibre optic faceplate. We are able to provide CCD readout options or users may provide their own readout arrangements.

We are able to provide certain standard lens mounts at the input face as an option.

The power supply is self contained and includes trigger input conditioning circuitry, intensifier high voltage supplies and protection, gain control, bias circuitry and remote computer control.



HRI Specifications

Features:	110MHz maximum trigger rate from logic input	
	<0.5ns to 1ms optical gate width (5% duty cycle limit)	
	800MHz maximum RF modulation from analogue input	
	Internal 0.5ns comb generator	
	Ideal for use with mode locked lasers	
	Single power supply with RS232 remote control facility	
Intensifier:	18mm diameter	
	S25 on glass or S20 on quartz cathode	
	P20, P43 or equivalent phosphor	
	Fibre optic output	
Operating modes:	Slave	
	Slave (high duty cycle)	
	Comb	
	RF	
	DC	
Controls:	Gate mode	Keypad/remote
	Gain	Keypad/remote
	Trigger source	Keypad/remote
	Analogue gain	Front panel
	Help	Button
	Reset overload	Keypad/remote
	Enable DC	Keypad/remote
Indicators:	Control status	LCD
	Trigger indicator	LED
	Overload	LED
	DC mode active	LED
	AC power	LED
Connectors:	Trigger input (logic)	BNC
	Analogue input	BNC
	Monitor output (logic)	BNC
	Monitor output (analogue)	BNC
	RS232 interface	15 way D

Description of gate modes

Slave

Intensifier gate is slaved to a logic input (TTL or ECL).
The maximum duty cycle is limited to 5% (eg 0.5ns gate at 100MHz or 10ns gate at 5MHz).
The gate width is between 0.5ns and 1ms.

Slave (high duty cycle)

Intensifier gate is slaved to a logic input (TTL or ECL) but the gate voltage is reduced to allow a greater duty cycle.
The maximum duty cycle is limited to 50%.
The gate width is between 1ns and 1ms.

Comb

The input trigger signal is converted to a comb of impulses internally and this is fed to the gate circuit. The trigger rate is up to 110MHz. This mode is most suitable for use with mode locked laser sources and will produce a gate width less than 500ps at the laser frequency.

RF

A sinusoidal (or square) trigger signal in the frequency range 1MHz to 800MHz is applied to the analogue input. The optical gate is approximately a square wave over a frequency range of <1MHz up to 200MHz. Note that as the frequency exceeds 200MHz the shape of the optical gate becomes less square as the finite bandwidth of the cathode pulser and the dynamics of the tube gating take effect however the gain modulation is useful to a frequency of 800MHz.

Gating specification

Slave mode

Input	TTL or ECL
Gate width	0.5ns to 1msec
Max duty cycle	5%
Switched voltage	50V (less 10V bias typical)
Resolution	12 lppmm nominal (depends on wavelength, gate width, gain and PRF)

Slave mode (high duty cycle)

Input	TTL or ECL
Gate width	0.5ns to 1msec
Max duty cycle	50%
Switched voltage	20V (less 5V bias typical)
Resolution	8 lppmm nominal (depends on wavelength, gate width, gain and PRF)

Comb mode

Input	Sinusoid, TTL or ECL
Gate width	<0.5ns to >1ns
Max duty cycle	50%
Switched voltage	30V (less 15V bias typical)
Resolution	8 lppmm nominal (depends on wavelength, gate width, gain and PRF)

RF mode

Input	Sinusoid, TTL or ECL
Input frequency	1MHz to 800MHz
Maximum duty cycle	50%
Switched voltage	20V
Resolution	8 line pairs per mm nominal (depends on wavelength, gate width, gain and PRF)

Notes

i) This intensifier system is optimised for high speed gating for which the cathode drive impedance must be very low. The maximum gate voltage is therefore set by average power limitations. For the high duty duty cycle modes (slave mode at high duty cycle and RF mode) the drive voltage is reduced (nominal 24V p-p). For this reason the user should be aware that for low frequencies (<100MHz) the cathode modulation voltage is lower than may be obtained from a system designed specifically for lower frequency operation although it should be mentioned that the wide bandwidth of the HRI allows the gate voltage waveform to be non-sinusoidal providing faster on/off and off/on transitions than sinusoidal drive would allow. Normally the gate signal will be a square wave with sub-nanosecond rise and fall times. This may be expected to provide enhanced time resolution, even for lower drive frequencies.

If you wish to use only RF modulation but do not need the 800MHz bandwidth we are able to offer alternatives. The higher cathode gate voltage available with restricted bandwidth will provide (slightly) higher gain and resolution.

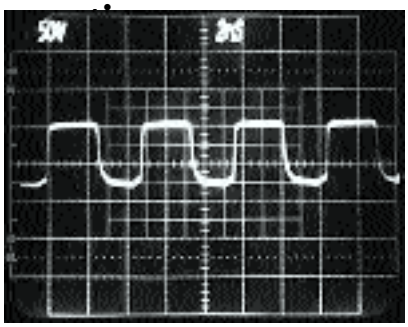
The low duty cycle modes are able to provide a higher switched voltage (50V p-p) as the dissipated power is reduced for the lower duty cycle.

ii) We manufacture a 1MHz, 0.5ns imager. The lower repetition rate allows the application of a higher gate voltage at the cathode providing improved resolution and gate speed. If very high repetition rates are not required then this instrument may be more suitable.

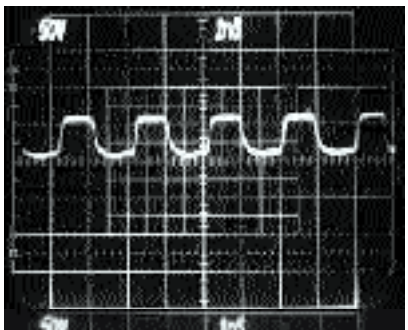
iii) We are able to provide double MCP intensifier options although when operated at high duty cycle the effective backgound illumination (EBI) level for the photocathode must be considered.

iv) Very narrow gate widths are obtained from the HRI by operating the intensifier close to cathode cut-off. The shortest gate widths (400ps and less) are sensitive to the incident wavelength, signal level and reverse bias. In comb mode, when operated at 100MHz, it may be expected to obtain gate widths below 300ps, although the cathode will be operating only a few volts from cut off. If your application demands gate speeds in the range 200ps and below our GOI imager, providing sub 100ps gating at 1 kHz repetition rate, may be more suitable.

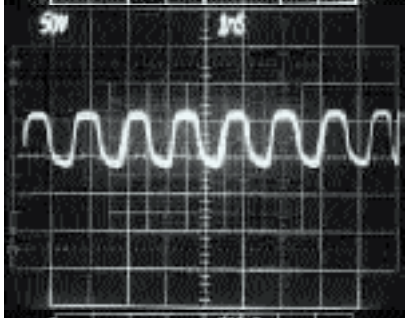
RF Modula-



200MHz

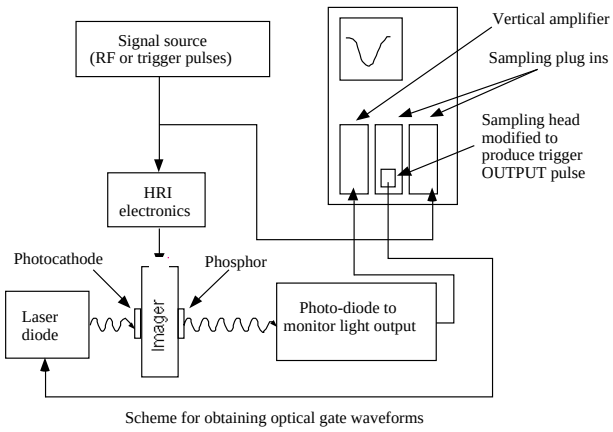


500MHz



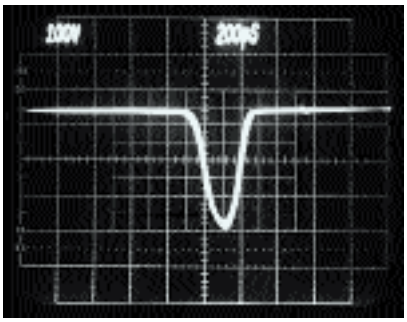
750MHz

1GHz

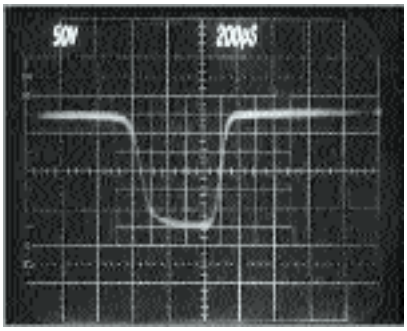


Scheme for obtaining optical gate waveforms

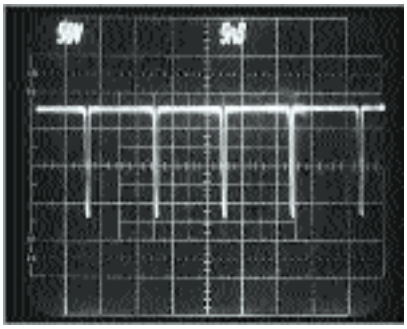
100MHz Impulse drive



0.3ns gating
at 100MHz

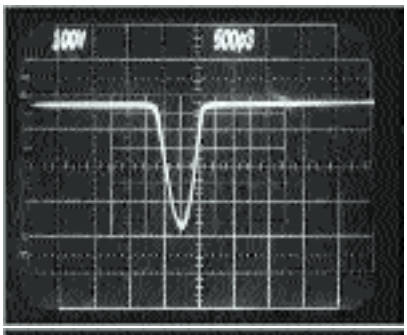


0.5ns gating
at 100MHz

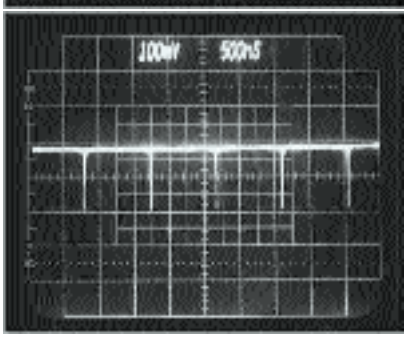


100MHz

1MHz Impulse drive



0.5ns gating
at 1MHz



1MHz

Precision Delay Generator

The Kentech Precision Delay Generatorprogrammable passive delay line is a compact unit designed for the critical timing adjustment of fast camera systems and other fast instrumentation. It will delay an arbitrary input signal over an adjustment range of 20ns in 25ps steps. The unit consists of a set of switched 50Ω calibrated delay lines together with a controlling microcomputer. The device has no inherent jitter, a risetime of better than 1ns and a high voltage capability for short pulses. The delay is set from the front panel or from an RS232 remote control interface. The current delay setting is shown on an LCD display and the unit features relative or absolute delay mode.

The delay is achieved by the switching in and out of various sections of delay line by a set of matched relays. Care has been taken to give a reproducible risetime over the entire adjustment range and the through risetime is better than 0.8ns for all delay settings. The unit may be used to delay short, relatively high voltage trigger signals. Many Kentech high voltage pulsers are able to use this feature to provide highly stable relative timing between two or more output pulse channels. This will find such applications as the adjustment of interframe timing in fast framing cameras and triggering or pulse shaping in laser systems.

Other delay lengths and step sizes can be considered to meet users specifications.

Specification

- Maximum adjustable delay 20ns
- Incremental delay step 25ps
- Typical throughput delay at minimum setting 6ns
- Interstep error <± 0.5 steps, but reproducible.
- Jitter effectively zero, mechanical device.
- Characteristic impedance 50Ω.
- Voltage handling D.C. 30 volts. With pulsed signals up to 30 volts the delay may be changed whilst the signal is propagating through the device. If the delay setting is not changed whilst the pulse is propagating, the pulse is limited to 1.8μA coulombs. e.g. 1.5kv for 2ns.
- Fully functional controls via front panel keys and serial port.
- LCD display of status and functions.
- Serial port RS232, 75 to 9600 baud, (rate is stored in EEPROM), requires simple text commands from a terminal or emulator.
- Delay Absolute or relative.
- Memory Nonvolatile memory of last manual delay setting and relative or absolute delay mode, absolute minimum delay and baud rate. (Note that when powered down the delay will revert to the minimum but the signal will still be transmitted.)
- Size 270 x 210 x 87 mm^3
- Power requirements Universal mains voltage at approximately 20 watts.