ITL

SHORT FORM CATALOGUE

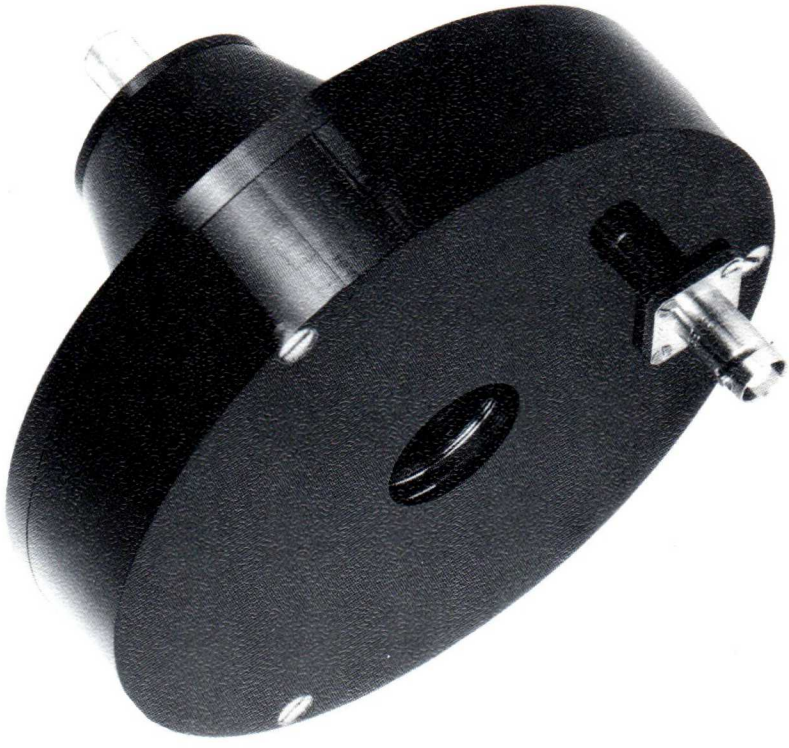
INSTRUMENT TECHNOLOGY LIMITED

INTRODUCTION

Instrument Technology Ltd., was formed in 1968, it specialises in opto-electronic devices such as vacuum photodiodes, sub-picosecond streak camera tubes, image intensifiers for cine radiography and Xray convertors.

Photomultipliers and Xray generating tubes also feature, as well as a comprehensive range of glass to metal vacuum components such as Ion Gauges, viewports, lead throughs, bases etc.

We also make custom built devices for research, many universities and government establishments have placed development contracts with the Company. Customers with specialised requirements in small or large numbers are invited to discuss these with our engineers.



HIGH SPEED HIGH CURRENT PHOTODIODES

The TF.1850 Series 100 picosecond risetime.
Capable of producing 150v. in 50 ohms with a risetime of 100 picoseconds, this device is invaluable in laser laboratories for examining pulse shapes and switching opto electronic equipment. It is available in S1 and S20 response, and with the UV option, will cover the range 150nM to 1100nM. It is provided with an impedance matched mount terminated with BNC Socket.

The FD.125 Series 200 picosecond risetime.
This device is similar to the TF.1850 type except that the tube and mount are impedance matched to 125 ohms.

IMAGE INTENSIFIER TUBES

A range of image intensifiers employing magnetic focussing some of which incorporate channel electron multiplier arrays are manufactured. They have high gain and high brightness and are very suitable for cine recording. Direct Xray convertors are also available employing special photocathodes with very high quantum efficiency for a wide range of Xray energies.

CHANNEL PLATE PHOTOMULTIPLIERS

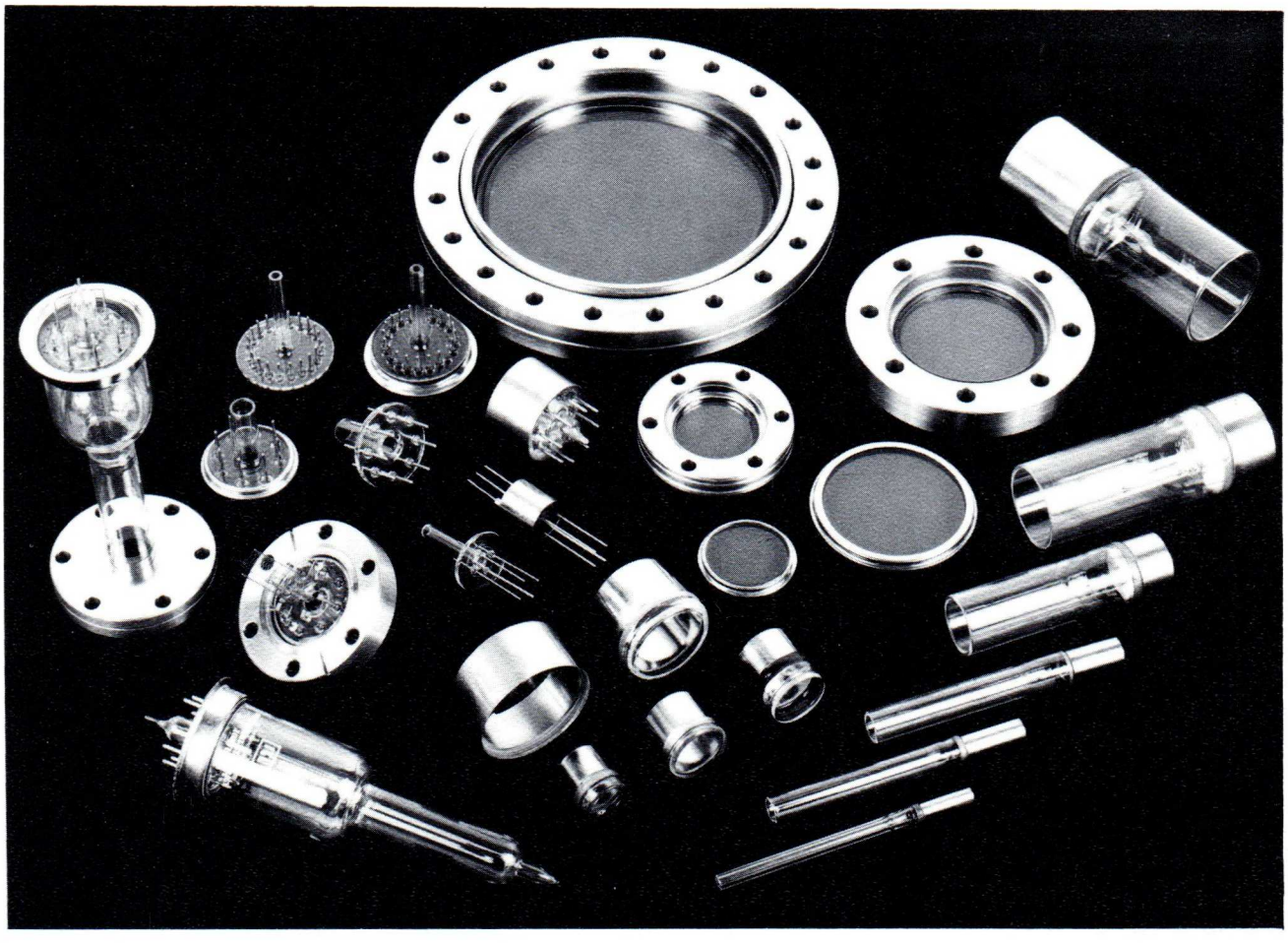
A variety of options are offered including one or two channel plates, UV sensitivity to 150nM. Both S1 and S20 photocathodes are available, the cathode being deposited on the input surface of the first channel plate. All devices are gateable and are supplied with a mount matched to 50 ohms including bleeder chain and capacitors. Magnetic fields as high as 1T are tolerated without shielding and subnanosecond pulse widths may be expected. Linear pulsed anode currents of up to 40.0 mA may be drawn at rates of 5.0 KHZ provided pulse widths of less than 10nS are being detected.

STREAK CAMERA TUBES

Temporal resolution of less than one picosecond may be obtained with the Photochron II range of Streak Camera tubes. Photocathodes available include S1, S11, S20. The output screen is usually deposited on fibre optics to provide efficient coupling. Ultra violet versions are produced as well as windowless Xray sensitive devices. A highly stable solid substrate version of the tube is also available with temporal resolution of 13 picoseconds which has important advantages for those working at 1.06 microns. Photochron III is expected to be in production during 1979.

DEVELOPMENT & CUSTOM BUILT EQUIPMENT

Instrument Technology have a good reputation for involvement in successful development projects in the opto electronic field in conjunction with universities and research institutes. We are always pleased to discuss possible new ventures with persons engaged on research and development. We are prepared to build equipment and devices to customers' design on a quantity or 'one off' basis. The technology of the ITL organisation may be of use to you. For further information on any of the listed products, or discussion of possible assistance with your current problems please contact us at the address below.



VACUUM COMPONENTS

Our highly skilled glassworking section has developed a range of viewports, lead throughs and tubulations, sealed to Conflat type flanges. All are bakeable to 450°C including UV viewports with transmission cut off at 150nM.

Ion gauges, both glass envelope and nude, are also produced and safety approved leads may be obtained for these devices. Special components including valve bases are produced to order.

The F.C. series of U.H.V. flanges incorporates the proven captured copper gasket sealing principle, which is accepted as the standard flange sealing method throughout the Ultra High Vacuum industry.

As with all our U.H.V. flanges, the material used in flange manufacture is chosen to ensure 100% reliability and freedom from leaks is guaranteed. In practice this means that all flange steels are electroflux refined, with the micro-cleanliness of the treated material monitored.

No inclusion greater than Grade 1 of ASTM E45 is permitted, thereby eliminating the risk of leaks caused by porous materials.

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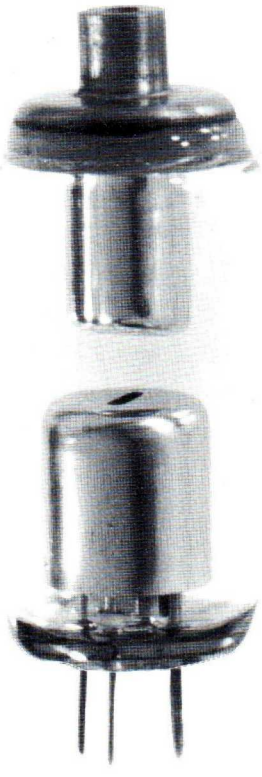

XRAY GENERATING TUBES

We manufacture a range of Xray generating tubes of the stationary anode type operating at 60Kv 15mA with Beryllium windows when required.

JUDSON INFRARED DETECTORS

Manufactured in the U.S.A. this range of detectors covers the range 1 to 25 microns. It includes Indium Arsenide, Indium Antimonide, Germanium and Silicon as well as Mercury Cadmium Telluride. Both room temperature and liquid nitrogen cooled operation is offered as well as multiple stage thermoelectric coolers inside standard T.O. packages.

This range of solid state detectors are of extremely high quality at competitive prices.

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'Photochron II' Picosecond Streak Camera Tube

INFORMATION ITL BULLETIN

Introduction

The INSTRUMENT TECHNOLOGY LTD. Image Converter Camera tube Photochron 2 is specifically designed for research in the fields of Laser, Plasma and chemical physics. Limiting time resolution of less than 1×10^{-12} sec. combined with sufficient sensitivity to record single photo-electrons, when used with the customary image intensifier, make this a device of outstanding value for monitoring such fast transient events as the output from mode locked Lasers, time resolved spectroscopy, and the study of photochemical kinetics.

The tubes, which are electrostatically focused and deflected, and incorporate a fine mesh extraction electrode, have been developed in close co-operation with Imperial College, London.

All tubes are capable of static resolution better than 32 lp/mm referred to the photocathode, and can operate with high peak currents without defocusing because of the use of photocathode conducting substrates. They are designed for applications where subsequent intensification of the image will be necessary, and have sufficiently low noise and good picture quality for this mode of operation.

Operation

Light from the transient event under study is imaged in slit form upon the photcathode of the image converter tube. Photoelectrons produced by the incident photons are accelerated into the image converter by a high positive potential applied to a fine mesh extraction electrode close to the photocathode. This high extraction field minimises the effect of finite distribution of photoelectron emission energies, hence reducing the time dispersion inherent in their transit across the tube. The photoelectronic image is refocused electrostatically upon the output phosphor. During transit through the tube, the photoelectrons are deflected at high velocity in a piane at right angles to the

axis of the slit, by means of an externally triggered voltage ramp which is applied to the deflecting electrodes. Consequently temporal variations of an event entering the tube are separated sequentially in space, producing a time-resolved display on the output phosphor.

This display is normally processed through an image intensifier system for ultimate recording with a photographic camera, coupling is usually acheived by fibre optics.

Specification

PHOTOCATHODE

Type	Semi transparent			
Spectral response	S-1	S-11	S-20	S-25
White light sensitivity	16μA/L**	30μA/L*	50μA/L*	100μA/L*
Photocathode shape	Flat 8.0mm diameter			
Photocathode substrate refractive index	1.487			
Tube faceplate refractive index	1.487			
Transverse resistance of photocathode substrate	50 ohm/square			

FLUORESCENT SCREEN

Shape	Flat circular
Useful size	55mm dia. or 39mm dia. Fibre Optic
Phosphor type	P11 (aluminised) or P4 (aluminised)
Fluorescence	Blue or Yellow
Persistance	Medium short
Deflector plate capacitance of any plate to all others connected	8 pF (maximum)

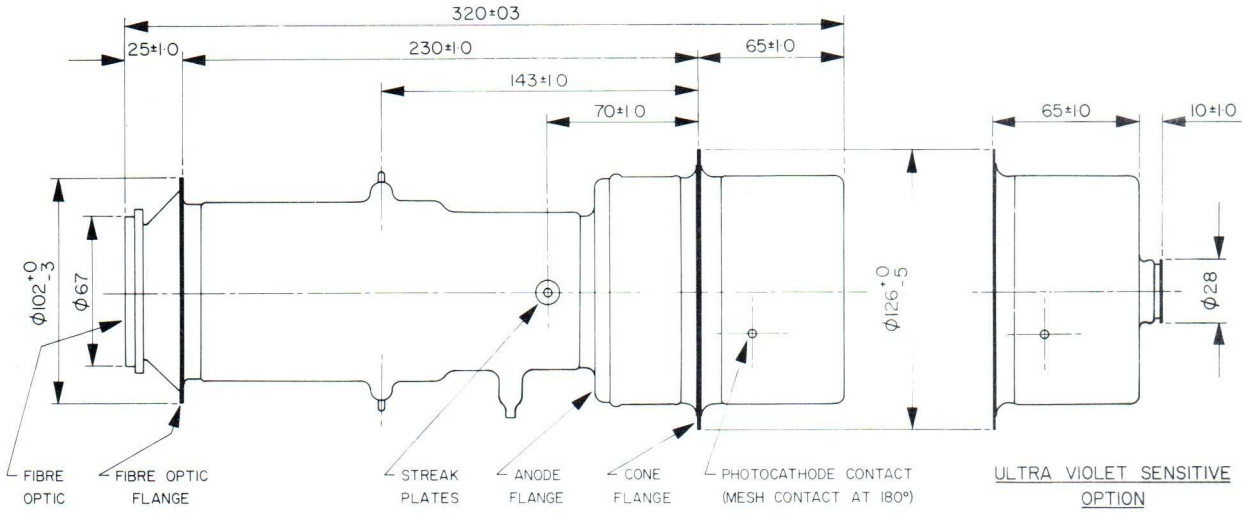
For U.V. application, a sapphire input window and a spectrosil B substrate is employed, this extends the response to 220nM.

TYPICAL RATINGS

Anode voltage	+ 18kV
Cone voltage	+ 850V
Mesh voltage	+ 1KV
Cathode voltage	0V
Magnification	2
Static resolution	32 lp/mm (referred to the cathode)
Background equivalent illumination	10^{-5} ft. candles

* This figure takes into account the approximate 50% loss due to absorption of the conducting substrate (not normally required for S-1).

**Sensitivity at 1.06μ - 0.2mA/W.



ALL DIMENSION IN MM

BIBLIOGRAPHY

P. R. BIRD, D. J. BRADLEY and W. SIBBETT: "The Photochron II Streak Camera", proceeding of the XIth High Speed Photography Conference, London, September 1974.

PATENTS

This tube is covered by the following Patents:
UK 1329977, France 71/23009, USA 3761614, Germany 2131652, Japan 43748/71

Instrument Technology Limited

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Telephone: Hastings 52511 (STD Code 0424)

Channel Plate Gated Photomultipliers

INFORMATION ITL BULLETIN

Mounted Photomultiplier

STANDARD FEATURES:

- Temporal resolution
  Risetime less than 500ps.
- Mounted in a 50 ohm matched holder.
- Linear pulsed anode current 40mA at 5KH pulse width 2.0nS.
- Unscreened operation in axial magnetic fields up to 1T.
- Transit time 1nS, jitter 100pS.
- Nanosecond gating.

OPTIONS:

- Single channel plate—gain 1 × 10^5.
- Two channel plates—gain 1 × 10^7.
- Ultraviolet response to 150nm.
- X-ray sensitivity 10% at 20KeV through 12 micron titanium input window.

This range of detectors has been further developed and simplified by the deposition of the photocathode on to the channel plate input surface. All devices now include gating facilities if required. All types depend on the channel electron multiplier array (channel plate) for high speed, high gain operation. Applications are envisaged in high energy physics, kinetic spectroscopy, photon counting as well as many laser experiments.

The holder provided enables good impedance matching to 50 ohms to be achieved. It is not, however, available for the X-ray versions.

SPECIFICATION:

Photocathode Spectral response	S20 or S1
Useful diameter	18mm.
UV input (where applicable)	UV grade sapphire
Gain (one channel plate)	1 × 10^5
Gain (two channel plates)	1 × 10^7 maximum
Nominal applied voltage (one channel plate) ...	-1.5kv, maximum -2.0kv.
Nominal applied voltage (two channel plates: ...	-2.0kv, maximum -2.5kv.
Maximum dc anode current	1μA
Maximum pulsed anode current	40mA at 5KH for pulse with 2.0nS.
Single electron pulse width	Less than 750 picoseconds 1 × 10^7 gain
Focussing	Proximity.

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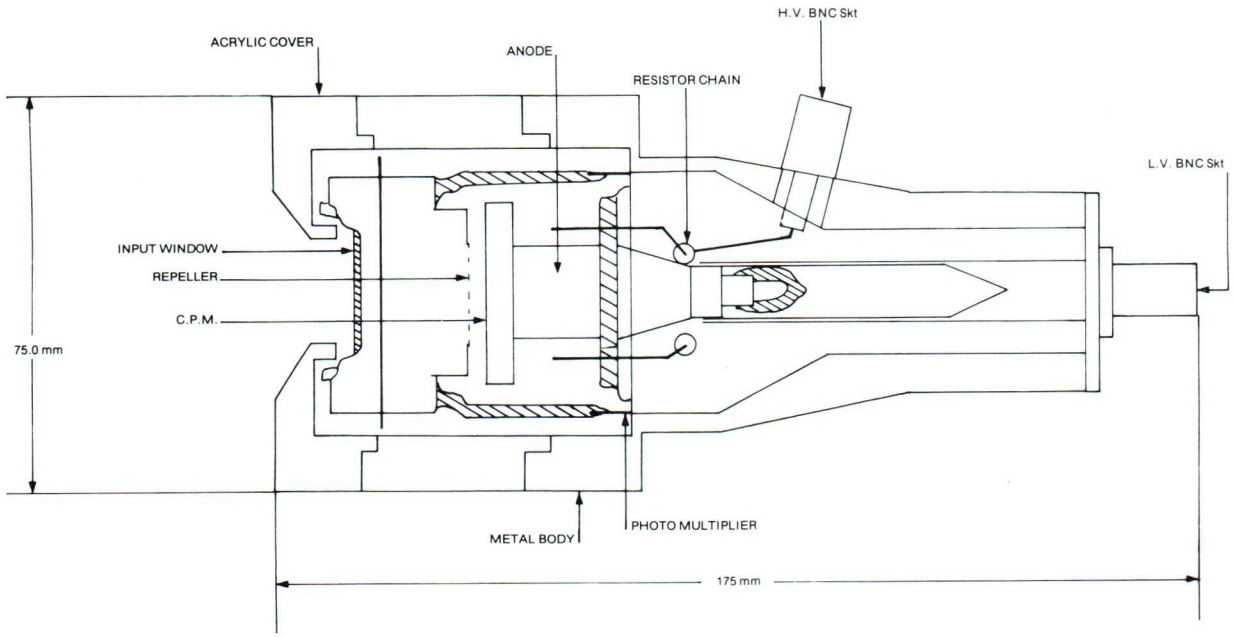
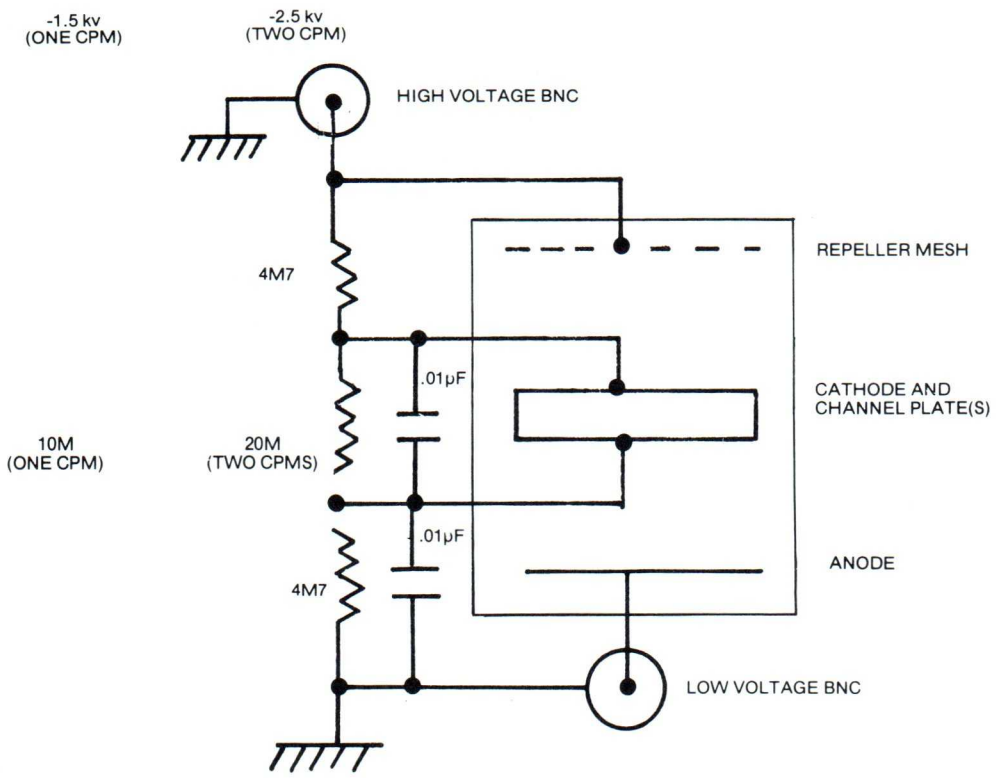
MICRO CHANNEL PLATE PHOTO MULTIPLIER



ELECTRICAL CIRCUIT (NON-GATING)



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High Current
50OHM Photodiode TF1850

INFORMATION
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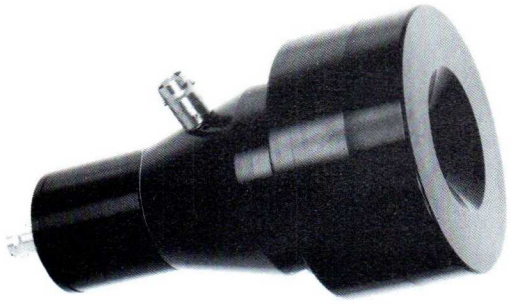


- RISETIME 100 PICOSECONDS
- MAX. PULSED CURRENT 3.0 AMP
- PHOTOCATHODE SPECTRAL RESPONSE: S-1, S-4, S-20
- U-V WINDOW OPTIONAL
- MATCHED 50 OHM MOUNT

Type TF1850 Photodiodes have been developed for detecting sub-nanosecond optical events in conjunction with real time and sampling oscilloscopes. The coaxial design of the diode and its mount avoids signal distortion and allows rise times of less than 100 picoseconds to be measured. For events of very short duration, optimum temporal resolution requires that the photon detector and display must be perfectly matched for impedance.

Regurlarly recurring events are conveniently displayed using a sampling oscilloscope (generally of 50 ohm impedance). The greater sensitivity of the sampling system requires lower current from the photocathode, so that solid conducting substrates have in the past not been necessary. The recent development of extremely fast real time oscilloscopes matched to 50 ohms requires a detector capable of delivering higher currents. It has therefore been decided to introduce the TF1850 series of tubes which can be used with either sampling or real time systems.

The device is, essentially, a specially designed photocell of biplanar geometry with a reflecting type photo-emissive cathode which by choice of type has sensitivity from 200nm to 1100nm. The anode-cathode separation is 2.0mm and a field of 1.5kV/mm maximum enables the relatively high currents to be drawn without pulse shape deterioration due to space charge. The effective photocathode diameter is 18.0mm and the dark current at the operating voltage is less than 10^{-7} Amperes. The device is mounted in a matched holder which includes a storage capacitor.

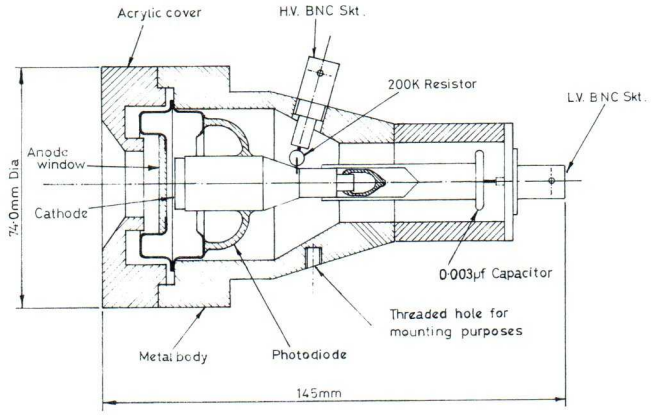
For examination of the pulse shape of mode locked d.c. lasers and other extremely fast events, this device is ideal.

SPECIFICATION

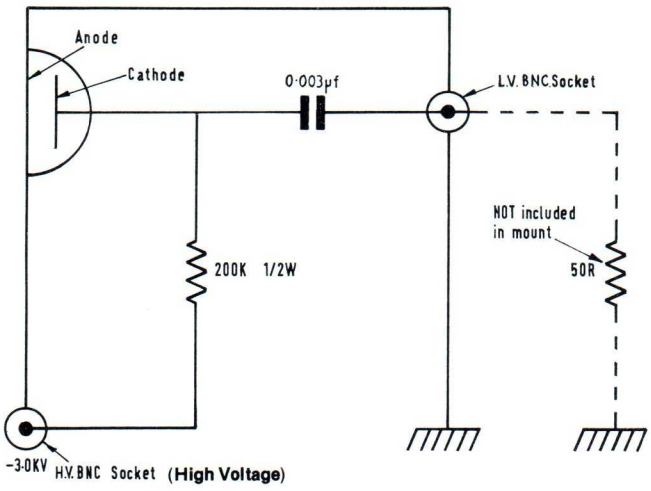
Photocathode Spectral Response	—	S-1
	—	S-4
	—	S-20
Effective Cathode Diameter	—	18.0mm
White Light Sensitivity (Typical)	—	
S-1	—	20μA/L
S-4	—	20μA/L
S-20	—	100μA/L
Infrared Sensitivity (Typical)	—	
at 1.06 u — S-1	—	0.3 mA/W
at600mm — S-20	—	40 mA/W

Max. Pulsed Output Current	—	3.0A
Max. d.c. Output Current	—	30μA
Dark Current at 1.5kV	—	1×10^{-7} A
Dark Current at 150V	—	
S-1	—	5×10^{-9} A
S-20	—	5×10^{-10} A
Rise Time	—	1×10^{-10} s
Max. Operating Voltage	—	4.0kV—VE
Typical Operating Voltage	—	3.okV—VE
Characteristic Impedance	—	50 ohms

MECHANICAL DETAILS

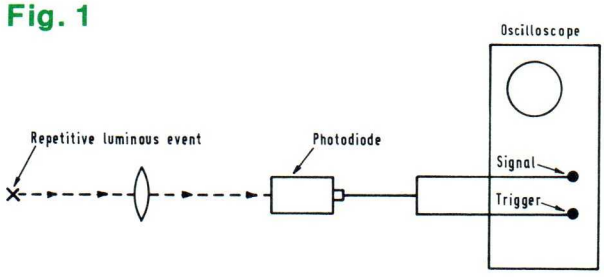


EQUIVALENT ELECTRICAL CIRCUIT



SPECTRAL CHARACTERISTICS

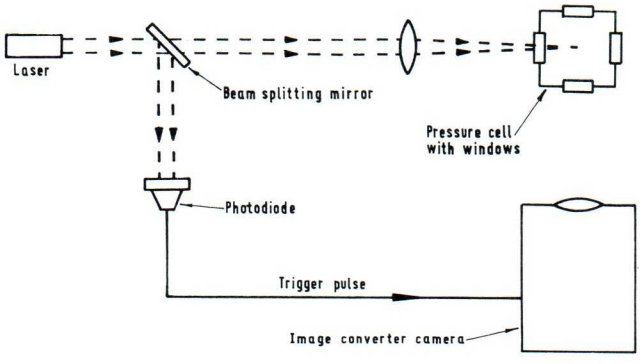
Fig. 1



TYPICAL APPLICATIONS

- Detection of optical signals in the gigahertz region.
- Study of repetitive luminous signals using sampling oscilloscopes. Fig. 1.
- Optical heterodyning at up to 4 gigahertz.
- Calibration of oscilloscope internal delay & time scales in the sub-nanosecond region.
- Switching of diagnostic optoelectronic equipment (Fig. 2) (e.g. switching of an image converter camera from the laser in a laser produced plasma).

Fig. 2



Specification subject to change without prior warning at manufacturers discretion

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125 ohm Photodiode

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- RISETIME 0.2 NANOSECONDS
- OUTPUT OF 250 VOLTS INTO 125 OHMS
- MATCHED 125 OHM MOUNT
- AVAILABLE WITH S-1 OR S-20 RESPONSE
- U V TRANSMITTING WINDOW

Type FD125 (M1) or (M20) is a fast, high vacuum photodiode with the photocathode formed on a solid metallic substrate. The anode is a tungsten mesh attached to the input window of the tube. Special design and fabrication techniques employed in the production of the tube make it unique in such applications as high intensity laser light detection, laser communication systems.

The special photocathode formation technique ensures pulsed photoemission current densities of 0.7A/cm² without any fatigue of the photocathode. Extremely high extraction field ensures linear operation over an intensity range of more than 1×10^8.

Coaxial design of the tube matched to 125 ohm system, associated with the high extraction field used, makes available a very fast rise time.

The use of a properly designed mount precision engineered, incorporating a disc capacitor of a few thousand picofarads, with an output coaxial socket and HV lead is of paramount importance if a smooth base line without any reflection is expected from the oscilloscope.

SPECIFICATION

Photocathode spectral response		—	S—1
			S—20
Effective cathode diameter		—	20mm
White light sensitivity (Typical)	S1	—	20 μA/L
	S20	—	100 μA/L
Infra-red sensitivity (Typical)			
at 1.06 μ —	S1	—	0.3 mA/W
at 600nm —	S20	—	40 mA/W
Max. pulsed output current		—	0.7A/cm²

Dark current at 3KV (Typical)	—	1×10^{-7} A
Dark current at 150V S1	—	1×10^{-10}A
Rise time		2×10^{-10}sec (10%—90%)
Fall time		6×10^{-10}sec (90%—10%)
Output impedance	—	125 ohms
Peak current		2.1A for 100ns max
UV Window cut off	—	150 nm

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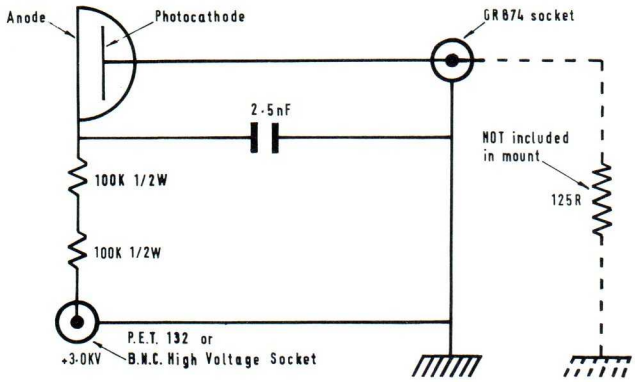
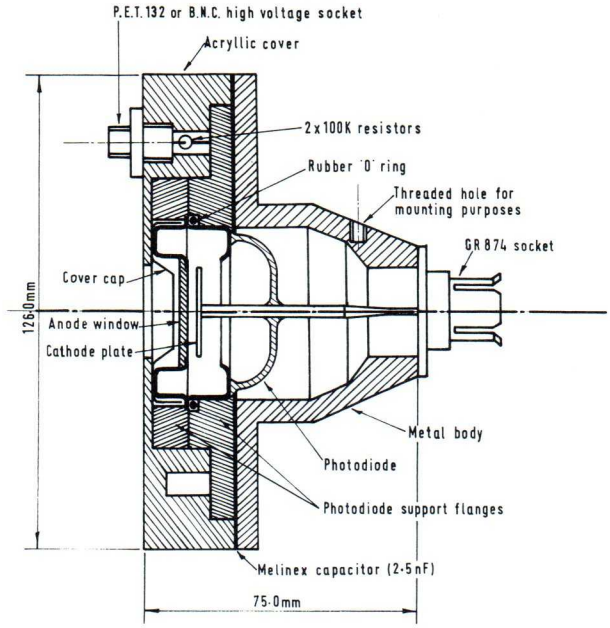
EQUIVALENT ELECTRICAL CIRCUIT



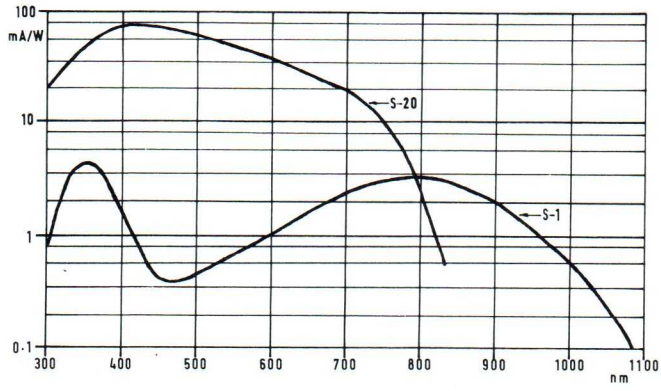
MECHANICAL DETAILS



TYPICAL APPLICATIONS

- Calibration of oscilloscope delay and time scales in the nanosecond region and below (Fig. 1).
- Monitoring fast light sources (Fig. 2).
- Switching of diagnostic optoelectronic equipment (Fig. 3), (e.g. switching of an image converter camera from the laser in a laser produced plasma).
- Study of repetitive luminous signals using sampling oscilloscopes.
- Radiometric measurements in the visible and U.V.

SPECTRAL CHARACTERISTICS



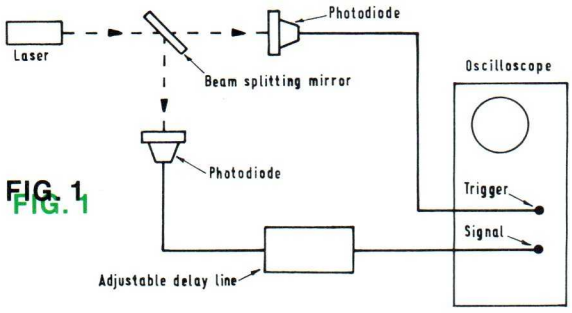


FIG. 1

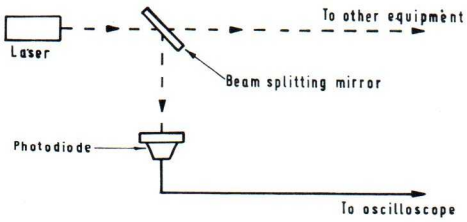


FIG. 2

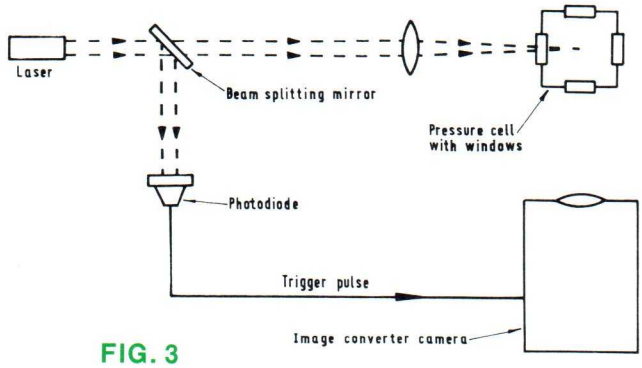


FIG. 3

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