

H28925

S-Range Scaler-Timer

NFU 556



Purpose

This unit is a general purpose digital scaler-timer suitable for radioactivity counting utilising Geiger-Muller tubes, and as a general purpose millisecond digital timing device with manual or electronic triggering.

Apparatus details

The unit is housed in a metal case with moulded plastic ends, which are easily removable for fuse replacement. All the controls are situated on the front panel of the instrument. The instrument is mains operated via three-core mains lead with IEC connector and moulded on mains plug (240V version).

The bright orange/red LED display has six digits, 24 mm high, making it suitable for individual or class use.

The desired mode of use is selected by setting the function switch into one of three positions:

- The counting position for radioactivity counting.
- The timing position for manual operation of the millisecond timer.
- The triggered timing for light gate operation of the timer.

In the radioactivity mode, the built-in EHT supply provides a GM tube supply voltage. This is adjustable between 300-500 V by the GM tube supply control. Loudspeaker sockets are provided for use when an audible indication of count rate is required.

In the timing mode, the display features most significant figure blanking. The clear display reads in seconds from 0.000 up to 999.999 and increments in ms.

Lamp supply sockets of 2 V 0.5 A a.c. and 6 V 0.5 A a.c. are provided for use with lamps or light gates when used to control timing operations.

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- 1 Function switch (counting/timing/triggered timing)
- 2 GM Tube variable power supply control
- 3 BNC connection for GM Tube Holder
- 4 Loudspeaker output for radioactivity measurement
- 5 Triggered timing inputs
- 6 LED display
- 7 Timer reset button
- 8 Mains on/off switch
- 9 Mains connection
- 10 Lamp supplies
- 11 Manual timing start/stop

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Ratings

Mains input:	220 – 240V	50/60Hz
	100 – 120V	50/60Hz
Power consumption:	9W	
Mains plug fuse:	5A	
Internal fuse:	T50mA	
Display:	6 digit (24mm LED)	
Timing oscillator:	1000Hz (1 ms period)	
Accuracy:	± 0.5% (typically ± 0.2%)	
Radioactivity inputs:	GM tube via BNC socket with integral 300-500V variable supply.	
Timing Inputs:	Manually switched stop/start Light gate operated stop/start Mechanical switch closure stop/start Triggered timing start/stop (momentary interruption of light beam)	
Outputs:	2V and 6V, 0.5A A.C. Loudspeaker output via 4mm sockets	
Dimensions:	W380 x D140 x H165 mm	

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Operating Procedure

Below are descriptions of how to set up each mode of operation, the numbers in brackets correspond to the numbers on the device description on page two.

NOTE: Only controls relevant to the activity are shown on diagrams.

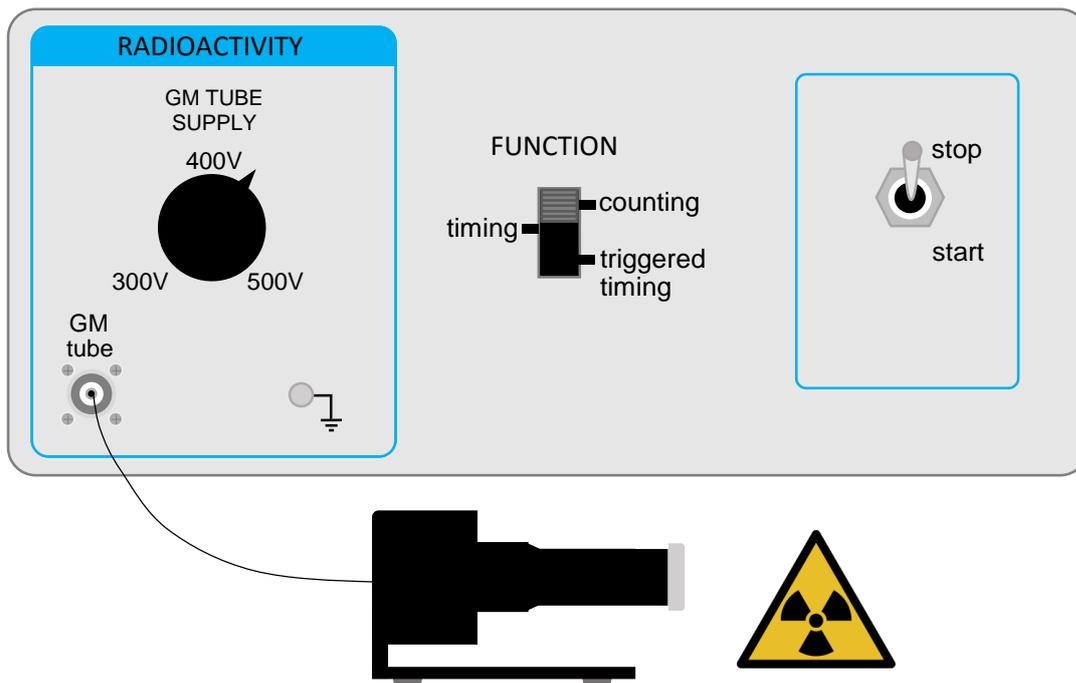
Radioactivity measurements

Connect a GM tube to the BNC socket and set the GM tube supply control to the recommended supply voltage (usually around 420 V).

If required, connect a loudspeaker of impedance 3Ω to 50Ω to the loudspeaker sockets (4).

Set the stop/start switch (11) to stop and the function switch (1) to **counting**. Switch on the mains switch (8) and depress the reset button (7) to zero the display.

When the start/stop switch is in the start position, the instrument will count the incoming pulses. Counting is stopped by returning the switch to the stop position.

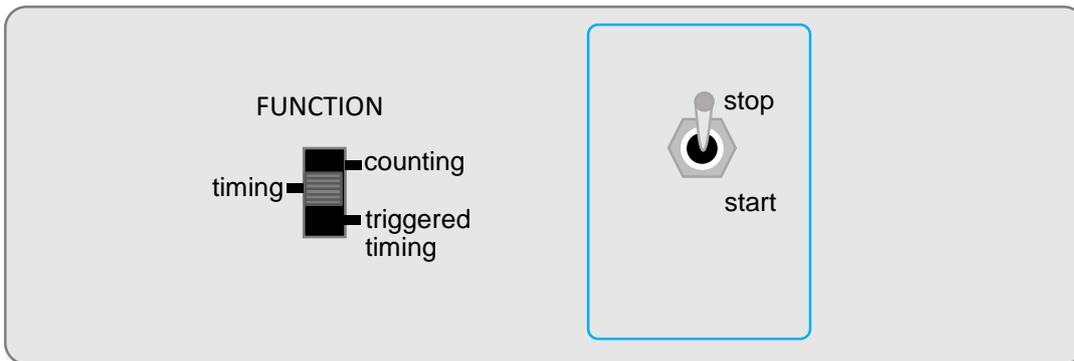


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Timing Measurements

1. Manual control

Set the function switch to **timing** and the stop/start switch to stop. Switch on the mains and depress the reset button to zero the display.

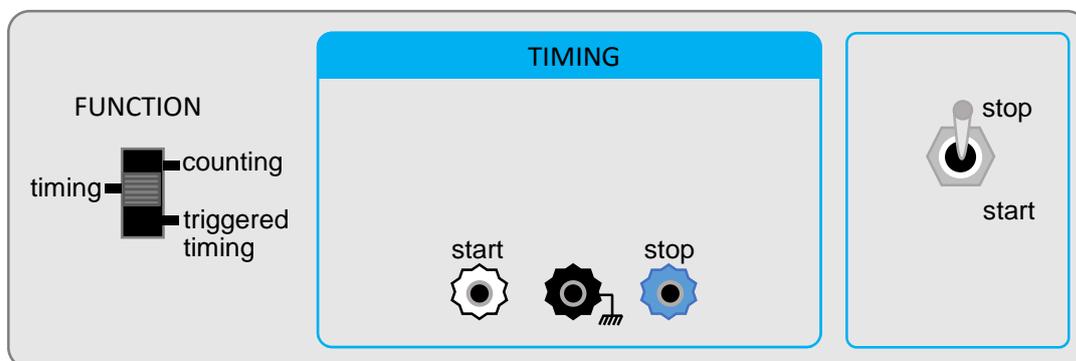


Timing is then **controlled by the stop/start switch**, and the instrument can be used this way for all experiments where a stopwatch or stopclock would normally be used. The display will count up in increments of 1 ms, to a maximum count of 999.999 s.

2. Electrical control

Set the function switch to **timing** and the stop/start switch to stop. Switch on the mains and depress the reset button to zero the display.

Timing can now be controlled by switches, photo transistors, or light dependent resistors (such as cadmium sulphide cells) connected to the start and stop sockets. Timing will commence when the start sockets are closed and the stop sockets are open, and stop when the stop sockets are closed.



Force of a Kick - Football Practical

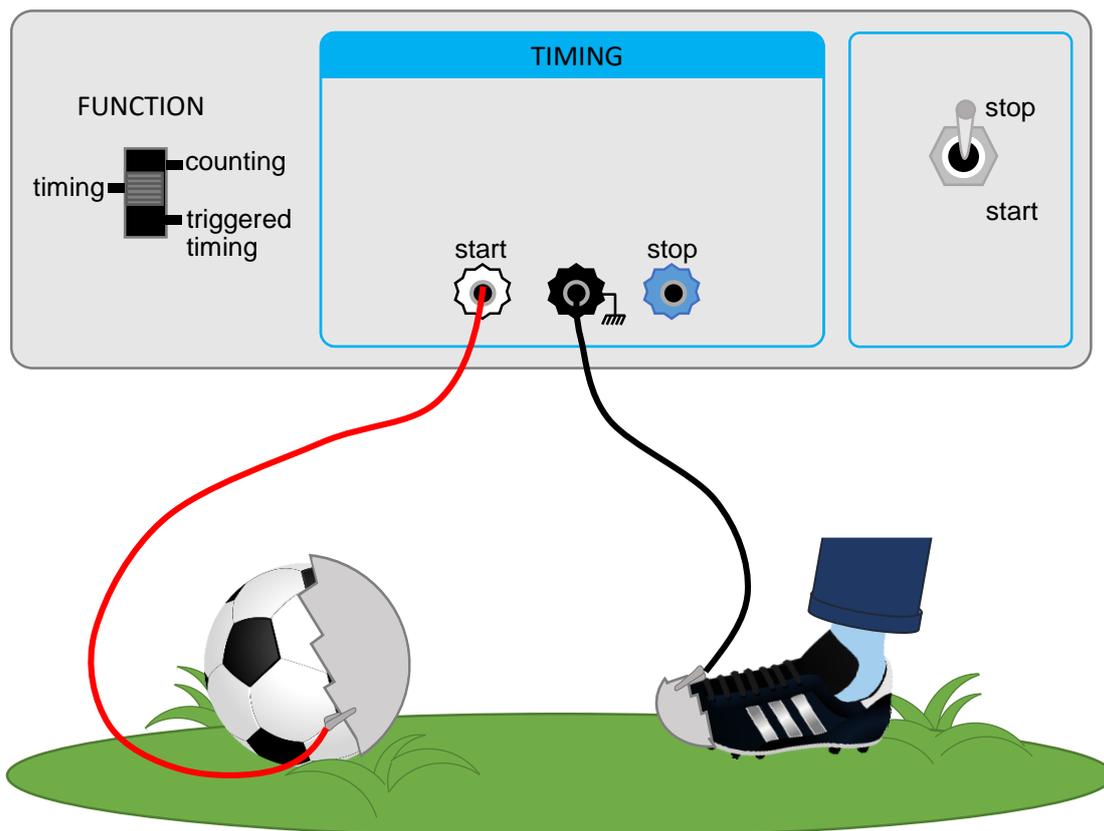
An example of using the timer with electrical control is the Football Practical, in which the force used to kick a football is calculated using the equation:

$$F \times t = m \times \Delta v$$

Where: F = impact force, t = time, m = mass, and v = velocity

By assuming the ball is in free fall once kicked, the time of flight can be calculated using the vertical distance it falls. Once you have measured the horizontal distance the ball travelled, the horizontal speed of the ball can be calculated.

In order to obtain the duration of contact between the foot and ball, the timer must be set up to start running when contact is made (between the foil on the shoe and ball) and stop when contact is broken. This can be done with the Scaler-Timer with the below arrangement.

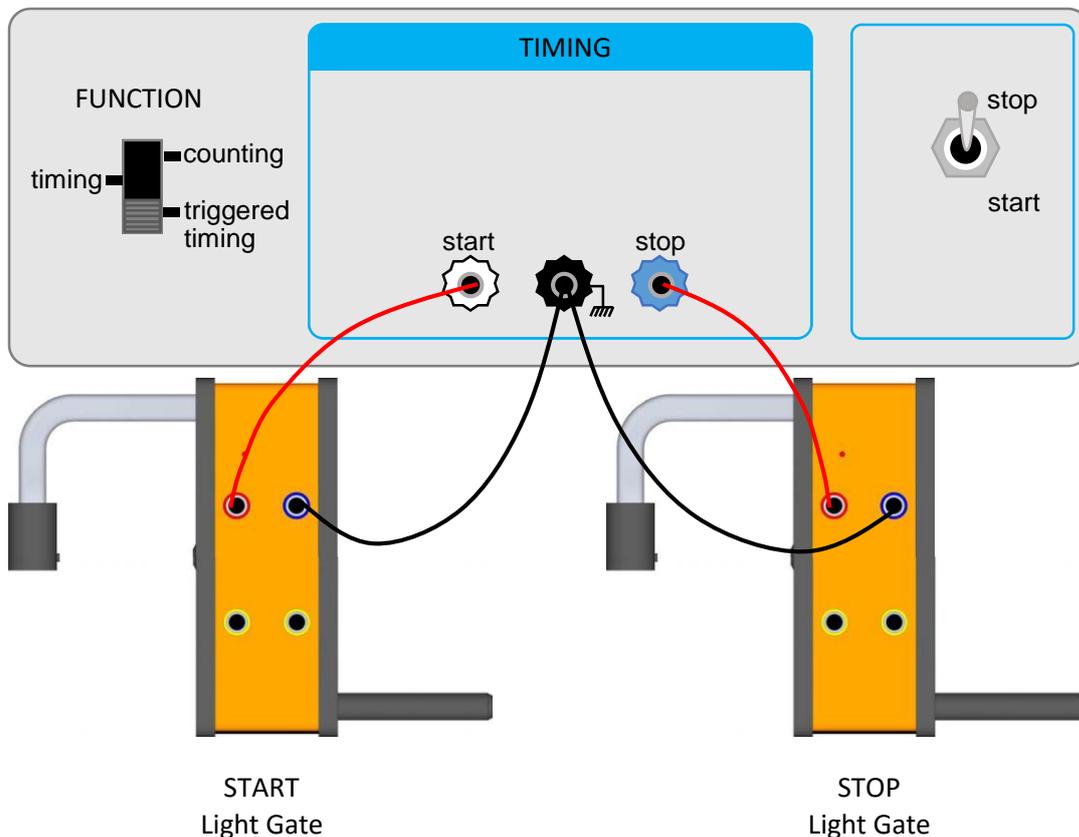


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3. Triggered timing with light gates

Set the function switch to **triggered timing** and the stop/start switch to stop. Switch on the mains. Connect light gates to the start and stop sockets (the black socket is common – see below). Depress the reset button.

Momentarily breaking the start beam will commence the timing, and momentarily breaking the stop beam will stop the timing. Light must fall on the start beam again before the stop beam is interrupted, otherwise timing will not stop (i.e. please ensure the light gates are not “always blocked” – please see Light Gate Notes for Use for more information).



EMC

This equipment is Class A according to the EMC standard EN55011 and is intended for use in a non-domestic environment only. Interference from nearby sources of RFI (radio frequency interference) may affect the output signals. Likewise, this equipment may affect other equipment: PC's, laptops, tablets and mobile phones may be affected.

Warnings

For your safety, this product should be used in accordance with these instructions; otherwise, the protection provided may be impaired. Risk of shock if the unit is opened.

Use only the 3-core mains cable supplied with the unit. If the mains cable is replaced, the rating of the replacement must be the same or better than the original.

Do not open or remove covers or panels. Repairs and service may only be carried out by our repair agent, otherwise the warranty may be void.

The unit must be earthed at all times. The unit is earthed/grounded through the 3-core main leads, so no additional earth connection is required.

This unit is intended for use in DRY conditions. Avoid spillage of water and other liquids on to the unit. If spillage occurs, disconnect the mains supply.

There is no specific requirement for insulation of external circuits as they cannot become hazardous live, as a result of connection to this unit.

Care should be taken when connecting lamps and light gates to these sockets because it is possible to obtain 8V A.C. between one of the 6 V sockets and the grounded 2 V socket.

Always position the Scaler timer so that it can be disconnected from the mains if an emergency arises.

Cleaning

The S-Range Scaler Timer may be wiped clean using a damp cloth. Be sure to disconnect the unit from the mains before cleaning, and do not use any abrasive cleaners or organic solvents.

Periodic testing

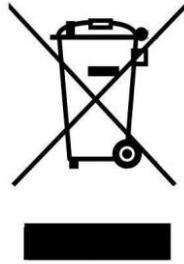
Check the mains lead and plugs at both ends for any damage.

Periodically check the earth bonding and insulation, by performing a Portable Appliance Test (PAT). Most schools and local authorities have a regular schedule for such testing.

Check that the fuse in the mains plug (5A recommended) and the T50mA internal PCB mounted fuse are of the correct rating. Please note the PCB mounted fuse T50mA is not user replaceable.

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Disposal of Waste Electrical and Electronic Equipment (WEEE)



Do not dispose of this product with household waste

- For the proper treatment, recovery and recycling please take this product to an appropriate collection point.
- If you are unsure where this is, contact your Local Authority
- By disposing of this product correctly you will be providing positive help to the environment.

Warranty, repairs and spare parts

The S-Range Scaler-Timer is guaranteed for a period of one year from the date of delivery to the customer. This warranty does not apply to defects resulting from the action of a user such as misuse, improper wiring, any operations outside of its specification, improper maintenance or repair, or unauthorized modification.

Our liability is limited to repair or replacement of the product. Any failure during the warranty period should be referred to Customer Services.

Please contact Customer Services or techsupport@philipharris.co.uk for advice

Instructions for authorized service technicians

Ensure that any replaceable mains cord is of the correct rating, and that all earth conductors and protective earth bonding is maintained after service work.

Please refer to the detailed service procedures, safe servicing and continued safety – contact techsupport@philipharris.co.uk for advice.

Please refer to product specific risks that may affect service personnel, the protective measures and verification of the safe state after repair.

Supplier details

Philip Harris Education, 2 Gregory Street, Hyde, Cheshire SK14 4RH

Orders and Information:

Tel: 0345 120 4520

Fax: 0800 138 8881

Repairs:

Tel: 0845 120 3211

Technical Support:

E-mail: techsupport@philipharris.co.uk

www.philipharris.co.uk

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