



## PHOTO ELECTRIC EFFECT - Planck's constant

Cat: AP2341-001 (LCD digital model with 5 filters)

### DESCRIPTION: KIT CONTENTS:

- 1 pce. Photo-Electric Effect instrument. Runs from 9V transistor battery.
- 1 pce. 9V battery, type #216
- 1 pce. Lamp as light source, 12Volt, 25 to 30Watt. Mounts on rear of unit. Spare lamp is Cat: PA2043-004 2pin, QI, 12V, 25 to 30W.
- 1 set of 5x Colour filters. Calibrated in nanometres wavelength. 428nm (blue) / 460nm (green) / 492nm (yellow) / 530nm (orange) / 590nm (red)
- 1 set. 4x Apertures to set the quantity of light from the light source. Aperture orifices: 7mm, 10mm, 14mm, and 20mm diameters

**AP2341-001 PE effect & Planck's constant**



**Physical size: 272x160x110mm LxWxH      Weight: 1.3 kg (incl.lamp)**

The 5x special filters and the 4x apertures store in a secure compartment at the rear of the instrument. The light source can run from any 12V power supply and all experiments can be run from this single light source. Special lights are not required.

For one of the experiments, an external student voltmeter is required.

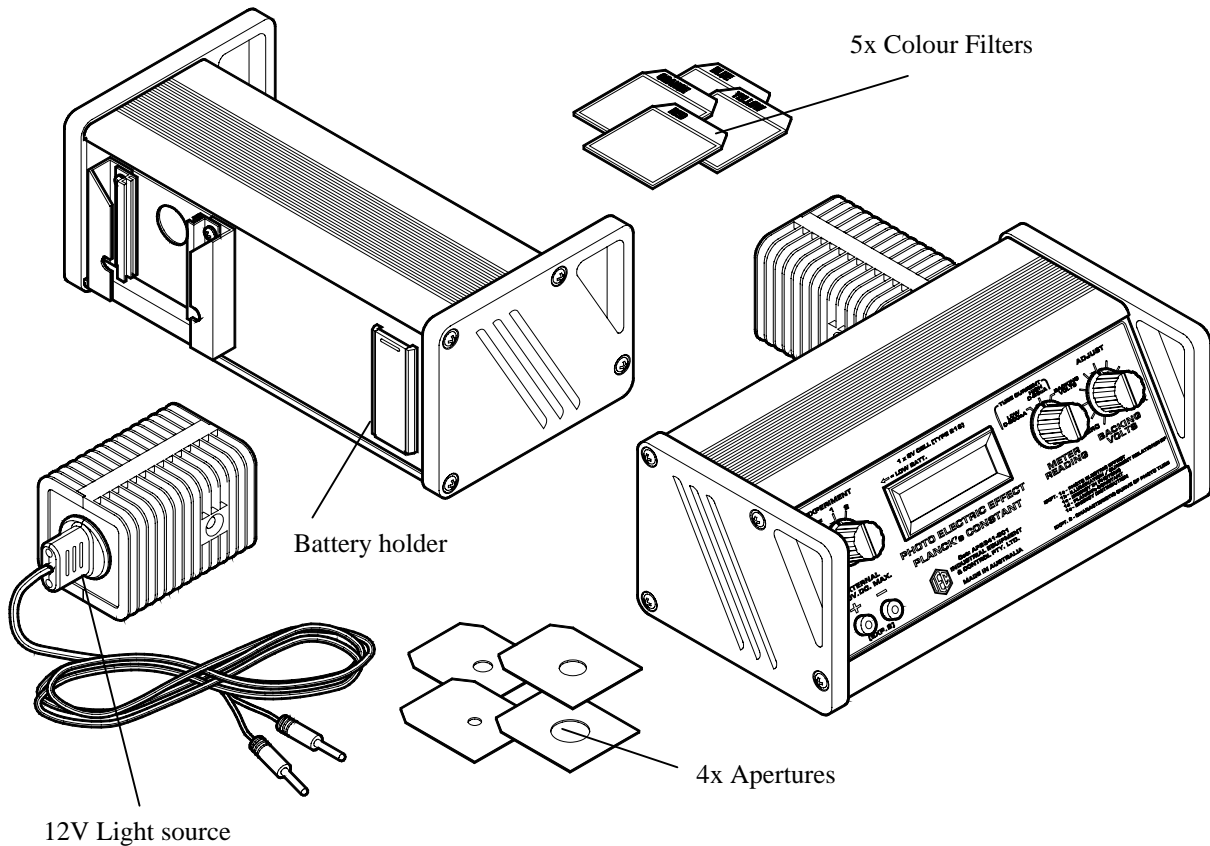
At the rear of the instrument, a shutter can be removed to permit complete viewing of the photo tube for better understanding for the students.



### THE 'IEC' PHOTO-ELECTRIC UNIT: description

Bench mounting instrument with digital meter to indicate either current through the internal Phototube or voltage applied to the Phototube.

A 9V battery, provided with the instrument, must be fitted into the small battery holder or compartment (depending on model) in the rear face of the instrument.



### Parts & accessories:

All parts are available as spares:

**FRONT PANEL CONTROLS:**

- **‘EXPERIMENT’ ROTARY SWITCH (left of meter) 3 pos’n:**
  - 1) Turn battery power ON/OFF. When selecting an experiment, LCD display is on.
  - 2) Select Experiment 1 (parts a-e):
    - a) Photo Electric Effect
    - b) Illumination / Current relationship.
    - c) Energy of a Photon
    - d) Planck’s Constant
    - e) Energy Distribution
  - 3) Select Experiment 2: The Characteristic Curve of a Phototube.
- **‘METER READING’ ROTARY SWITCH (right of meter) 3 pos’n:**
  - 1) Select the digital meter to read very small current through the tube (0-200nA).  
1 nA (nanoamp) is  $1 \times 10^{-9}$  amps. Reads to 0.1 nA.
  - 2) Select the digital meter to read larger current through the tube (0-20uA).  
1 uA (microamp) is  $1 \times 10^{-6}$  amps. Reads to 0.01 uA.
  - 3) Select the digital meter to read the Backing Voltage applied to the tube. This Backing Voltage is adjustable from 0 to -1.8V. When Experiment 2 is selected, this switch position monitors the 0 to +20V applied to the tube from the External sockets.
- **‘ADJUST BACKING VOLTS’ ROTARY CONTROL:** When in Experiment 1, adjusts the backing voltage applied to the tube from zero to about 1.8 volts. The application of this voltage to the tube (backwards) is to reduce the current passing through the tube to zero nanoamps (amps  $\times 10^{-9}$ ). When Experiment 2 is selected, this control has no function.
- **‘EXTERNAL’ 4mm SOCKETS:** When Experiment 2 is selected, an external voltage **not exceeding 20V.DC.** can be connected to these sockets to perform the experiment dealing with the forward current characteristics of the phototube when illuminated. Although an external voltage is applied to the sockets, the 9V battery in the rear panel is still required for the instrument to run.
- **METER:** The digital meter is ON when power is ON. The meter reads as follows:  
**Experiment 1:** Reads the selected Current flow through the phototube of 0-20uA or 0-200nA, Reads Backing Volts applied to the tube as adjusted by front panel control, from 0 to -1.8V.  
**Experiment 2:** Reads the 0-20uA current flow through the phototube or reads the adjustable forward volts from 0 to +20V as applied to the tube from External sockets.



**BATTERY:** On the rear face of the instrument, a small holder or compartment (depending on model) carries a 9V Transistor battery. The instrument cannot operate if this battery is flat. The current drain on this battery is very low and it has a very long life providing the instrument is turned OFF after use. When the battery voltage reaches 7V, the digital display will show either an arrow pointing to the left or the symbol 'LO BAT'. In either case, the 9V battery must be replaced before proceeding with the experiments.

**LIGHT SOURCE (12 Volt, AC or DC. 2 amps):** On the rear face of the instrument, a clear plastic lens accepts light from the 12V.AC/DC. light source supplied and directs it to the active face of the phototube. The phototube tube itself can be seen inside the housing by looking through this clear plastic lens with the aid of a small torch.

Around this lens a thick soft pad is held captive between two rails. The front rib on the body of the light source engages behind these two rails and the light source is slid down into place and will be held firmly in line with the lens. The light source is held firm so it cannot be moved out of position during the experiment and is connected by its banana plugs to any 12V.AC/DC source at about 2 amps.

Spare globes are 25W to 30W 12V QI type. **Cat: PA2043-004**

The filters, placed into the light path, cut off all wavelengths above a particular value, therefore the maximum frequency of light reaching the tube is known for the experiments dealing with Photon energy and Planck's Constant.

By removing this incandescent light source, other light sources may be used. Perhaps a mercury vapour lamp or a monochromatic light sources which emit known wavelengths. If several wavelengths are present in the light source, the filters supplied would be required to provide an upper limit of wavelength passing to the tube.

**FITTING COLOUR FILTERS AND APERTURES:** Two pairs of guides are fitted to the rear face of the instrument, just in front of the light source. One pair accepts the colour filters and the other pair accepts the apertures.

If a filter is inserted, the light that reaches the cell contains all the **wavelengths** that pass through the filter. If various apertures are inserted, the **amount** of light or brightness passing to the phototube is altered.

**NOTE: IEC produces another information file outlining the use of the equipment and the experiments to be performed.**

**Developed, designed and manufactured in Australia**