DANBRIDGE
DENMARK

research
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THE BASC BATTERY SCALER

THE SCALER FOR USE IN THE
- LABORATORY
- INDUSTRY
- FIELD
- HOSPITAL

OPERATES FROM
- MAINS
- INTERNAL ACCUMULATOR (WITH INTERNAL CHARGING UNIT)
- EXTERNAL ACCUMULATOR

TRANSISTORIZED
PRINTED BOARD CIRCUITS

HIGH STABILITY
BETWEEN 0° C AND 40° C

INCLUDES PULSE
HEIGHT DISCRIMINATOR AND
PRESET COUNT FACILITY

The BASC is a light-weight, portable and highly stable preset count scaler powered by an internal 12 Volt completely sealed nickel-cadmium accumulator.

The accumulator can be charged by means of the built-in power unit, which can also be used to drive the instrument direct from the mains. In case of power failure during mains operation, the instrument will automatically revert to battery operation without affecting the count.

The BASC is fully transistorized with printed circuit boards for easy servicing and fitted into a glass-fibre reinforced polyester case which is provided with a rubber sealed lid for field use.

The BASC is stabilized against battery and mains voltage variations. All functional units include temperature compensating circuits or are intrinsically temperature insensitive. Thus, the BASC works extremely stable over the range of temperatures occurring in field work (0 to 40° C).

The BASC incorporates 3 fast electronic decades and a 6-digit mechanical register with a preset count facility for every multiple of 100 counts. The timer is a high precision spring-driven stopclock.

The BASC has a stabilized high voltage supply for scintillation detectors, GM-tubes and proportional counters.

The BASC operates on both negative and positive pulses and has a stabilized supply for transistor pre-amplifiers.

The BASC includes a discriminator for pulse height selection between 20 millivolt and 25 volt.

A special feature is the pulse shaping circuit giving standard output pulses for every single, every 10th, 100th or 1000th input pulse. These output pulses can be used to trigger an event marker pen on a recorder. Thus, a continuous integration of the count rate is obtained. This integration method is much more accurate than the measurement of the area under a

countrate meter curve. The BASC pulse integration method is useful in single channel pulse height analysis, in radio paper chromatography and in a variety of tracer experiments. This pulse recording method also gives clear indication of erraneous noise counts in low level activity counting. (See illustration below).

A test facility which is used to control the proper functioning of all parts of the instrument is provided.

The BASC can be fitted with a ratemeter with two logarithmic and 4 linear ranges as optional. This unit can be ordered with the instrument or purchased separately at any time, being simply plugged into the space provided. The logarithmic ratemeter is particularly useful in dynamic tracer experiments with large countrate variations where it is possible to record the countrate without shifting the measurement range.

For measurement of gamma radiation a water and pressure tight scintillation detector with a 1″ by 1″ Na I-crystal is available. The detector is housed in a stainless steel house with very small outer dimensions. It has a transistorized pre-amplifier, a very good stability against temperature influences and can be used with a long length of cable.

The BASC Battery Scaler has been developed by and is manufactured under licence to the Danish Isotope Centre in Copenhagen.

APPLICATIONS:

The BASC can be used as an ordinary laboratory scaler, having all the facilities and the high accuracy required of such an instrument. At the same time, the BASC has been designed particularly for all kinds of field work, the following being some of the more typical problems which can be solved with the aid of this instrument.

Tracer investigations in the field with very low activity, for example, hydrological investigations.

For use in hospitals where the easy portability of the BASC scaler makes it possible to perform patient measurements at the bedside instead of having to move the patient to a special instrument room.

For accurate determination of background activity near reactor installations.

Measurement of low fall out and contamination levels.

Investigations of water flow by means of the pulse integration method (total count method).

For measurements of radioactivity in environments where mains fluctuations or interference or the risk of mains failure make it desirable to use mains independent instruments.

SPECIFICATION

INPUT

The minimum input is 20 mV for both positive or negative pulses. Input impedance: Positive: 75 ohm, 50 pF (for coax cables). Negative: 100 k ohm, 75 pF.

LINEAR AMPLIFIER

The input pulses are amplified by means of a linear amplifier. The gain can be adjusted in four steps corresponding to input levels of 20 mv, 100 mv, 500 mv and 2.5 volt nominal. (Deviation from nominal values: ± 10 % .

Linearity better than 1 % within discriminator range. Temperature drift less than 0.02 % per ° C. The amplifier has a very good overload performance.

DISCRIMINATOR

The input threshold can further be varied by means of a discriminator controlled by a 10 turn "Helipot" potentiometer. The range of the discriminator is 1:11. Temperature drift less than 0.02 % of max. setting per ° C.

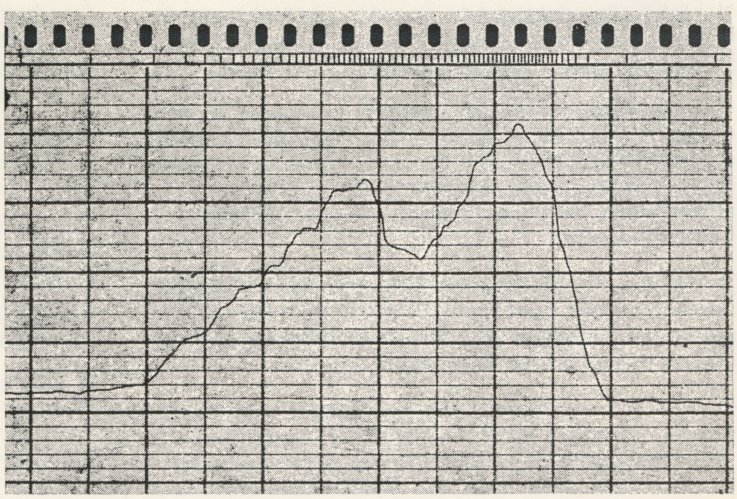
SCALER

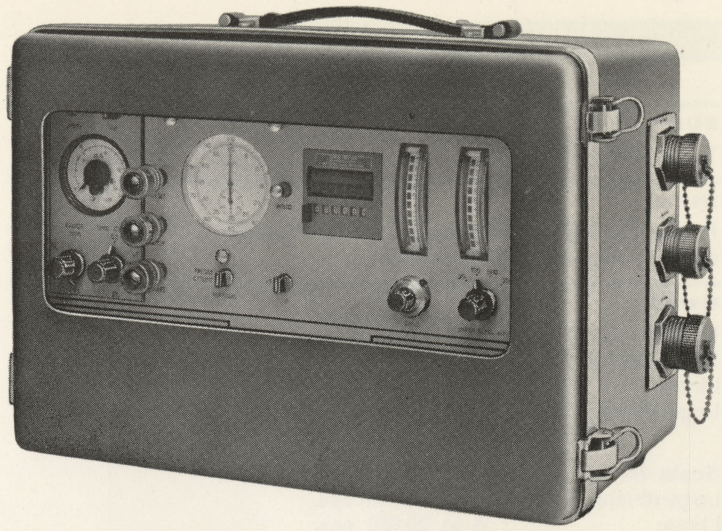
3 electronic decades and mechanical 6 digit register.

The first electronic decade has no read out (The first figure is not significant in fast counting operations). The first decade can be bypassed by means of a scale factor switch (x1/x10 switch) for use in connection with low counting rates where every digit is significant. The read-outs for the other electronic decades

PART OF RECORDER STRIP DEMONSTRATING THE BASC PULSE INTEGRATION METHOD

The strip shows a count rate curve and the corresponding pulse marks at the edge of the paper. Any part of the count rate curve can be integrated by counting the marks over that part of the curve and multiplication with the scale factor. This integration can be made extremely accurate by proper selection of paper speed and scale factor. The integration is independent of recorder non-linearity, curve distortions due to long time constants, etc.





are two moving coil meters, the pointers moving stepwise from 0 to 9.
Max. counting rate: 100,000 cpm (scale factor 1).
1,000,000 cpm (scale factor 10).
Resolution: 3 μsec.
Preset count: The mechanical register can be set to stop counting operation and timer at any multiple of 100 counts.
Start, stop, reset is operated by means of push buttons on the front panel and can also be operated with the splash proof lid in place.

TIMER

A "Jaquet" precision stop watch is built into the instrument and operates in synchronism with the start/stop/reset mechanism of the BASC.

HIGH VOLTAGE

Two high voltage supplies are provided.

The high voltage for GM- and proportional counters is variable from 400 v to 1475 v in 25 v steps. This supply can deliver 1–5 μA.

For scintillation detectors there is a fixed highly stabilized supply of 1000 volt nominal (Deviation from nominal: ± 5 %). The current available is 20–80 μA and this supply is stabilized to better than 0.05 % (after about 5 min. initial warm up). The temperature drift is about 0.01 % per ° C.

The high voltage supplies are open circuit and short circuit proof.

POWER SUPPLY

Internal: 12 volt completely sealed nickel-cadmium accumulator 3.5 amp hours.

Operation time: Normally better than 16 hours.

External: A.C. mains by means of the built-in power unit. A 12 v accumulator can also be connected. Automatic revertion to battery occurs in the event of mains failure during mains operation.

The power supply for all units is highly stabilized. Battery or mains voltage drift has no effect on the operation of the instrument.

The internal accumulator is charged by means of the built-in power unit.

PRE-AMPLIFIER VOLTAGE SUPPLIES

9 volt ± 5 %. 10 mA. Stabilized to better than 3 %.

6 volt ± 5 %. 10 mA. Stabilized to better than 3 %.

PULSE-OUT FACILITIES

There are two pulse outputs available at the output socket.

1. A 10 μsec ± 2 μsec. negative pulse of 7 volt amplitude. Frequency same as input pulses with scale factor switch in position x 1 and frequency same as input pulses divided by 10 with scale factor switch in position x 10. Output impedance: 50 ohm.
2. A 23 msec. ± 2 msec. negative pulse of 7 volt amplitude and of frequency 1/100 and 1/1000 of input pulse frequency depending on the position of the scale factor switch. Output impedance: 50 ohm.

At the output connector a voltage supply of 12 volt negative is available to drive an external marker pen pulse former e.t.c.

WEIGHT

14.5 kg (32 lbs.) complete including countratemeter, internal battery and splashproof lid.

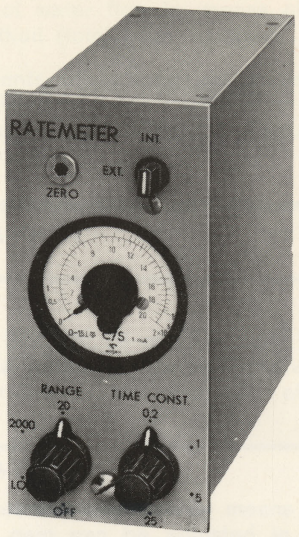
DIMENSIONS

Height 180 mm (11 ins.)
Width 390 mm (15.4 ins.)
Depth 240 mm (9.5 ins.)

The BASC is normally supplied complete with internal accumulator, splashproof lid, power supply cable for 220 volt ac. and instruction manual. Countratemeter, probes, detectors, cable for external battery and for external countrate recorder and pulse-out facilities are optional.

ACCESSORIES

COUNTRATE METER



SUPPLY

11 to 15 V (DC) 45 mA.

INPUT

Positive going pulses 4 to 8 V or the trailing edge of negative going pulses.

RANGES

Used in the BASC scaler 6 ranges are available

Scale factor switch: Position x 1
Linear : 0.5 to 2,000 cps.
Logarithmic : 0 to 2,000 cps.
0 to 20 cps.

Scale factor switch: Position x 10
Logarithmic : 0 to 20,000 cps.
Linear : 5 to 20,000 cps.
0 to 200 cps.

LINEARITY

The linearity of the linear ranges is better than 0.5 % measured on the 1 mA DC output.

TEMPERATURE DRIFT

The temperature drift is about 0.05 % per °C.

ACCURACY

The accuracy of the logarithmic range is better than 15 %.

TIME CONSTANT

Four time constants are provided:
0.2 – 1 – 5 and 25 sec. (± 20 %).

OUTPUT

The chopper amplifier which delivers 1 mA for the built-in 260° moving coil instrument is capable of delivering 1 mA into an external load of max. 1500 ohms such as an external indicator, recorder etc.

DIMENSIONS

Front panel 65 x 140 mm (2 9/16 x 5 1/2 ins). Depth 160 mm (6 1/4 ins).

WEIGHT

1.26 kg (2 3/4 lbs.)

STANDARD GAMMA SCINTILLATION DETECTOR (SEE FRONT PAGE PICTURE)

CRYSTAL

1″ x 1″ ruggedized NaJ crystal Harshaw type 4PA4.

PHOTOMULTIPLIER

EMI 11 stage, box and grid type. Type 9524B.

PREAMPLIFIER

Transistorized pre-amplifier suitable for a 75 Ω transmission line.

STABILITY

Temperature stability af countrate is about 0.03 % per °C at 20 mV discriminator level.

CALIBRATION

Pulse height energy calibration approx. 1 mV = 1 kev when used in connection with BASC instrument.

DIMENSIONS

Water and pressure tight stainless steel house. Smooth surfaces for easy decontamination.

Diameter 38 mm. (1.5 ins.)
Total length 390 mm. (15.4 ins.)

WEIGHT

Standard version with 6 m cable and plug. 2.6 kg (5 3/4 lbs.). Other cable lengths supplied to order.

WE RESERVE THE RIGHT TO DEVIATE FROM THIS SPECIFICATION

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