CROPICO

ELECTRONIC STANDARD CELL TYPE ESC1

OPERATORS HANDBOOK

IMPORTANT
Please read before operating instrument

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ELECTRONIC STANDARD CELL TYPE ESC1

General

1 The instrument is supplied with the batteries fitted ready for use.

2 The battery life with intermittent use is approximately 300 hours.

3 If the 'Battery Low' red LED commences flashing, this indicates that the batteries are reaching exhaustion. The instrument will normally continue to function correctly for about a further 10 h. continuously after the red LED first commences to flash.

4 The batteries should be replaced as soon as convenient after the red LED commences flashing. Any 'D' size (IEC R.20) dry Leclanche cells can be used. Ever-Ready SP2 cells are suitable. The 18 cells which comprise the battery are all connected in series. All the cells should be replaced simultaneously. The batteries are situated under the top cover plate of the instrument. As with all dry batteries, do not leave nearly exhausted cells in the instrument as they may leak and cause corrosion. Replacement batteries should be stored in an ambient temperature of 20° C, otherwise the fitting of batteries which have been stored at a temperature far removed from 20° C will affect the temperature of the instrument from which it will take several hours to recover.

5 Remove the top cover plate of the instrument. On the back of it you will find the calibration certificate where we have given figures for the 1 and 1.01861 volt outputs at 20° C. You will note that the uncertainty of these figures is ± 5 p.p.m. This chart has been designed so that the history of the device can be recorded over many years and has provision for including not only the actual test figures, but their uncertainty, name of certifying laboratory, remarks etc.

FIG 1

S/No. _____ ELECTRONIC STANDARD CELL TYPE ESC1

CERTIFICATE OF TEST

ALL FIGURES ARE TAKEN AFTER BEING SWITCHED ON FOR A MINIMUM OF 1 HOUR

DATE	TEMP.	1 VOLT	UNCERTAINTY	1·01861 VOLTS	UNCERTAINTY	CERTIFIED BY	TRACEABILITY	REMARKS

6 Due to the fact that this instrument has a low noise level and high stability, it would be in order for the user prior to putting the instrument into service to have it calibrated by a B.C.S. approved laboratory or equivalent to a closer tolerance. In this respect we would advise that tests be taken at 20 ± 1° C. That a total of five tests are made and that the values given are the average values at each respective elapsed time from switch on. We recommend an elapsed time of 1, 4 and 8 hours.

7 For optimum results, we would advise re-certification at six–monthly intervals to enable a drift pattern and a history of the device to be established. This is most important for the user who is involved in 'State of the Art Measurement'.

This instrument, like all electrical standards, is subject to small drifts. We expect it to behave in a similar way to resistance standards as its stability is mainly dependent upon the quality of the resistor network incorporated.

8 The instrument should be connected by means of a screened cable using the conductor as the + connection and the screen as the – connection.

9 It should be operated in good environmental conditions, this is **most important.**

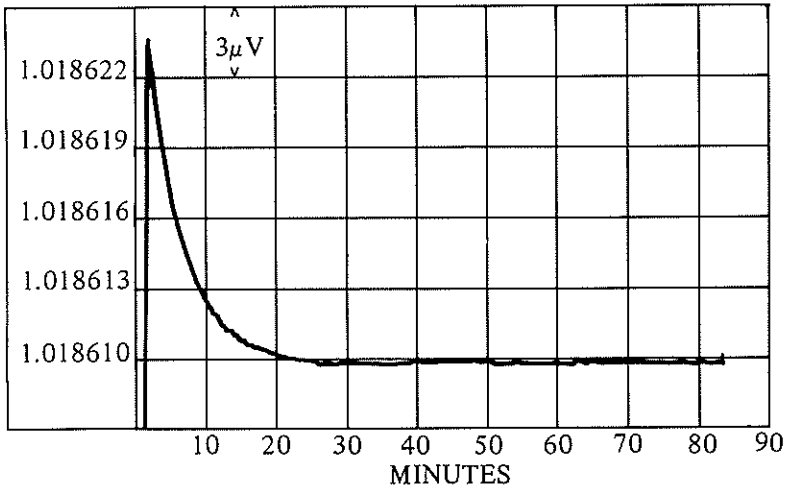
i.e. out of draughts
not in direct sunlight
no sharp temperature gradients

In fact, a constant temperature enclosure or laboratory would be ideal.

10 As the temperature co-efficient of this instrument has a long time constant, after delivery it should be left in a temperature-controlled laboratory for at least six hours before use.

11 **Warm-up Time**
When the instrument is first switched on, the output quickly rises to approximately 30 μV above the nominal and then rapidly falls to the actual value. Fig. 2.

FIG 2



a Allow 15/20 minutes to be within ± 2 p.p.m.
b For closer tolerances, allow 60 minutes.

The temperature co-efficient of the instrument is a parabolic curve peaking at 20 ± 1°C.

12 Switch off when not in use.

Use as a Voltage Audit Device

1 Figures for the device would be taken under reference conditions at the supervising laboratory.

2 The instrument can be sent by any reasonable form of transport to the Audit Site, a courier is not necessary.

3 At the Audit Site, before taking any measurement, allow the instrument to stabilise in the laboratory environment for at least six hours before use.

4 Switch ON the instrument 60 minutes prior to use.

5 Take 3 measurements at 15 minute intervals, they should all be similar. If possible take repeat measurements over a period of 2/3 days.

6 Record all the measured values with date and time and the ambient temperature in the vicinity of each instrument.

7 Return the E.S.C.1. to the supervising laboratory for confirmation of the original figures.

CAUTION

Whilst this instrument is very rugged, and will withstand thermal and mechanical shocks, remember that it is an electrical standard and whenever possible should be treated as such.

It is unwise to subject the instrument to extremes of temperature (exposure to arctic or tropical conditions), as this could affect the resistor values, resulting in a change in the value of the output voltage.

For best results, the user of the E.S.C.1 must establish his or her own reference conditions and adhere rigidly to them. Under such conditions the best repeatability will be established. For example, if the E.S.C.1 is left in a temperature-controlled environment for 6 hours, then switched on and after 60 minutes its output voltage measured and recorded, (taking into account any uncertainty in the measurement), the same procedure must be strictly followed at the audit site and upon its return to the premier laboratory.

Principle of Operation

I.C.2 is the initial current regulator which compensates for changes in the battery voltage from a new to a partially exhausted condition in the range 20 ... 30 volts. The flasher circuit is set to operate at 21 volts.

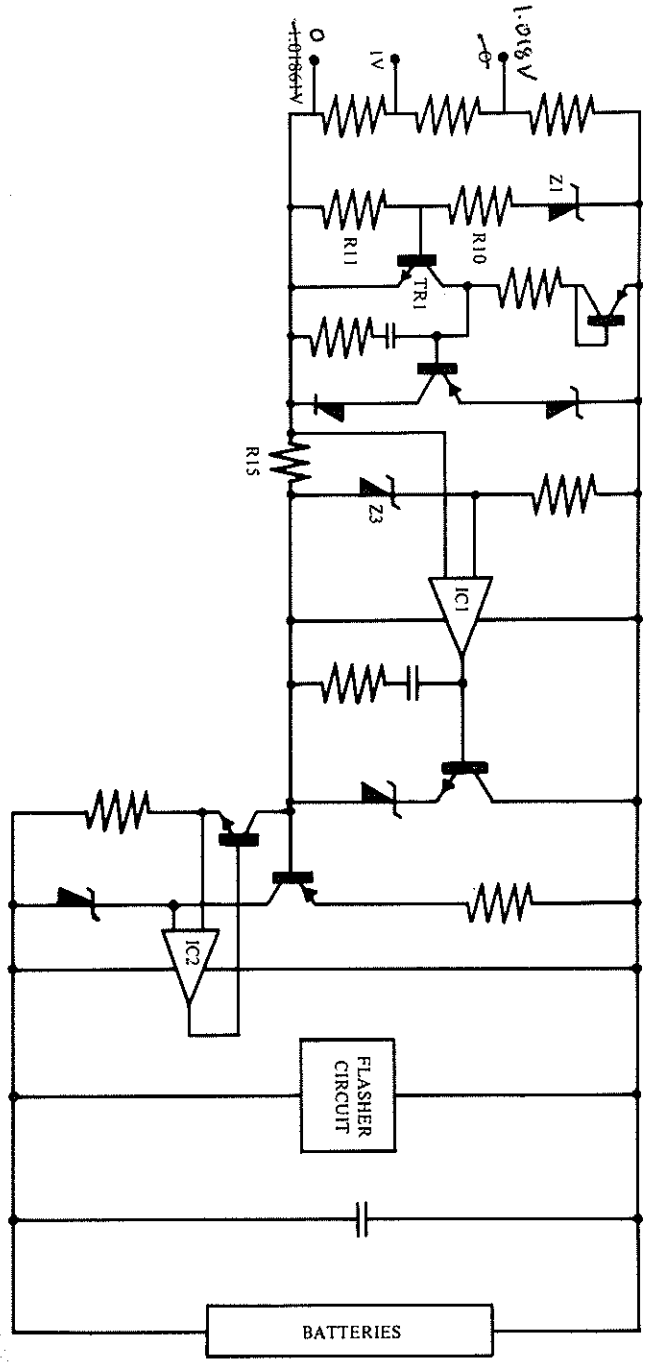
I.C.1. Ensures a constant current for the output stage by comparing the voltage drop on R15 with a compensated zener diode Z3 which has a t.c. of 10 p.p.m. per °C.

Z1, TR1. The output voltage is controlled by the zener diode Z1 which has a positive t.c. This is compensated by the negative t.c. of the base to emitter voltage of the transistor TR1. Both of these components are sealed into a specially designed heat sink to ensure close thermal contact.

The current through the zener diode is controlled by the base to emitter voltage of the transistor which permits a nominal 5 mA to pass through the 120 ohm resistor R11. The resistor R10 in series with the zener diode is adjusted so that the voltage across the two resistors cancels the t.c. of the zener diode. As the diode has a non-linear voltage to current characteristic, this compensation is only correct at one temperature. The units are adjusted so that the output voltage t.c. curve is flat at 20 ± 1°C.

Maintenance

The only maintenance that this instrument requires is the changing of the batteries, otherwise it is maintenance free. In the rare event of any faults occuring it must be returned to our works for rectification.



Electronic Standard Cell Type E.S.C.1.

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