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USER MANUAL: JCI 256 Charge Calibration Unit

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Contents:

1. INTRODUCTION
2. PRACTICAL DESIGN FEATURES
3. CALIBRATION
4. SPECIFICATION FEATURES

USER MANUAL: JCI 256 Charge Calibration Unit

providing defined quantities of charge 1.0 – 999.0nC for calibration of instruments dependent on charge measurement

1. INTRODUCTION

The JCI 256 Charge Calibrator provides calibrated quantities of charge on the basis of switching a defined current into the output connection for a defined period of time. The current is defined by a stable and known reference voltage and a precision resistor. The period of current flow is defined by selected number counting of cycles from a crystal controlled clock. Calibration is provided for quantities of charge from 1-999nC with an accuracy better than 1%. Provision is included to enable the unit itself to be formally calibrated with measurements whose accuracies are traceable to National Standards.

The JCI 256 is designed for calibration of JCI instruments such as the JCI 176 Charge Measuring Sample Support, the JCI 178 Charge Measurement Unit and the JCI 278 Aerosol Charge Measurement Unit. It may of course also be used for calibration of other non-JCI instruments.

2. PRACTICAL DESIGN FEATURES

The Calibrator Unit is a compact easy to use, battery powered unit. The quantity of charge to be output is selected using easy to read thumbwheel switches and this quantity of charge is output on pressing the output button. The unit is shown in Figure 1. Charge output is provided via the BNC connector and the two stereo sockets provide access for formal calibration of the unit.

The unit is powered by a PP3 battery accessible under the slide cover on the back of the unit. The level of battery charge remaining is indicated by a bi-colour led in the pushbutton switch – green to indicate a satisfactory level, red to indicate the need to replace the battery.

The quantity of charge is defined by a selected time for flow of a known current. The current flow is defined by a reference voltage and a precision resistor to earth. The time is defined by counting pulses from a crystal clock via decade counters selected via the thumbwheel switches. The output end of the resistor is switched between earth and the charge output for the defined time defined by the clock pulse count. For charge injection into a virtual earth charge measurement circuit (as used in the JCI 176, JCI 178 and the JCI 278) the output remains at earth potential so the current flow through the defined resistor is unaffected during switching.

Connections are provided for formal calibration of the Calibrator Unit by direct measurement of the reference voltage, the value of the precision resistor and the time the defined current is switched to the output.

3. CALIBRATION

The quantity of charge output is defined from the current flow and the time of flow of this current. The current is defined by a precise reference voltage (5.0V) and a precision resistor ($1.0 \pm 0.1\%M$) to earth or switched to the input of a virtual earth charge measurements circuit. This provides a defined current of 5.0 microamps. The period the current is switched to the output is defined by counting pulses from a 2.00MHz crystal clock. A time of 200.0 microseconds provides a charge of 1.0nC.

Two 3.5mm stereo sockets provide access for formal calibration of the unit in terms of the reference voltage value, the resistor value and the time for which the current flow is switched to the BNC output connector. These sockets provide:

- Cal 1: earth (shank), reference voltage (tip), switching period (middle)
- Cal 2: earth (shank), resistor - isolated from circuit (tip to middle)

4. SPECIFICATION FEATURES:

<i>Charge calibration range:</i>	1 - 999nC
<i>Reference voltage:</i>	5.0V
<i>Resistor:</i>	1.0M
<i>Clock frequency:</i>	2.0MHz
<i>Accuracy:</i>	±1% 1nC to 999nC
<i>Power supply:</i>	- PP3 replaceable battery
<i>Controls:</i>	- ON/OFF slide switch - thumbwheel switches to select quantity of charge (nC) - top cover push button for charge output – with battery level indicating leds (red for low battery)
<i>Connections:</i>	- BNC connector for charge output - two 3.5mm stereo sockets for formal calibration Cal 1: earth (shank), reference voltage (tip), switching period (middle) Cal 2: earth (shank), resistor - isolated from circuit (tip to middle)
<i>Dimensions:</i>	90x145x35mm Weight 100grams