

# CALIBRATION OF JCI ELECTROSTATIC INSTRUMENTS

*Calibration provides confidence in the operation of measuring instruments, in the values of the parameters measured and in the interpretations made from them.*



JCI 155v5 Charge Decay Test Unit on JCI 255 Calibrator Unit

## DESCRIPTION:

JCI instruments are set up and tested in manufacture on the basis of measurements whose accuracies relate to National Standards. Formal calibration provides documented information establishing the performance of instruments at a variety of points over the range of operation. Calibrations are carried out at John Chubb Instrumentation to procedures described in British Standard 'Methods for Measurements in Electrostatics' BS 7506: Part 2: 1996 Annex A.

### Calibration of electrostatic fieldmeters:

Calibration of JCI 111, JCI 102A and JCI 131 instruments is carried out using a large plane parallel plate calibration system in which the sensing aperture of the fieldmeter is made flush with the inner surface of one plate. A calibrating electric field is created by applying a defined voltage across a known separation gap between the plates in the vicinity of the fieldmeter sensing aperture. The design of the particular system in use at JCI has been chosen to

ensure the plates are large enough that fringing field effects at the plate edges and the influence of external charges, even at the lowest calibration field, are negligible at the fieldmeter. The separation between the plates is sufficiently large that perturbation of the local field by the sensing region of the fieldmeter itself does not penetrate any significant influence across the inter plate gap [1]. Calibration procedure is to British Standard BS 7506: Part 2: 1996 Annex A2.

### Calibration of surface voltmeters:

The basis of calibration of JCI 140 and JCI 105A instruments is to mount the earth bonded Voltmeter at a fixed distance from the centre of a large plane metal surface to which a measured voltage can be applied - with all other surfaces and structures well away from the Voltmeter to plate gap, preferably at least half a metre. Calibration procedure to British Standard BS 7506: Part 2: 1996 Annex A3. Calibration is changed by less than 1% by holding the instrument in the bare hand near the back end.

**Electrostatic voltmeter Calibration:**

Calibration of JCI 148 instruments is carried out with a defined JCI 140 Static Monitor instrument used in the JCI 148 Electrostatic Voltmeter (or with a defined JCI 111 fieldmeter for JCI 156 or JCI 158) instruments. Calibrated positive and negative voltages are applied and the readings recorded. Calibration arrangements to British Standard BS 7506: Part 2: 1996.

**Faraday Pail Calibration:**

The basis of calibration of JCI 147 (and JCI 151) instruments is separate measurement of the capacitance of the pail, as set up for normal use, and of the voltage sensitivity of the fieldmeter as set up and used to measure the increase in pail voltage when charge is introduced into the pail. Calibration procedure is as described in British Standard BS 7506: Part 2: 1996 Annex A4 (Method A4.1(a)).

**Charge Decay Test Unit Calibration:**

Calibration of JCI 155 Charge Decay test Units is carried out with a plane metal conducting surface mounted across and just below the test aperture (about 1/2 mm). The surface voltage sensitivity is expressed in terms of a calibrated voltage applied to this conducting surface. Defined values of charge decay times are created with defined values of resistors and capacitors connected in parallel between the plane conducting surface and earth. Decay time ( $V_{pk}$  to  $V_{pk}/e$ ) measurements made by the instrument and compared to the expected time constant values. Calibration procedure to British Standard BS 7506: Part 2: 1996 Annex A5. (The JCI 255 Calibrator Unit is available to assist formal calibration of JCI 155 instruments).

**Basic calibration parameters:**

Voltage measurement: Calibration voltages are measured with a defined combination of high voltage divider and digital multimeter. This combination is formally calibrated with reference to National Standards at all the same voltage values as those used in calibration work.

Distance measurement: All distances relevant to calibrations are measured using calibrated slip gauges. These measurements are used:

- to determine separation distances between the parallel plates used for fieldmeter calibration, the thickness of the mounting plate aperture and the height of the spigot around the sensing aperture of individual fieldmeter instruments.
- to determine the separation distance of the sensing aperture of surface voltmeter instruments from the large plane calibration surface.

[1] J. N. Chubb "The calibration of electrostatic fieldmeters and the interpretation of their observations" 'Electrostatics '87' Inst Phys Confr Series 85 1987 p 261.

**HELP LINE**

*JCI offers consultancy through which we advise and assist customers who need to assess and overcome problems with static electricity. We also test customer materials for static charge dissipation and capacitance loading performance*

The business of JCI is the design, development, manufacture and marketing of high quality instruments for electrostatic measurements. JCI also carries out electrostatic testing of materials, consultancy and calibration of JCI instruments to BS 7506: Part 2: 1996.

For further information contact Dr John Chubb at:

Unit 30, Lansdown Industrial Estate, Gloucester Road, Cheltenham, GL51 8PL, UK  
(Tel:+44 (0)1242 573347 Fax:+44 (0)1242 251388 jchubb@jci.co.uk <http://www.jci.co.uk>)

**jci**  
John Chubb  
Instrumentation