

AUTOMATED CRYOGENIC CURRENT COMPARATOR BRIDGE FOR QUANTUM METROLOGY AND RESISTANCE CALIBRATIONS

Latest design of automated CCC Bridge with digital feedback control

The CCC itself is tested to be accurate to 1 part in 10^9 and using the optically isolated current sources the bridge can make comparisons between resistors with an accuracy and repeatability of better than 10^{-8} . It is also possible to transfer the QHR standard to a temperature stabilised 100 ohm resistor as a primary standard of resistance.

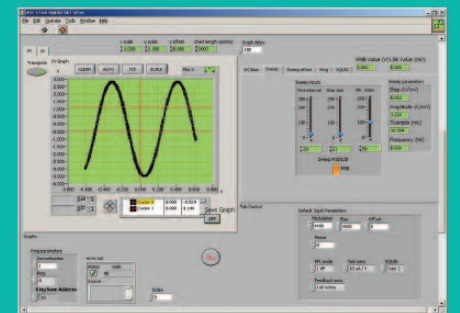
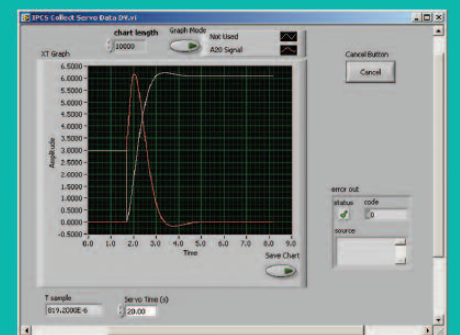
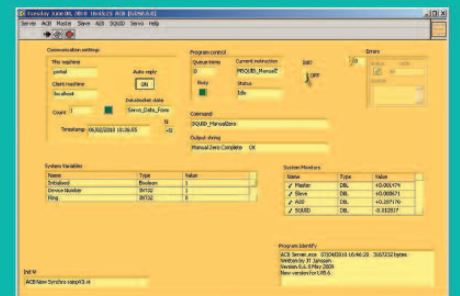
NPL and Cryogenic Ltd. have been involved in the development of cryogenic current comparator (CCC) technology for over two decades and have built up internationally recognised expertise in this field. A resistance bridge based on a CCC using a SQUID as a null detector allows the metrologist to exploit fully the accuracy of the quantum Hall effect as a primary standard of resistance. At the same time an automated CCC bridge is ideally suited to routine calibration work on four terminal resistance standards.

Specifications

- CCC ratio accuracy - better than 1 in 10^9
- CCC sensitivity - $\sim 20 \mu\text{AT}/\phi_0$
- CCC current sensitivity - $2.10^{-10} \text{ AT} / \sqrt{\text{Hz}}$
- CCC Ratios - 100 Ω to QHR ($i=2$ and $i=4$) 1 to 1, 10 to 1, 100 to 1
- Resistor range - 1 Ω to 10 k Ω
- Measurement resolution - typical 1 in 10^9 (except for 1 Ω , 10 k Ω and 100 to 1)
- Selectable current ranges - 100 μA to 30 mA full scale (max. voltage 10 V)
- Overall system accuracy: better than 1 in 10^8

Other features

- Digital feedback
- Low loss cryogenics
- Unique design of isolated power supplies for continuous mains operation
- Computer control using NPL optical ring interface
- Software LabVIEW®
- Additional options to suit customer requirements



Training: In order to get the best performance from the complex CCC system, NPL will offer all new users extensive consulting and training programmes.

National Physical Laboratory

Queens Road, Teddington,
Middlesex, TW11 0LW, UK.

Tel: 020 8943 6376. Fax: 020 8943 7138

E-mail: jonathan.williams@npl.co.uk

Web: www.npl.co.uk

Cryogenic Limited

Unit 30, Acton Park Industrial Estate,
The Vale, Acton, London, W3 7QE, UK.

Tel: +44 (0)20 8743 6049. Fax: +44 (0)20 8749 5315

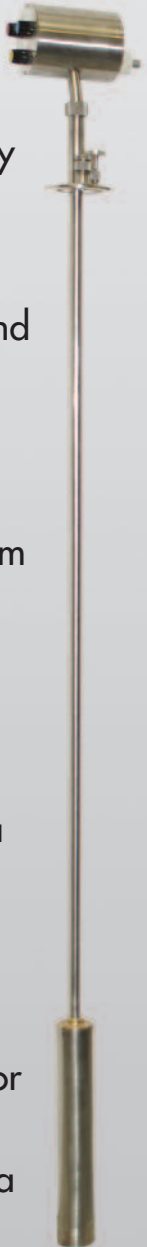
E-mail: sales@cryogenic.co.uk

Web: www.cryogenic.co.uk

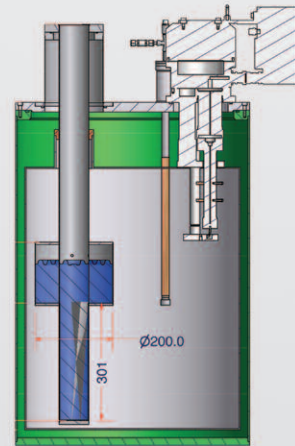
CRYOGEN-FREE CURRENT COMPARATOR (CCC) AND JOSEPHSON ARRAY INSERT



- Re-condensing CCC cryostat with 50mm access suitable for both CCC and Josephson Array Insert.
- Fitted with 1 Watt Pulse tube cryocooler, for low vibration and low maintenance (every three years)
- Special built-in facility for liquefying helium gas from room temperature – No cryogenics required for start-up or operation.
- Optimised radiation shield to reduce external heat loads to a minimum.
- Turns ratio accuracy of 10^{-10} .
- Bridge with the cryogen free CCC used to establish values for 1, 10, 100, 1K and 10K Ohm resistor to a high accuracy on a continuous basis.



CRYOCOOLED CRYOSTAT FOR USE WITH CCC/JOSEPHSON ARRAY INSERTS



- Re-condensing liquid helium CCC cryostat with 3 inch (76.2 mm) bore access
- Suitable for both CCC and Josephson Array Insert
- Fitted with $\frac{1}{2}$ Watt PT405 Pulse tube cryocooler
- Pressure stabilised helium reservoir to minimise instability in CCC operation
- Low vibration and low maintenance (every three years)
- Special built-in facility for liquefying helium gas from room temperature - No cryogenics required for start-up or operation
- Optimised radiation shield to reduce external heat loads to a minimum
- Open LabVIEW® software.

Cryogenic Limited,

Unit 30, Acton Park Industrial Estate,
The Vale, Acton, London, W3 7QE. United Kingdom.

Tel: +44 (0) 20 8743 6049

Fax: +44 (0) 20 8749 5315

E-mail: sales@cryogenic.co.uk