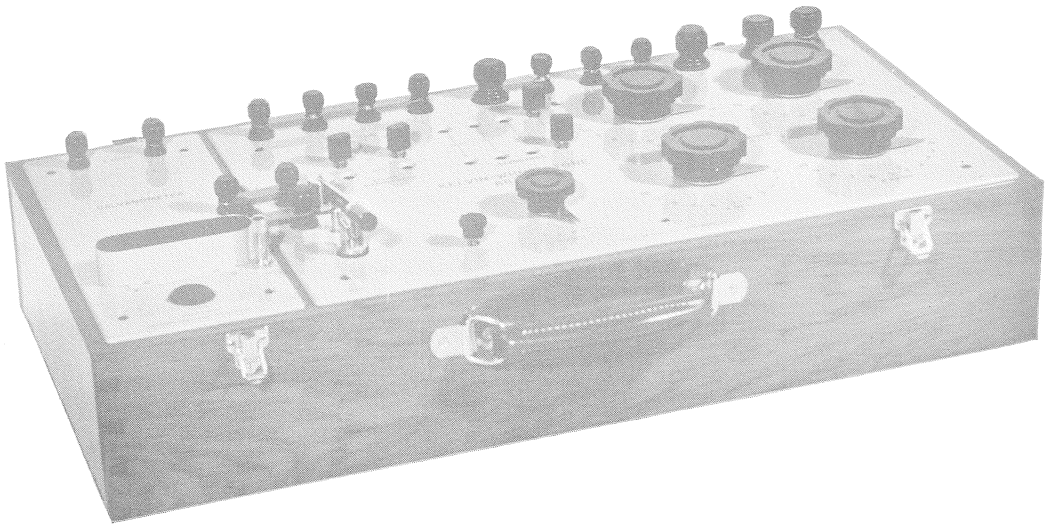
CROPICO

LEAFLET No. 59
January 1964

CROYDON PRECISION INSTRUMENT CO.

COMBINED
KELVIN AND WHEATSTONE BRIDGE

Type K.W.1



FOR ALL RESISTANCE MEASUREMENTS

Range: 1 microhm to 100,000 ohms.

Four Internal Standards: 0·1, 0·01, 0·001, and 0·0001 ohms.

Constant Resistance Switch Contacts.

Complete with Sensitive Spot Reflecting Galvanometer.

Hampton Road, Croydon, Surrey, England.

Telephone: THOrnton Heath 4025 & 4094

COMBINED KELVIN AND WHEATSTONE BRIDGE

TYPE K.W.I.

This is a completely self contained instrument designed to measure resistance with a moderate degree of accuracy over the range 1 microhm to 100,000 ohms.

Following our standard practice the switches and coils are mounted on a $\frac{1}{2}$ in. ebonite sub-panel and protected by a dust-proof grey painted cover panel which is suitably engraved.

A Sensitive Spot Reflecting Galvanometer is incorporated which has a centre zero scale; a sensitivity control is fitted, and there are coarse and fine adjustment controls on the Galvanometer Zero. The Galvanometer unit is easily removable by unscrewing three screws in the underside of the case, permitting lamp replacement or the adjustment of the optical system should this become necessary.

The instrument is built into a french polished teak case with leather carrying handle. The detachable lid contains a diagram showing the external connections to the bridge when used as a Wheatstone or as a Kelvin bridge with either internal or external standards.

Regarding the bridge supply, we recommend a heavy current (20 amps intermittent) 2 volt cell when used as a Kelvin, and a dry battery of suitable voltage according to the resistance being measured when used as a Wheatstone. The Galvanometer lamp supply is 2 volts and a separate 2 volt cell is recommended.

The battery switch is of the knife type, the design of which is very generous with regard to the current carrying capacity.

The coils are wound in Manganin on insulated metal formers and are carefully aged and adjusted.

The Resistance decade has four dials utilising CROPICO Type S.P.I. Switches which have a contact resistance of 1500 microhms, and a maximum contact resistance variation of 150 microhms. These switches are extremely robust having a bearing over 1 in. in length. The studs are copper 5/16 in. in diameter and the brush is of the multi leaf self cleaning phosphor bronze type.

RANGE AND ACCURACY AS A KELVIN BRIDGE USING INTERNAL GALVANOMETER

Range: 1 microhm to 10 ohms.

Range	Standard	Dividing Ratio	Accuracy
10 to 100 μΩ	0·0001 Ω	100 Ω	3% to 1%
100 to 1,000 μΩ	0·0001 Ω	100 Ω	0·2% to 0·1%
0·001 to 0·01 Ω	0·001 Ω	100 Ω	0·1% to 0·05%
0·01 to 0·1 Ω	0·01 Ω	100 Ω	0·1% to 0·05%
0·1 to 1 Ω	0·1 Ω	100 Ω	0·1% to 0·05%

Dividing Ratios: 1, 10 and 100 ohms, selected by plug blocks.

Multiplying dials: 10×0·1, 10×1, 10×10 and 10×100 ohms on four double decade dials.

Internal standards Selected by Plug Blocks: 0·0001 ohm to 20 amp.
0·001 ohm to 20 amp.
0·01 ohm to 10 amp.
0·1 ohm to 10 amp.

Current limitors are fitted to each range so that the above stated currents for the internal standards will not be exceeded.

Provision is made for connecting external standards.

The unknown resistor and the External Standards if used are connected to the Bridge Terminals with short, low resistance connectors. The Resistance of the Standard should where possible be approximately equal to that of the unknown. Selecting a suitable dividing ratio the multiplying dials are then adjusted to balance the bridge.

$$\text{Unknown Resistance} = \frac{\text{Standard} \times \text{Multiplying Dials}}{\text{Dividing Ratio}}$$

RANGE AND ACCURACY AS A WHEATSTONE BRIDGE

Range : 0·1 ohm to 100,000 ohms.

Range Ohms	Ratio ÷ ×	Accuracy %
1 to 10	100 — 1	0·5
10 to 100	100 — 10	0·1
100 to 1,000	100 — 100	0·05
1,000 to 10,000	10 — 100	0·1
10,000 to 100,000	1 — 1,000	0·5

Ratios : 1, 10 and 100 ohms selected by plug blocks.

Multiplying dials : 10 × 0·1, 10 × 1, 10 × 10 and 10 × 100 ohms on four decade dials.

When used as a Wheatstone Bridge the Kelvin Bridge standards are not used but the double Kelvin ratios are now used as the Wheatstone Dividing and Multiplying ratios. Having selected suitable multiplying and dividing ratios the unknown is connected to the appropriate terminals with wire of negligible resistance and the balance obtained by adjusting the multiplying dials.

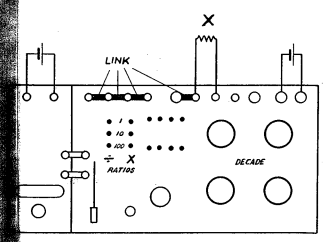
$$\text{Unknown Resistance} = \frac{\text{Multiplying Ratio} \times \text{Multiplying Dial}}{\text{Dividing Ratio}}$$

Size : 27″ × 13¼″ × 7″ (68 cms. × 34 cms. × 18 cms.)

Weight : 34 lbs. (15·4 kgs.)

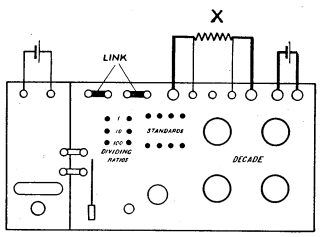
KELVIN-WHEATSTONE BRIDGE

WHEATSTONE BRIDGE



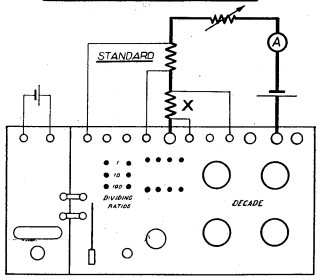
$X = \text{DECADE} \times \frac{\text{MULTIPLYING RATIO}}{\text{DIVIDING RATIO}}$

KELVIN BRIDGE WITH INTERNAL STANDARDS



$X = \text{STANDARD} \times \frac{\text{DECADE}}{\text{DIVIDING RATIO}}$

KELVIN BRIDGE WITH EXTERNAL STANDARD



$X = \text{STANDARD} \times \frac{\text{DECADE}}{\text{DIVIDING RATIO}}$

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