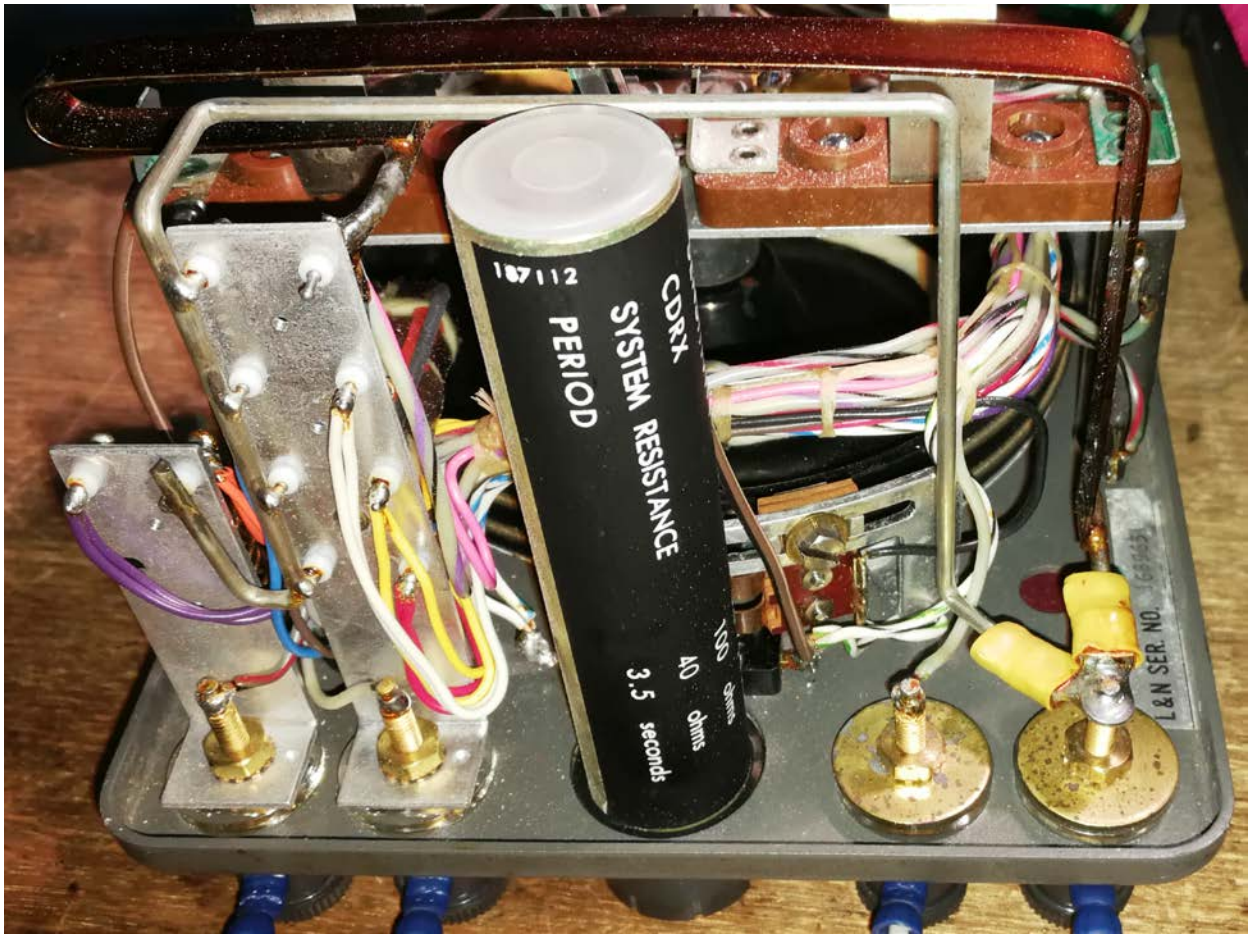
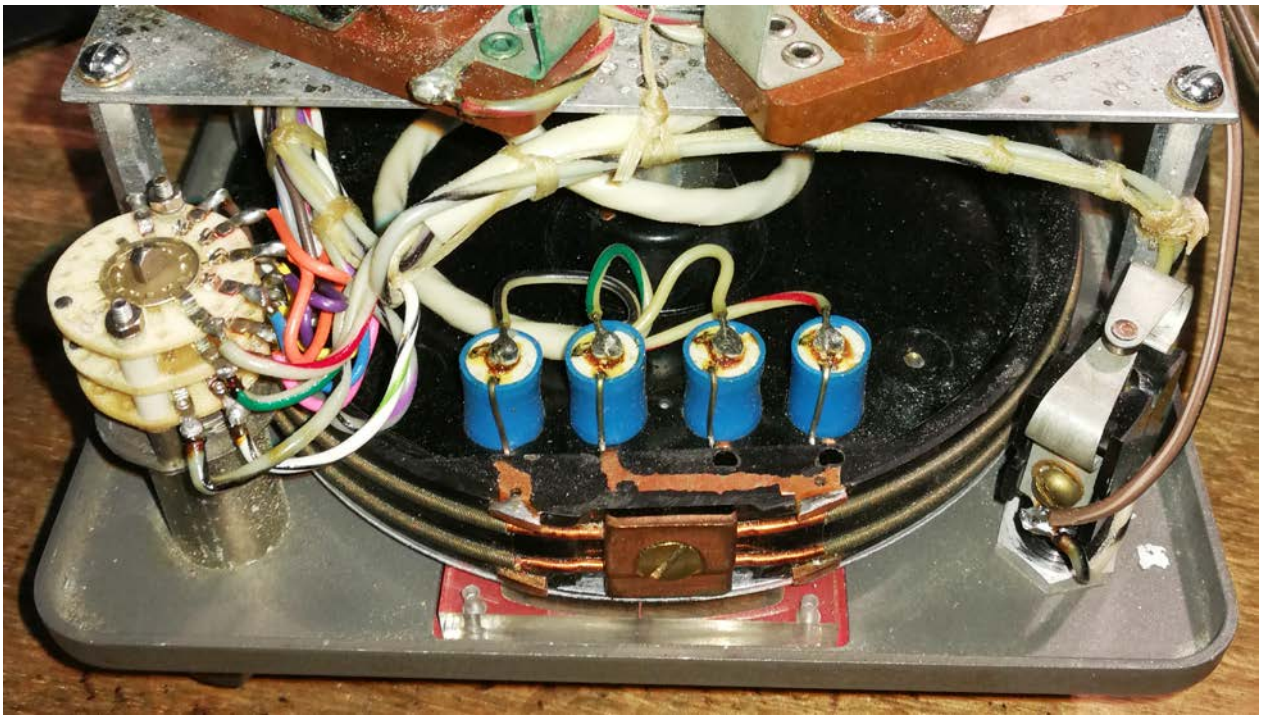
1. Summary

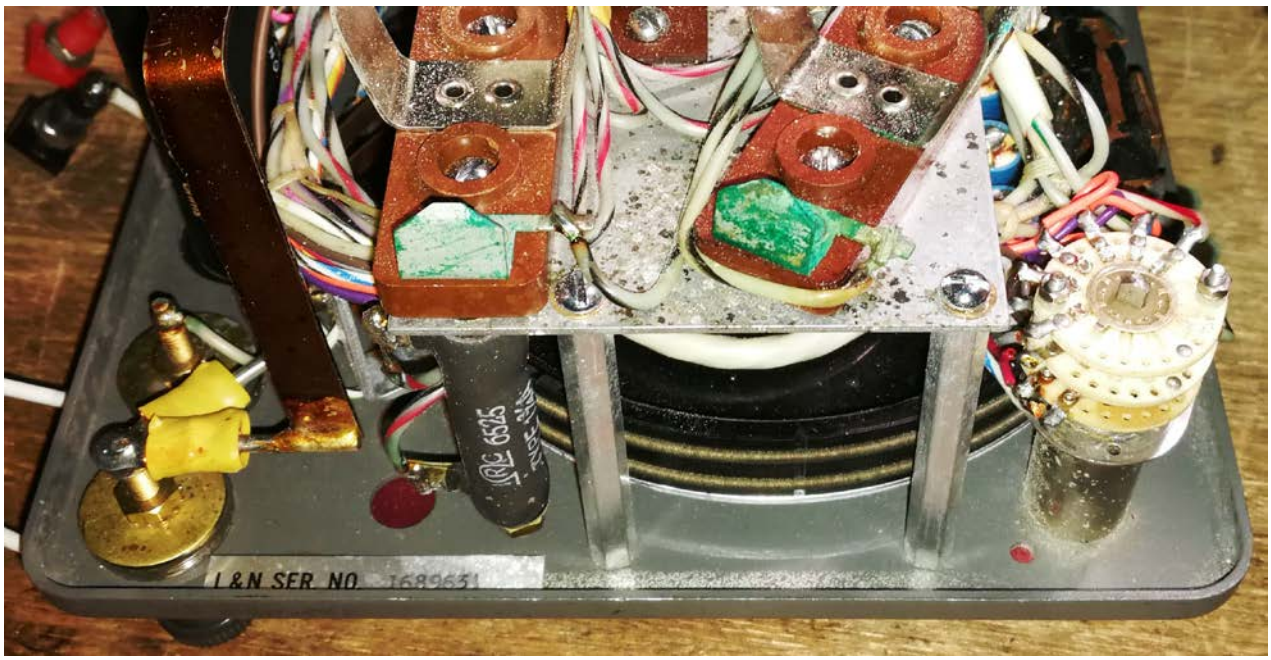
Leeds & Northrup Kelvin Bridge 4288
S/N 1689631

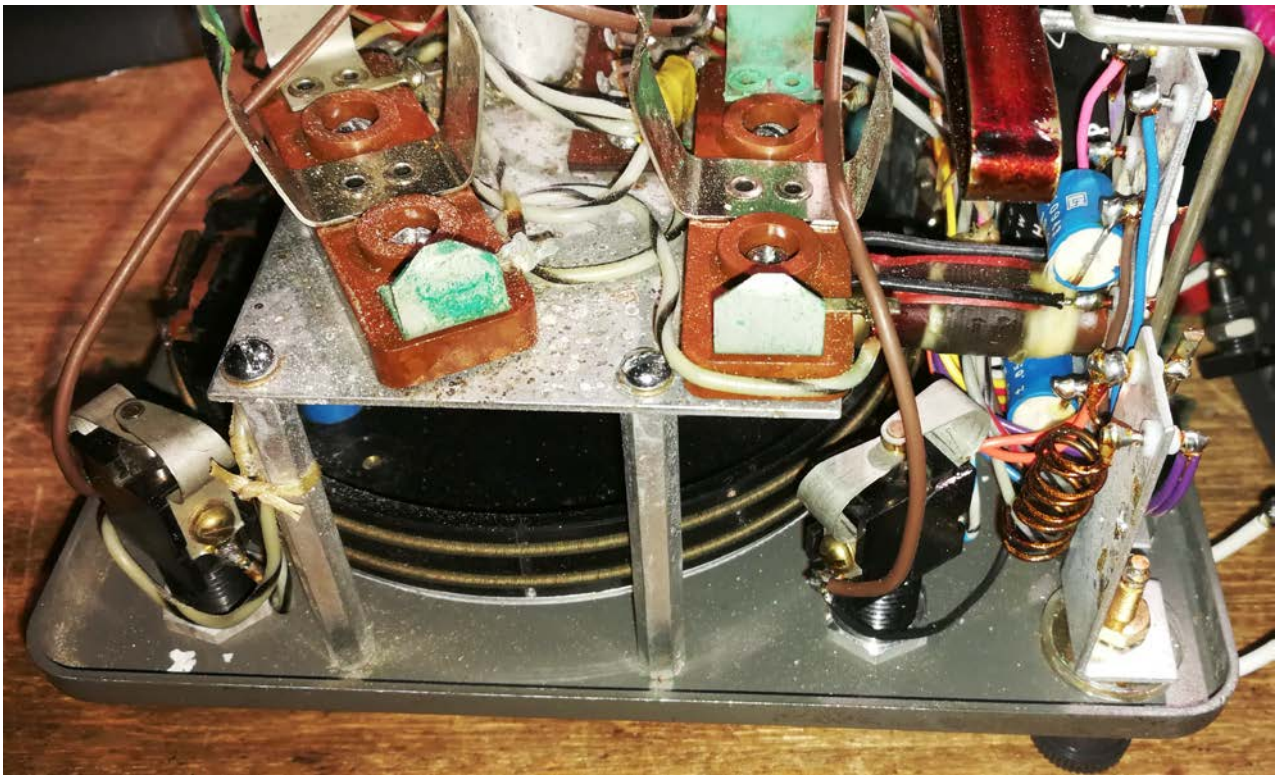
Kelvin double bridge with dual wirewound slidewires and dial range from 0.01 to 0.11. Five switched ranges from x0.01 to x100 for a measurement range from 0.1mΩ to 11Ω using five reference resistors.

Good external condition and internal condition. Unmodified. All battery terminals with some corrosion. Rear removed by turning slotted catch.


187112
CDRX
SYSTEM RESISTANCE
PERIOD
100 ohms
40 ohms
3.5 seconds
L&N SER. NO.







1.1 Parts

L&N fixed resistors:
0.01Ω (folded); 0.1Ω (open coil); 1Ω (fixed coil); 10Ω 0.05%; 100Ω 0.05% date code 010943
L&N galvanometer:
062112; sensitivity 0.6uA/mm; CDRX 100Ω; system resistance 40Ω; period 3.5 sec.
IRC 0.2Ω

2. Measurements

Accurate dial reading for: 10Ω 0.05%; 200mΩ 1%; 47mΩ 1% using 4-point measurement and 1.4Vdc regulated supply (in lieu of battery).

Accurate dial reading for 47mΩ 1% using 4-point measurement and 10mA CCS and Aneng 8009 mVdc range (in lieu of battery and galvanometer). Slidewire dial may need to pass through reading from each side to clearly identify centre position (due to wirewound element). DMM polarity may need to be swapped to clearly identify null at 0.000mV.

Measurement of internal fixed bridge resistors using 10mA and 100mA CCS and Picotest M3510A (uncalibrated) - for benchmarking using voltage and current measurements.

L&N resistor	9.9995mA CCS vol	R calc	100mA CCS volt	current	R calc
0.01Ω folded	0.1159 mV	0.0116 Ω	1.020 mV	99.952 mA	0.0102 Ω
0.1Ω open coil	1.0159 mV	0.1016 Ω	10.012 mV	99.953 mA	0.1002 Ω
1Ω fixed coil	10.0204 mV	1.0021 Ω	99.963 mV	99.963 mA	1.000 Ω
10Ω 0.05%	99.971 mV	9.9976 Ω	999.23 mV	99.994 mA	9.993 Ω
100Ω 0.05%	999.74 mV	99.979 Ω			

3. Operation

Operation:

- Operate on horizontal surface, with Galv pointer centred with dial.
- Preferably use a dc CCS of lower level than default battery current operation.
- Preferably use a DMM with 1uV resolution instead of galvanometer.

Fine tolerance adjustment can be made with slidewire wiper location adjustment slot, however parallax error and dial gradations only allow about +/- 0.2% resolution reading near full-scale.

Very inconvenient to have to press both Battery and Galv front panel buttons, and adjust the dial, to make a measurement – so set up external connections that defeat those pushbuttons.

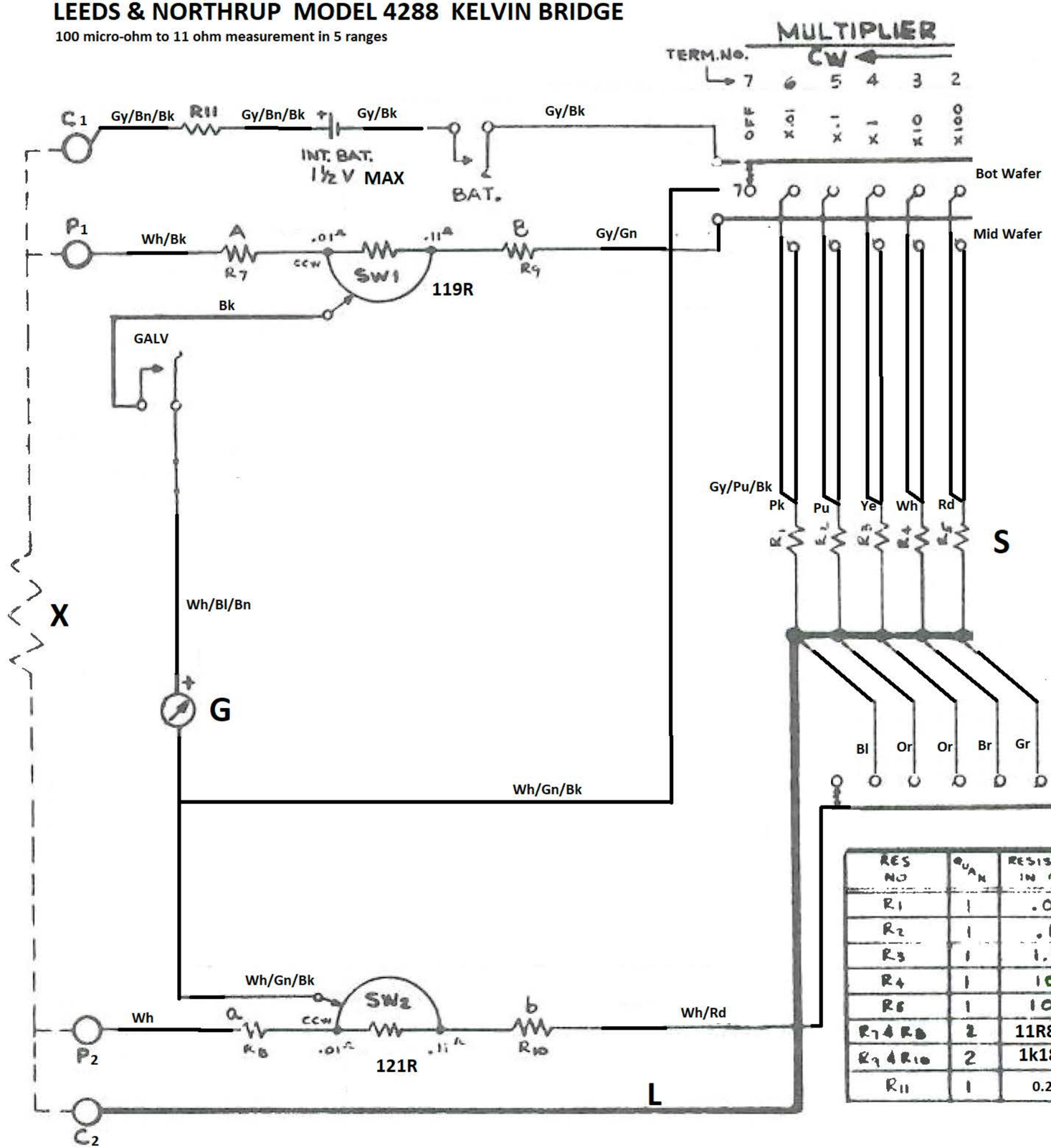
Schematic – modified from AVO catalog no. 72-436-01 Kelvin Bridge, which appears to be a later version of this bridge with:

- extra x1000 range
- terminals and switch for external battery
- lower test currents
- instrumentation amplifier and MC meter (in lieu of galvanometer)

References on Kelvin double bridge technique:
Electrical Measurement, by Frank A. Laws, 1938 2nd Ed., pages 186-193.
Precision Measurement and Calibration, 1968, Precision Resistors and Their Measurement by James L. Thomas, pages 168-170.

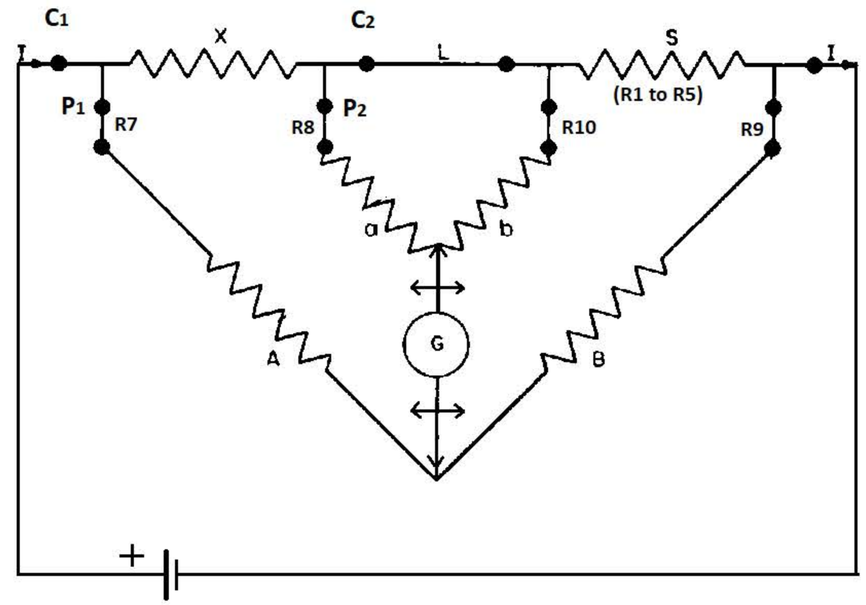
LEEDS & NORTHRUP MODEL 4288 KELVIN BRIDGE

100 micro-ohm to 11 ohm measurement in 5 ranges



RES NO	QUAN	RESISTANCE IN OHMS	TOL %
R1	1	.01	
R2	1	.1	
R3	1	1.0	
R4	1	10	0.05%
R5	1	100	0.05%
R7 & R8	2	11R8, 12R	
R9 & R10	2	1k18, 1k2	
R11	1	0.2	

KELVIN DOUBLE BRIDGE



Batt Current (1.5V):

x100	(1R - 11R)	15mA max	100 ohm loop
x10	(0R1 - 1R1)	150mA max	10.2 ohm loop
x1	(R01 - R11)	1.24A max	1.2 ohm loop
x0.1	(1m - 11m)	5A max	0.3 ohm loop
x0.01	(0.1m - 1.1m)	7.1A max	0.21 ohm loop