High Accuracy Resistance Decade Boxes RBB 5 & 6 Decades

Operating Instructions

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Limited Warranty & Limitation of Liability

CROPICO guarantees this product for a period of 1 year. The period of warranty will be effective at the day of delivery.

Due to a policy of continuous development CROPICO reserves the right to alter the equipment specification and description outlined in this publication without prior notice and no part of this publication shall be deemed to be part of any contract for the equipment unless specifically referred to as an inclusion within such contract.

Disposal of Old Product

This product has been designed and manufactured with high quality materials and components that can be recycled and reused.

When the crossed out wheelie bin symbol is attached to a product it means the product is covered by the European Directive 2012/19/EU.

Please familiarise yourself with the appropriate local separate collection system for electrical and electronic products.

Please dispose of this product according to local regulations. Do not dispose of this product along with normal waste material. The correct disposal of this product will help prevent potential negative consequences for the environment and human health.

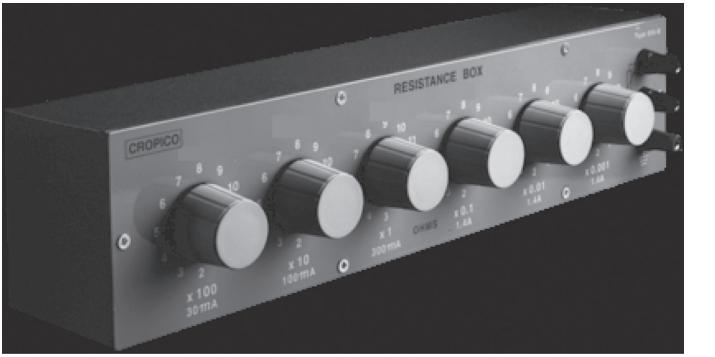
Do not connect the decade box to voltage sources exceeding 30V AC or 60V DC!

User Note:
These Operating Instructions are intended for the use of Competent Personnel.

CONTENTS

HIGH ACCURACY RESISTANCE DECADE BOXES – RBB 5 & 6 DECADES

The RBB series of resistance boxes are available in 5 & 6 decades. High Accuracy and wide range 0.001 ohm to 11 Megohms are combined in a compact case. Some models are particularly suited to Pt100 simulation with resolution as low as 0.001 ohm (±0.0025°C).



Switches

Contact material gold plated brass, Contact Resistance <5mΩ, Insulation Resistance (all paths >10GΩ)

Resistance Coils

The precision resistors fitted in the type RBB resistance boxes are non-inductively wire wound and carefully aged for maximum stability. For comprehensive technical details of each decade see page 3.

10 Models to choose from

Model	Number of Decades	Total Resistance	Resolution	Residual Resistance	Size	Weight
RBB5-B	5	1,112.1Ω	0.01Ω	1Ω	300x100x140	0.85kg
RBB5-C	5	11,111Ω	0.1Ω	<0.03Ω	300x100x140	0.85kg
RBB5-D	5	11,110Ω	1Ω	<0.03Ω	300x100x140	0.85kg
RBB5-E	5	1.1111Ω	10Ω	<0.03Ω	300x100x140	0.85kg
RBB5-F	5	11.111MΩ	100Ω	<0.03Ω	300x100x140	0.85kg
RBB6-B	6	1,112.11Ω	0.001Ω	1Ω	350x100x140	1 kg
RBB6-C	6	11,112.1Ω	0.01Ω	1Ω	350x100x140	1 kg
RBB6-D	6	111,111Ω	0.1Ω	<0.035Ω	350x100x140	1 kg
RBB6-E	6	1.11111MΩ	1Ω	<0.035Ω	350x100x140	1 kg
RBB6-CF	6	11.1111Ω	10Ω	<0.035Ω	350x100x140	1 kg

Accuracy of Decades

Decade (Ohms)	Accuracy of Adjustment	Power Reading	Temperature Coefficient
10 x 1MΩ	± 0.1%	0.5W	10ppm/°C
10 x 100kΩ	± 0.1%	0.5W	10ppm/°C
10 x 10kΩ	± 0.05%	0.33W	3ppm/°C
10 x 1kΩ	± 0.05%	0.33W	3ppm/°C
10 x 100Ω	± 0.05%	0.33W	3ppm/°C
10 x 10Ω	± 0.05%	0.33W	3ppm/°C
10 x 1Ω	± 0.2%	0.33W	3ppm/°C
10 x 0.1Ω	± 0.5%	0.75W	10ppm/°C
10 x 0.0001Ω	± 010%	0.75W	10ppm/°C

The RBB series of decade resistance boxes has been designed to be robust, reliable, and require the minimum maintenance. The switches should serviced and cleaned annually to ensure best performance. The resistance elements are factory adjusted to be within specification and it is not possible to alter their value. In the event of a resistor becoming damaged it is necessary to replace the whole resistor.

Residual Resistance

With all the decade dials set at 0 there will be a resistance measured at the terminals, this resistance is made up form 2 components. The resistance of the wires connecting the decade switches to the terminals; this is a constant value. The contact resistance of the decade switches, this will vary each time the switch is turned or disturbed. This residual resistance must be added to the decade values set on the decades, it is therefore important that this residual should be as low and constant as possible.

The CROPICO decade boxes have a low and stable residual resistance per decade. This value is controlled by the use of special low resistance switches.

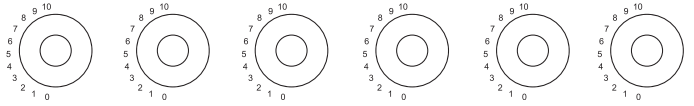
Low Value Decades

When switching decade resistance of 0.01Ω and lower the switch contact resistance variations become significant, this variation can be typically 10mΩ for a 5 decade unit and 13mΩ for a 6 decade unit. In addition the total residual resistance which would also include the internal wiring of the decade box could be significantly higher than the lowest decade values. CROPICO overcome this problem by using the Wagner Wolf decade, this technique enables higher resistance values to be used for the decade which are then shunted to give the correct incremental steps. The residual value of the unit is deliberately increased to 1Ω, and the 1Ω decade will start at 1 and not zero. This is not normally a problem, because the applications that require values to be selected with high resolution would have a much greater full scale resistance, typical applications include the simulation of Pt100 temperatures. The Pt100 resistance thermometers have a resistance of 100Ω at 0°C and 0.01°C is approximately equal to 0.001Ω.

Operation

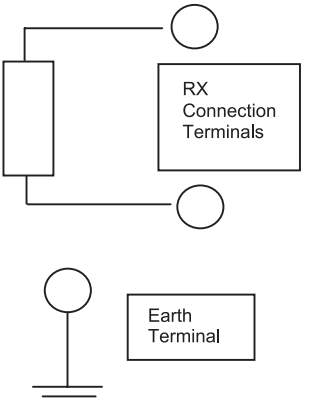
To select a resistance value turn the dial of the appropriate decade until the desired value is indicated by the switch pointers. The multiplier for each decade is shown below the dial i.e. x 0.1 or x 10 etc.

Example to select 21,234.5 Ω



Connection

The connections to the resistance box are made via the two 4mm terminals marked with the resistance symbol either banana plugs or spade terminals may be used. The third terminal marked with an earth symbol is connected directly to the top panel and case.



Operating and Maintenance Instructions

These Resistance Boxes are supplied calibrated to specification and ready for use.

The specified accuracy refers to the dial setting. To maintain the calibrated accuracy, avoid subjecting the box to thermal shocks or rough handling

1. When using in a voltage carrying circuit, to determine the correct resistance value to be used, always start by setting the dials at a high value. This avoids the possibility of overloading the resistance box and possible permanent damage to the resistance coils.

2. Remember that the box has a residual resistance which must be added to the final reading. This value is defined in the specification and is usually insignificant. The low value boxes with decades of 10 x 0.01, 0.00 1 and 0.0001 are constructed using the WAIDNER-WOLFF system, in which case the residual resistance is clearly defined, as the 1 ohm dial starts at “I” and not “0”.

3. The models with low value decades are often used for resistance thermometer simulation, in which case the following data may be useful.

Platinum resistance thermometers ballasted to give a total resistance of 100 ohms at U°C.

Fundamental interval 38.50 ohms

Degrees	C Resistance Ohms BS1904/I.E.C. 751
-100	60.25
-50	80.31
-25	90.19
0	100.00
±25	109.73
±50	119.40
±100	138.40
±150	157.31
+200	175.84
+250	194.07
+300	212.02
+350	229.67
+400	247.04
+450	264.11
+500	280.90
+550	297.39
+600	313.59

Calibration Temperature 20°C

Prior to despatch, each box is subjected to 100% inspection and issued with a Certificate of Conformity. Information regarding traceability to the National Standard is also supplied.

The RBB# series of decade resistance boxes has been designed to be lightweight, small in size, and require the minimum maintenance. The switches should not require any maintenance during their lifetime. The resistance elements are factory adjusted to be within specification and it is not possible to alter their value. In the event of a resistor becoming damaged it is necessary to replace the whole resistor.

The resistors will remain within specification for many years and with normal usage should never need attention. However, accidents do happen, and should they be burnt out due to overloading, the connections to the faulty resistors can be unsoldered and the resistor replaced. Order replacement resistors are as follows:

One ohm resistor for decade box type RBB or RB

Note a dial marked 10 x 100 would have 10 x 100 ohm resistors wired in series

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