Time Electronics
Calibration, Test and Measurement

User Manual

1040
Resistance Decade Box

Version 1.2
11-22

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This also applies to any schematics, drawings and diagrams contained herein.

This manual provides operating and safety instructions for the Time Electronics product. To ensure correct operation and safety, please follow the instructions in this manual.

Time Electronics reserves the right to change the contents, specifications and other information contained in this manual without notice.

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1 Introduction



A wide range resistance decade box designed to meet the requirements of both industry and education. The 1040 is compact and durable, housed in a robust metal case with removable protective rubber cover, making it ideal for use in either the laboratory or field. Excellent accuracy (mid-scale 0.1 %) is achieved by using high stability metal film resistors.

The 8-digit thumbwheel switch enables simple and precise setting with a clear indication of the resistance value. To make selecting and reading the setting easy the 1040 incorporates colour-coded digits: megohms - red, kilohms - yellow, ohms - white.

Special attention has been given to maximize the reliability of operation. A special multiple gold contact switch arrangement ensures that a back-up contact is always available to take over should a failure occur.

For connections the unit features safety terminals that are compatible with 4 mm shrouded plugs, as well as standard plugs, bare wires, and spade terminals.

The 1040 comes fitted with an ergonomic rubber cover providing increased protection and durability. It has a textured grip for comfortable handling, and side openings to place labels. It is easy to remove if you prefer a stand-alone unit or to use the optional 9026 carry case.

Features

- 1 Ω to 100 MΩ
- High accuracy
- Clear visual indication
- High stability
- Low temperature coefficient
- Safety terminals
- Removable protective cover
- Suitable for industry or education

2 Specifications

Resistance range .....1 Ω to 100 MΩ in 1 Ω steps

Decade (9 steps each)	1 Ω	10 Ω	100 Ω	1 kΩ	10 kΩ	100 kΩ	1 MΩ	10 MΩ
Accuracy	± 1 %	± 0.5 %	± 0.1 %	± 0.1 %	± 0.1 %	± 0.1 %	± 0.1 %	± 1 %
Max current DC	0.5 A	0.3 A	100 mA	30 mA	3 mA	0.3 mA	30 µA	3 µA
Max voltage DC	4.5 V	27 V	90 V	250 V	250 V	250 V	250 V	250 V
Max current RMS	0.354 A	0.212 A	70.66 mA	19.56 mA	1.96 mA	0.196 mA	19.56 µA	1.96 µA
Max voltage RMS	3.2 V	19.1 V	63.6 V	176 V	176 V	176 V	176 V	176 V

NOTE: On all ranges, the maximum applied voltage is proportional to the set point, keeping the current at or below the maximum specified. The maximum voltage of 250 V DC or 176 V RMS cannot be exceeded.

Residual resistance .....Less than 250 mΩ (< 31.25 mΩ / decade).

Power rating .....1 watt per resistor.

Voltage rating .....Maximum 250 V DC, 176 V AC RMS.

Current rating .....Maximum 0.5 A DC, 0.36 A AC RMS.

Temperature coefficient .....50 ppm/°C.

Connections .....2 x 4 mm active safety terminals. A third safety terminal is to enable the case to be earthed or connected to either output.

Dimensions.....W200 x H75 x D110 mm
(215 x 100 x 120 mm including supplied protective cover).

Weight.....0.6 kg (1.0 kg including protective cover)

Options .....Calibration certificates, carry case.

Ordering Information

1040 .....Resistance Decade Box

9026.....Carry case (replaces protective cover)

C161 .....Traceable calibration certificate (Factory)

C114 .....Accredited calibration certificate (ISO 17025)

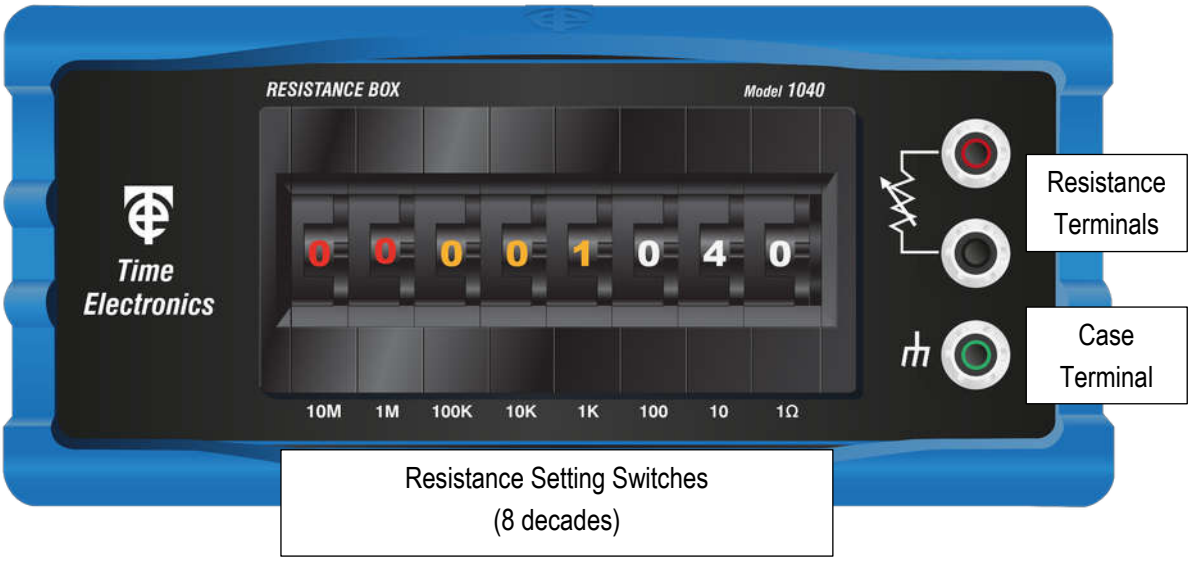
3 Operation

3.1 Safety Precautions



Observe proper safety operational guidelines when working with high voltages. To minimize shock hazard connect the case terminal to an electrical ground. Always take precautions to avoid and prevent contact with live components. Handle the unit with care and use as per the instructions in this manual.

3.2 Front Panel Controls and Connections



- **Resistance Terminals:** Resistance is connected via the safety terminal binding posts that are suitable for twisted stripped wire compression connection, spade terminals, or by 4 mm shrouded or normal plug insertion.

- **Case Terminal:** The case terminal is isolated from the two active resistance terminals. When connected to ground/earth, it may be used as a guard or shield connection, this can help to reduce unwanted electrical noise pickup, and help maintain the case at a safe voltage in certain modes of use.

- **Resistance Setting Switches:** Used for selecting the required resistance by setting the thumbwheel digit switches to the value of the decade range. Each decade can be set from 0 to 9.

3.3 Operating Instructions

3.3.1 Connections



Connection to the decade box is via 4 mm safety terminal posts, using 4 mm shrouded or standard plugs. Alternatively, crocodile clips or stripped wire connections can be used.

Whatever method is used, the connection must be tight to the terminal posts to avoid introducing unwanted additional resistance.

The red and black active terminals connect to the resistance elements, and the green terminal is connected to the case for screening purposes.



For certain applications, the user may want to connect the case terminal to either of the active terminals. This can be done, but the case would then be at the same potential as the active terminals. The user should be aware that this could be hazardous and safety precautions must be taken to prevent electric shock.

3.3.2 Setting Resistance



Before use it is recommended that all the thumbwheels are rotated completely 2 times. This will ensure the contacts are self-cleaned, maximizing their low contact resistance. This is particularly beneficial if the decade box has not been used for a long time.

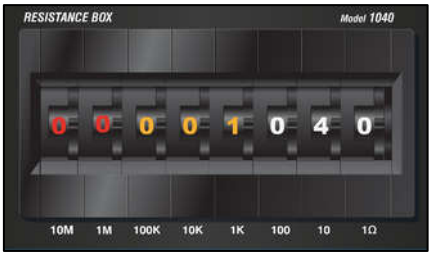
The 1040 features colour-coded digits to help provide a clear indication of the set values.

- Megohms (10 MΩ, 1 MΩ decades) = Red.
- Kilohms (100 kΩ, 10 kΩ, 1 kΩ decades) = Yellow.
- Ohms (100 Ω , 10 Ω, 1 Ω decades) = White.

To set resistance, use the thumbwheel digit switches to set the required values according to the decade ranges.

For example, to set 1040 Ω:

- Set the 10MΩ/1MΩ/100kΩ/10kΩ decades to 0.
- Set the 1 kΩ decade to 1.
- Set the 100 Ω decade to 0.
- Set the 10 Ω decade to 4.
- Set the 1 Ω decade to 0.



For a quick reference to the setting values of the 1040, please see the Resistance Setting Table on the following page.

Note: All resistance boxes have a residual resistance, meaning that when the decades are set to zero a small resistance remains. If you are making precision measurements or recalibrating the instrument, this residual value must be subtracted from all measurements.

Typical values of residual resistance are shown in the specifications.
For precise values relating to your specific unit, refer to calibration certificate (if ordered).

3.4 Resistance Setting Table

The below table shows the settings of each resistance decade using the switches.

















10 MΩ Decade		**1 MΩ Decade**		**100 kΩ Decade**		**10 kΩ Decade**		**1 kΩ Decade**		**100 Ω Decade**		**10 Ω Decade**		**1 Ω Decade**	
Digit	**Ω**	**Digit**	**Ω**	**Digit**	**Ω**	**Digit**	**Ω**	**Digit**	**Ω**	**Digit**	**Ω**	**Digit**	**Ω**	**Digit**	**Ω**
0	0 Ω	0	0 Ω	0	0 Ω	0	0 Ω	0	0 Ω	0	0 Ω	0	0 Ω	0	0 Ω
1	10 MΩ	1	1 MΩ	1	100 kΩ	1	10 kΩ	1	1 kΩ	1	100 Ω	1	10 Ω	1	1 Ω
2	20 MΩ	2	2 MΩ	2	200 kΩ	2	20 kΩ	2	2 kΩ	2	200 Ω	2	20 Ω	2	2 Ω
3	30 MΩ	3	3 MΩ	3	300 kΩ	3	30 kΩ	3	3 kΩ	3	300 Ω	3	30 Ω	3	3 Ω
4	40 MΩ	4	4 MΩ	4	400 kΩ	4	40 kΩ	4	4 kΩ	4	400 Ω	4	40 Ω	4	4 Ω
5	50 MΩ	5	5 MΩ	5	500 kΩ	5	50 kΩ	5	5 kΩ	5	500 Ω	5	50 Ω	5	5 Ω
6	60 MΩ	6	6 MΩ	6	600 kΩ	6	60 kΩ	6	6 kΩ	6	600 Ω	6	60 Ω	6	6 Ω
7	70 MΩ	7	7 MΩ	7	700 kΩ	7	70 kΩ	7	7 kΩ	7	700 Ω	7	70 Ω	7	7 Ω
8	80 MΩ	8	8 MΩ	8	800 kΩ	8	80 kΩ	8	8 kΩ	8	800 Ω	8	80 Ω	8	8 Ω
9	90 MΩ	9	9 MΩ	9	900 kΩ	9	90 kΩ	9	9 kΩ	9	900 Ω	9	90 Ω	9	9 Ω

4 Maintenance and Repair

Overload Considerations

To avoid overload, power dissipation in the resistive elements must be kept below 1 W. To achieve this the maximum current must not exceed those shown for each decade in the specifications table. Current will be proportional to the applied voltage. The maximum allowed working voltage that can be applied at the maximum setting for each decade is also shown in the specifications.
If multiple decades are being used, the current must not exceed that of the lowest rated decade. For example, if you set 7152 Ω, the 1 kΩ decade has the lowest current rating at 30 mA. Therefore the current flowing through the decade box must not exceed 30 mA.

Repair

NOTE: No repair work should be undertaken by the customer while the instrument is under warranty, as such work may render the warranty invalid.

Certain precision components used in this instrument are not readily available and make repairs by the customer difficult if these components are damaged. You should only use Time Electronics original parts to ensure the unit meets the stated specifications.

Dismantling the Instrument
Remove the protective rubber cover. Then removal of four case screws enables the metal cover to be taken off, enabling access to all parts of the instrument.

Spare Parts List

Part #	Description
017-1900	1 Ω resistor
017-1913	10 Ω resistor
017-1914	100 Ω resistor
017-1915	1 kΩ resistor
017-1916	10 kΩ resistor
017-1917	100 kΩ resistor
017-0001	1 MΩ resistor
017-1919	10 MΩ resistor
062-0060	4 mm red terminal
062-0061	4mm black terminal
062-0062	4 mm green terminal
063-6323	Pair of tolec bank ends & fixing clips

Part #	Description
094-9562	1 Ω decade assembly
094-9563	10 Ω decade assembly
094-9564	100 Ω decade assembly
094-9565	1 kΩ decade assembly
094-9566	10 kΩ decade assembly
094-9567	100 kΩ decade assembly
094-9568	1 MΩ decade assembly
094-9569	10 MΩ decade assembly
090-9015	Case metal cover
9026	Carry case
9028	Protective rubber cover

5 Warranty and Servicing

Warranty

Time Electronics products carry a one-year manufacturer's warranty as standard.

Time Electronics products are designed and manufactured to the highest standards and specifications to assure the quality and performance required by all sectors of industry. Time Electronics products are fully guaranteed against faulty materials and workmanship.

Should this product be found to be defective, please contact us using the below details. Inform us of the product type, serial number, and details of any fault and/or the service required. Please retain the supplier invoice as proof of purchase.

This warranty does not apply to defects resulting from action of the user such as misuse, operation outside of specification, improper maintenance or repair, or unauthorized modification. Time Electronics' total liability is limited to repair or replacement of the product. Note that if Time Electronics determine that the fault on a returned product has been caused by the user, we will contact the customer before proceeding with any repair.

Product Registration

You can register your product at: www.timeelectronics.com/contact/product-registration. Registering your product will enable us to maintain a record of purchase for your warranty. You can also use the web form to provide feedback about our products and services.

Calibration and Repair Services

Time Electronics offers repair and calibration services for all the products we make and sell. Routine maintenance by the manufacturer ensures optimal performance and condition of the product. Periodic traceable or accredited calibration is available.

Contacting Time Electronics

Online:
Please visit www.timeelectronics.com and select Technical Support from the Contact links. From this page you will be able to send information to the Time Electronics service team who will help and support you.

By phone:
+44 (0) 1732 355993

By email:
mail@timeelectronics.co.uk

Returning Instruments

Prior to returning your product please contact Time Electronics. We will issue a return merchandise authorization (RMA) number that is to accompany the goods returning. Further instructions will also be issued prior to shipment. When returning instruments, please ensure that they have been adequately packed, preferably in the original packing supplied. **Time Electronics Ltd will not accept responsibility for units returned damaged.** Please ensure that all units have details of the service required and all relevant paperwork.

Send the instrument, shipping charges paid to:

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Tonbridge, Kent, TN9 1RA.
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Email: mail@timeelectronics.co.uk
Web Site: www.timeelectronics.com

Disposal of your old equipment



1. When this crossed-out wheeled bin symbol is attached to a product it means the product is covered by the European Directive 2002/96/EC.
2. All electrical and electronic products should be disposed of separately from the municipal waste stream via designated collection facilities appointed by the government or the local authorities.
3. The correct disposal of your old appliance will help prevent potential negative consequences for the environment and human health.
4. For more detailed information about disposal of your old appliance, please contact your city office, waste disposal service or return to Time Electronics.