User's Manual

2793 (279301, 279303) Decade Resistance Box

IM 2793-01E

YOKOGAWA
Yokogawa Test & Measurement Corporation

IM 2793-01E
9th Edition: Nov. 2020 (YMI)

Introduction

Thank you for purchasing the 2793 Decade Resistance Box.
This User's manual contains useful information regarding the instrument's functions and operating procedures, as well as precautions that should be observed during use.
Before using this product, thoroughly read this manual to understand how to use it properly.

Keep this manual in a safe place for quick reference in the event that a question arises.

Contact information of Yokogawa offices worldwide is provided on the following sheet.
PIM 113-01Z2 Inquiries List of worldwide contacts

Notes

- The information contained in this manual is subject to change without notice.
  Furthermore, the actual display items may differ slightly from the ones appearing in this manual.
- Every effort has been made to ensure the information contained herein is accurate.
  However, should any concerns, errors, or emissions come to your attention, or if you have any comments, please contact us.
- Copying or reproduction of any or all of the content of this manual without Yokogawa's permission is strictly prohibited.

Cautionary Notes for Safe Use of the Product

When operating the instrument, be sure to observe the cautionary notes given below to ensure correct and safe use of the instrument. If you use the instrument in any way other than as instructed in this manual, the instrument's protective measures may be impaired.
This manual is an essential part of the product; keep it a safe place for future reference.
YOKOGAWA is by no means liable for any damage resulting from use of the instrument in contradiction to these cautionary notes.

■ The following safety symbols are used on the instrument and in the manual:

⚠ Danger! Handle with Care.
This symbol indicates that the operator must refer to an explanation in the User's Manual or Service Manual in order to avoid risk of injury or loss of life of personnel or damage to the instrument.

⚠ WARNING

Indicates a hazard that may result in the loss of life or serious injury of the user unless the described instruction is abided by.

⚠ CAUTION

Indicates a hazard that may result in an injury to the user and/or physical damage to the product or other equipment unless the described instruction is abided by.

■ **Since mishandling the instrument can result in an accident that may lead to injury or death of the operator, such as an electric shock, be sure to observe the following instructions.**

⚠ WARNING

● **Measurement**

- Always maintain the instrument within the limits for allowable current, voltage and power, during operation. If there is more than one limit for any of these parameters, the lowest limit takes precedence.
- Only operate the instrument on an input-to-ground supply voltage of no greater than 250 V (except for Model 279303).
- When an input-to-ground supply voltage of greater than 250 V needs to be applied to Model 279303, exercise extra care when handling the instrument.
- The terminals and internal circuitry may become electrified to high voltages and extremely hot depending on the instrument's condition of use. Do not touch these parts.

● **Grounding**

- To avoid electric shock, be sure to apply protective grounding to the grounding terminal.

● **Protective Measures**

- If a crack appears in the instrument after it has been accidentally dropped or bumped, the safety-purpose insulation may be damaged.
  By all means do not use the instrument, but ask the manufacturer for repair.

● **Operating Environment**

- Do not operate the instrument in a flammable or explosive gas atmosphere.
- Do not operate the instrument if there is any condensation on it.

● **Do Not Remove the Casing or Disassemble**

- Only Yokogawa service personnel are authorized to remove the casing or disassemble or modify the instrument.
  Do not attempt to repair the instrument yourself, as doing so is extremely dangerous.
  (If you are rack-mounting the instrument, use it correctly according to the handling procedure.)

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1. GENERAL

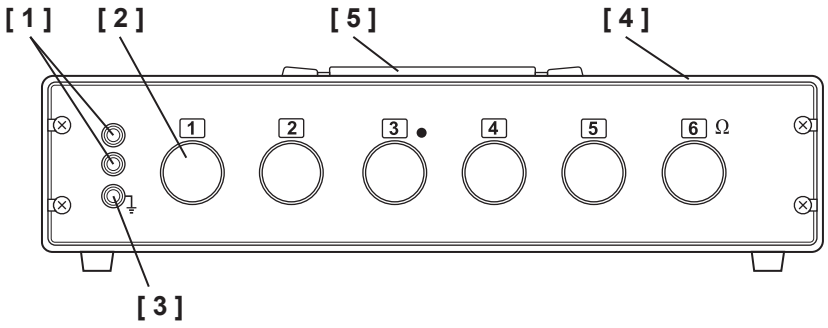
The 279301 and 279303 Resistance Boxes are high-accuracy variable resistors with 6 dials. Setting of these instruments is easy over wide resistance range.

The 279301 has resistance range of 0.1 to 1111.210 Ω in 1 mΩ steps and accuracy of ±0.01%.
It is best suited for calibration of resistance thermometers.

The 279303 has resistance range of 0 to 111.1110 MΩ in 100 Ω steps and accuracy of ±0.05%.
It is best suited for calibration of insulation resistance testers.

These Decade Resistance Boxes employ in-line display system, and rack-mounting is possible.

2. NAMES AND FUNCTIONS OF COMPONENTS



[1] Resistance Terminals
[2] Resistance Setting Decade Dials
[3] Earth Terminal
[4] Outer Case
[5] Carrying Handle

3. SPECIFICATIONS

279301

Resistance Range: 0.100 to 1111.210 Ω

Dial Composition: 0.001 Ω × 10 + 0.01 Ω × 10 +
0.1 Ω × 11 + 1 Ω × 10 + 10 Ω × 10 +
100 Ω × 10

Resolution: 0.001 Ω

Accuracy: ± (0.01% + 2 mΩ)
(At temperature 23 ± 2ºC, humidity 45 to 75%)
Input Power: Max.0.1 W

Temperature Coefficient:

Dial / T.C.	100 Ω step	10 Ω step	1 Ω step	0.1 Ω step
α_{20} ($\times 10^{-6}$/ºC)	−5 to +10	−5 to+20	Approx. * 20 to 90	Approx. * 90 to 900
β ($\times 10^{-6}$/ºC^2)	−0.3 to −0.7		——	——

$Rt = R_{20}\{1 + \alpha_{20}(t - 20) + \beta(t - 20)^2\}$
Rt : Resistance Value at tºC
R_{20} : Resistance Value at 20ºC

* Inculuding T.C. of wiring and switches resistance (60 μΩ/ºC)

Max. Allowable Power: 0.25 W per step
Within 1 W for overall instrument
Temperature Raise: Less than 30ºC
at maximum power rating.

Max. Allowable Current:

100 Ω step	50 mA
10 Ω step	150 mA
1 Ω step	500 mA
0.1 Ω step	1.5 A

Insulation Resistance:
More than 500 MΩ (at 500 VDC)
between panel and circuit

Dielectric Strength:
1000 VAC 1 minute
between panel and circuit

Dimensions: Approx. 116 × 497 × 140 mm

Weight: Approx. 4.8 kg

Accessory: User's Manual 1 copy

279303

Resistance Range: 0 to 111.1110 MΩ

Dial Composition: 100 Ω × 10 + 1 kΩ × 10 +
10 kΩ × 10 + 100 kΩ × 10 +
1 MΩ × 10 + 10 MΩ × 10

Accuracy: 100 Ω, 1 kΩ, 10 kΩ, and 100 kΩ step
± (0.05% + 0.05 Ω)
1 MΩ and 10 MΩ step
± 0.2%
(At temperature 23 ± 2ºC,
humidity below 75%,
incuding residual resistance approx. 0.05 Ω)

Max. Allowable Input (Current · Voltage):

100 Ω step	100 mA
1 kΩ step	30 mA
10 kΩ step	10 mA
100 kΩ step	3 mA (100 kΩ to 600 kΩ) 2000 V (700 kΩ to 1 MΩ)
1 MΩ step	2000 V
10 MΩ step	2000 V

Temperature Coefficient:
100 Ω and 1 kΩ step
$\alpha_{20} = (-2 \text{ to } +20) \times 10^{-6}$/ºC
$\beta = -(0.3 \text{ to } 0.7) \times 10^{-6}$/ºC^2
10 kΩ, 100 kΩ, 1 MΩ, and 10 MΩ step
$\pm 30 \times 10^{-6}$/ºC

Variation of resistance with temperature change is shown in the following equation:
$Rt = R_{20}\{1 + \alpha_{20}(t - 20) + \beta(t - 20)^2\}$
Where Rt : Resistance Value at tºC
R_{20} : Resistance Value at 20ºC

Insulation Resistance:
More than 10^{11} Ω (at 1000 VDC)
between panel and circuit

Dielectric Strength:
2500 VAC 1 minute
between panel and circuit

Dimensions: Approx. 116 × 497 × 140 mm

Weight: Approx. 4.8 kg

Accessory: User's Manual 1 copy

4. CIRCUIT DIAGRAM

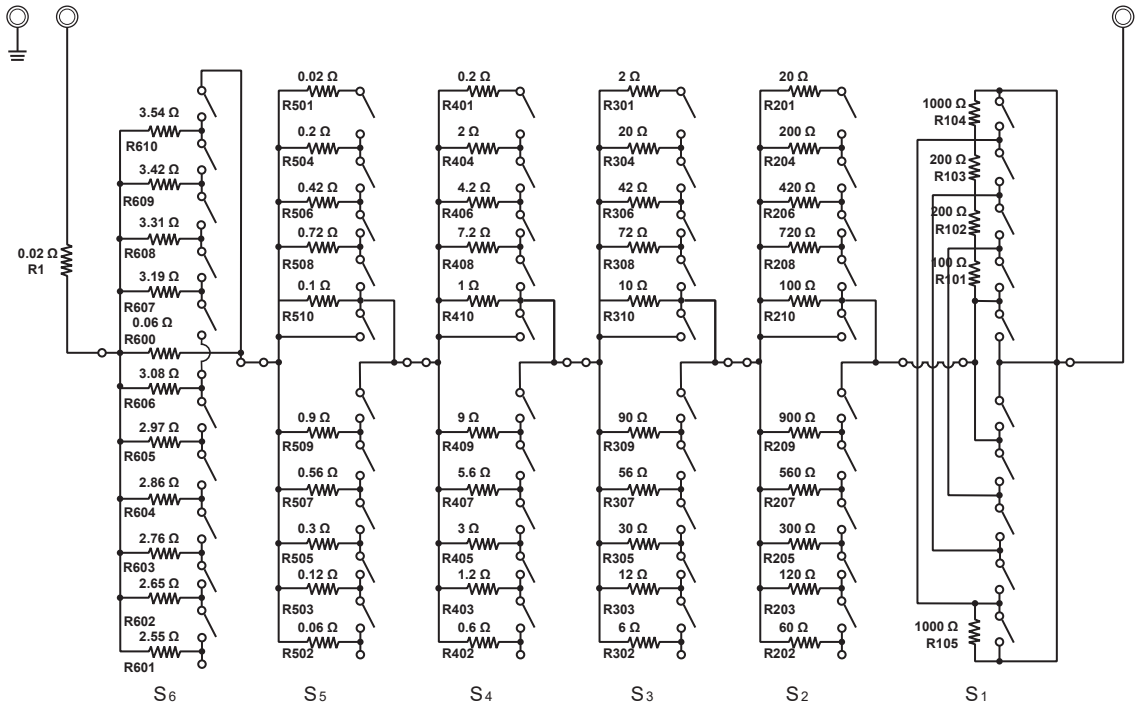


Fig. 1.1 Circuit Diagram

279301

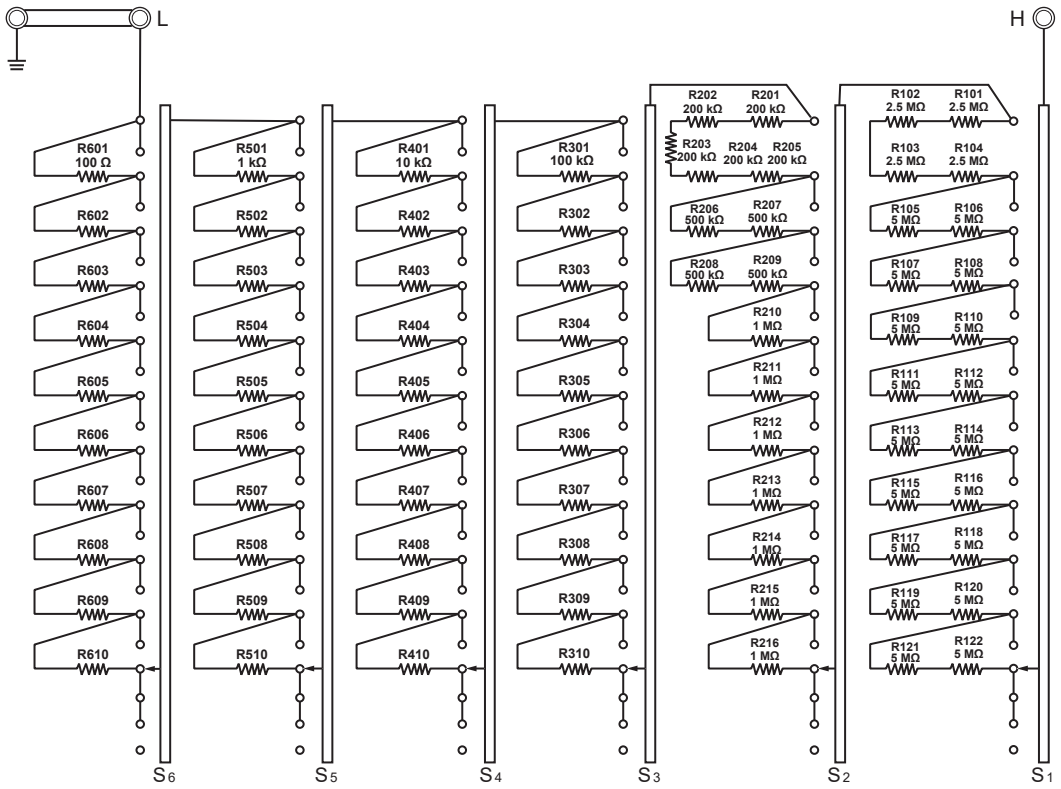


Fig. 1.2 Circuit Diagram

279303