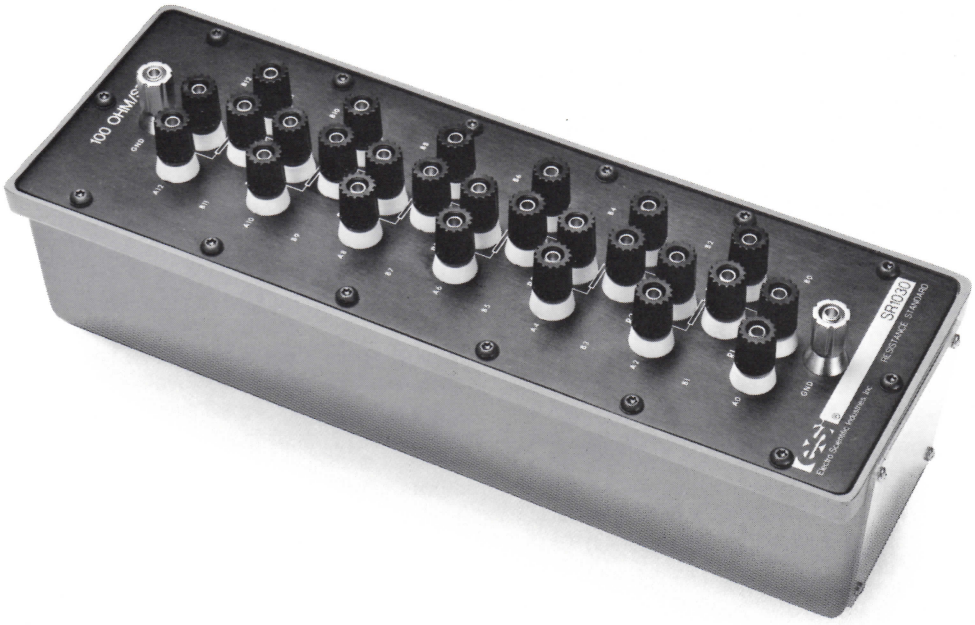
DATA SHEET

Model SR1030

Resistance Transfer Standard System



- **Part-per-million transfers from 100 mΩ to 1 MΩ**
- **Thermally isolated by oil for maximum short-term thermal stability**
- **Excellent long-term stability; ±20 ppm for 6 months**
- **Accuracy calibrated to ±10 ppm**
- **Seven decades of resistance transfer –1, 10, 100, 1 k, 10 k and 100 kΩ/step**
- **100:1 resistance transfers using series, parallel, series/parallel connection**
- **Calibration readings traceable to the NIST are provided**

Extremely Accurate and Stable

The Model SR1030 provides the part-per-million (ppm) resistance transfer accuracies and the long-term stabilities you need in today's modern metrology and calibration laboratories.

The SR1030 Resistance Transfer Standards are extremely accurate, stable resistance standards that are used on the bench and are light enough to carry with you to remote calibration, repair, production or R&D sites. The SR1030 consists of six transfer standards in decades from 1 Ω to 100 kΩ per step. Each decade standard consists of 12 nominally equal resistors matched initially to within 10 ppm. In addition, each decade standard produces three decade values — 10 resistors in series (10R), 10 resistors in parallel (R/10), and nine of the ten resistors in series/parallel (R). By making a 1:1 comparison with the tenth resistor, you can resolve a series-parallel value to better than 1 ppm.

Oil Immersion Provides Thermal Isolation

All standards, except the 100 kΩ/step standard, are immersed in a mineral oil bath. Oil immersion provides thermal isolation to minimize the effects of ambient temperature variations. This means maximum short-term thermal stability for the standards. The SR1030 also exhibits superior long-term stability (±20 ppm of nominal for six months; ±35 ppm for two years; ±50 ppm typical for five years). This gives you longer mean time between calibrations, increasing your calibration throughput.

As an added benefit, the oil speeds the dissipation of heat created in the resistors during calibration. This heat dissipation further contributes to the stability of the standards.

Gaskets seal the SR1030 to keep your work surface and measuring contacts clean. The gaskets also minimize oil aging and contamination to lengthen the time between oil changes.

Since the 100 kΩ standard can be measured at much lower bridge power than the lower value standards, it is not necessary to immerse the standard in oil. However, this standard still benefits from the thermal lagging effects because it is sealed in a chamber using insulating materials that provide approximately the same temperature lagging effects as oil.

Over 30 Years of Experience Refining Resistance Technology

ESI's more than 30 years of experience in design and manufacture of resistance standards has made ESI standards highly respected throughout government and industry. The SR1030 incorporates all the features of the SR1010 Resistance Transfer Standards with the many benefits of a sealed oil bath.

Ideal as a Multi-Value Standard Resistor or Reference Voltage Divider

The high accuracy and precision of the individual resistors make the SR1030 ideal for use as a multi-value standard resistor or reference voltage divider. The superior stability of the SR1030 makes it particularly suitable for calibrating 6½, 7½, and 8½ digit digital multimeters.

Certified Traceable to the NIST

The SR1030 Resistance Transfer Standard System is certified traceable to the National Institute of Standards and Technology. You can use the SR1030 to transfer this traceability to your resistance standards and measuring equipment. Certified calibration data is supplied with every standard.

The SR1030 Resistance Transfer Standard System also meets military specifications MLEE-JR-88-9.

Specifications

Nominal Values (per step)
1, 10, 100, 1 k, 10 k and 100 kΩ

Transfer Accuracy

100:1	±(1 ppm + 0.1 μΩ) at parallel value, using SB103, PC101, and SPC102 as necessary
10:1	±(1 ppm + 1 μΩ) at series or parallel value, using SB103, PC101, and SPC102 as necessary

Initial Adjustment
±20 ppm, matched within 10 ppm

Initial Calibration Certificate
±10 ppm, NIST traceable

Calibration Conditions
23 ±1°C, low-power, four-terminal measurement, initial calibration readings are provided

Long-Term Resistance Stability
±20 ppm of nominal for 6 months
±35 ppm for 2 years
±50 ppm for 5 years, typical

Temperature Coefficient

1 Ω	±15 ppm/°C, matched within 5 ppm/°C
10 Ω	±1 ppm/°C, matched within 5 ppm/°C
100 Ω to 100 kΩ	±5 ppm/°C, matched within 3 ppm/°C

Power Coefficient (typical)

1 Ω	±0.3 ppm/mW/resistor
10 Ω	±0.02 ppm/mW/resistor
100 Ω to 100 kΩ	±0.1 ppm/mW/resistor

Maximum Power Rating

Single Step	1 W/step
10 resistors	5W distributed

Leakage Resistance

1 Ω to 10 kΩ	$>10^{12}$ Ω, terminal to case
100 kΩ	$>10^{13}$ Ω, terminal to case

Breakdown Voltage
1500 volts peak to case

Oil Bath

Type	Mineral oil, USP Light Penco, Sontex 85, white
Insulation Resistance	Typically 10^{14} Ω cm
Quantity	Approximately 0.5 gallons

Dimensions (with oil)

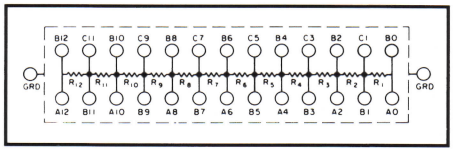
Height	120 mm (4.7 in.)
Width	117 mm (4.6 in.)
Depth	335 mm (13.2 in.)
Mass	6.35 kg (Weight 10 lb)

Operating Environment

Temperature	22.8 ±3.3°C (73±6°F)
Humidity	20 to 50% relative humidity

Safe Operating Environment

Temperature	0 to 50°C (32 to 126°F)
Humidity	15 to 80% relative humidity



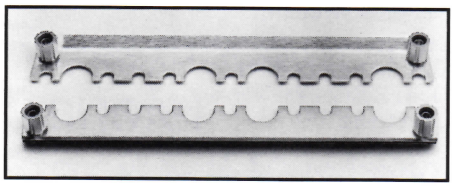
Maximum Current and Voltage Capabilities

SR1030 Resistance Value Per Step	One Resistor Alone Maximum I, V	10 Resistors in Parallel (R/10) Maximum I, V	10 Resistors in Series (R10) Maximum I, V
1 Ω	1.0 A, 1.0 V	7.07 A, 707 mV	707 mA, 7.07 V
10 Ω	316 mA, 3.16 V	2.23 A, 2.23 V	223 mA, 22.3 V
100 Ω	100 mA, 10 V	707 mA, 7.07 V	70.7 mA, 70.7 V
1 kΩ	31.6 mA, 31.6 V	223 mA, 22.3 V	22.3 mA, 233 V
10 kΩ	10 mA, 100 V	70.7 mA, 70.7 V	7.07 mA, 707 V
100 kΩ	3.16 mA, 316 V	22.3 mA, 223 V	1.5 mA, 1500 V*

*Based on the breakdown voltage of 1500 volts peak to case

Options to Complete Your Installation

Model SB103 Shorting Bars



The Model SB103 Shorting Bars are used to connect any number of Model SR1030 Resistors in parallel or nine resistors in series/parallel arrangement. They may be used by themselves or in conjunction with the Model PC101 or SPC102 networks. The resistance that must be added to the value calculated from the individual resistor values is given in the accompanying table for two- and four-terminal measurements. See Combined Option Functional Specifications on page 4.

Resistance

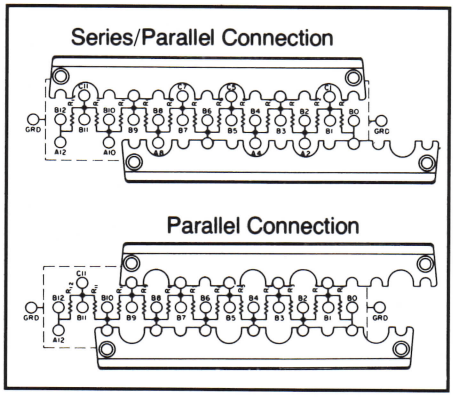
End to end: approximately 100 μΩ/bar

Maximum Current

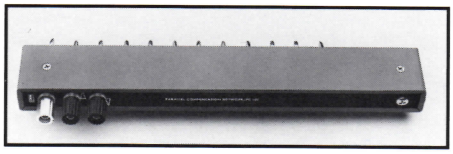
10 A/bar

Dimensions (Each Bar)

Height	36 mm (1.4 in.)
Width	241 mm (9.5 in.)
Depth	20 mm (0.8 in.)
Mass	0.23 kg (Weight 8 oz)



Model PC101 Parallel Compensation Network



The Model PC101 Parallel Compensation Network is used in addition to the Model SB103 Shorting Bars for the four-terminal parallel connection of 10 low-value resistors in the Model SR1030 Resistance Transfer Standard System.

Effective Resistance and Accuracy

Effect of connection resistances on four-terminal parallel value less than ±0.1 μΩ. See Combined Option Functional Specifications on page 4.

Resistor Matching

Matched to 0.05%.

Maximum Current

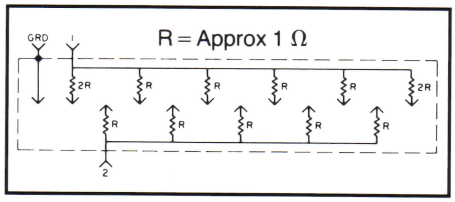
2.0 A

Breakdown Voltage

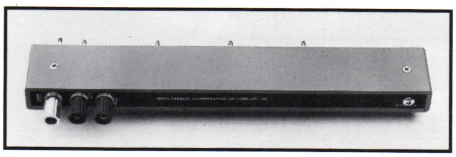
1500 volts peak-to-case

Dimensions

Height	25 mm (1 in.)
Width	305 mm (12 in.)
Depth	81 mm (3.2 in.)
Mass	0.45 kg (Weight 1 lb)



Model SPC102 Series/Parallel Compensation Network



The Model SPC102 Series/Parallel Compensation Network is used in addition to the Model SB103 Shorting Bars for the four-terminal series/parallel connection of nine low-value resistors in the Model SR1030 Resistance Transfer Standard System.

Effective Resistance and Accuracy

Effect of connection resistances on four-terminal series/parallel values less than ±0.1 μΩ. See Combined Option Functional Specifications on page 4.

Resistor Matching

Matched to 0.05%

Maximum Current

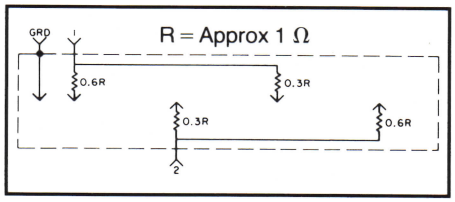
2.0 A

Breakdown Voltage

1500 volts peak-to-case

Dimensions

Height	25 mm (1 in.)
Width	305 mm (12 in.)
Depth	81 mm (3.2 in.)
Mass	0.45 kg (Weight 1 lb)



Options, continued

Combined Option Functional Specifications

Resistor Grouping	Ten Resistors in Parallel	Nine Resistors in Series/Parallel	Ten Resistors in Series
Nominal Value (Relative to Individual Resistor Value R)	0.1R	R	10R
Four-Terminal Measurement	Resistance Added to Value Calculated from Individual Resistor Values (Value and Tolerance in Microhms)		
With SB103 and PC101 or SPC102	0 ±0.1 μΩ	0 ±1 μΩ	—
With SB103 Alone	50 ±10 μΩ	200 ±40 μΩ	—
With no Accessories	—	—	0 ±10 μΩ
Two-Terminal Measurement			
With SB103	150 ±30 μΩ	300 ±60 μΩ	—
With no Accessories	—	—	300 ±60 μΩ

Order Information

	Part number
SR1030 Resistance Transfer Standard System:	
1 Ω Resistance Transfer Standard	31030
10 Ω Resistance Transfer Standard	31031
100 Ω Resistance Transfer Standard	31032
1 kΩ Resistance Transfer Standard	31033
10 kΩ Resistance Transfer Standard	31034
100 kΩ Resistance Transfer Standard	31035
Options:	
SB103 Shorting Bars	30103
PC101 Parallel Compensation Network	08540
SPC102 Series/Parallel Compensation Network	08560

Warranty

WARRANTY OF QUALITY

Electro Scientific Industries, Inc., warrants its products to be free from defects in material and workmanship. Rigorous quality control permits the following standard new equipment warranties:

1. Two years for components and instruments exclusively utilizing passive circuitry.
2. One year on components and instruments utilizing active circuitry.

During the warranty period, we will service or, at our option, replace at the factory any device that fails in normal use to meet its published specifications. Batteries, tubes and relays that have given normal service are excepted. Special systems will have warranty periods as listed in their quotation.

DISCLAIMER OF IMPLIED WARRANTIES

THE FOREGOING WARRANTIES OF ESI ARE IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED. ESI SPECIFICALLY DISCLAIMS ANY IMPLIED WARRANTIES OR MERCHANTABILITY OF FITNESS FOR A PARTICULAR PURPOSE.

In no event will ESI be liable for special or consequential damages. Purchaser's sole and exclusive remedy in the event any item fails to comply with the foregoing express warranties of ESI shall be to return the item to ESI, shipping charges prepaid, and at the option of ESI obtain a replacement item or a refund of the purchase price.

Where an ESI product will interconnect with components not supplied by ESI, ESI does not warrant the ESI product against failures caused by mismatch of the non-ESI component to the ESI product, nor will ESI be liable for damages to the non-ESI component resulting from the mismatch.

Unless specifically requested by the customer, ESI does not inspect or test an instrument for compliance with applicable safety, governmental or industry standard. Customers who desire an inspection or test for conformity to a standard should specify the standard with particularity. Not all instruments can be modified to conform with standards adopted after the instrument was manufactured, and such modifications are not repairs, nor is failure to comply with a standard adopted after the date of manufacture a defect.

For complete information regarding warranties, terms and conditions, contact ESI.

WARRANTY OF TRACEABILITY

The reference standards of measurement of Electro Scientific Industries, Inc. are compared with the U.S. National Standards through frequent tests by the U.S. National Institute of Standards and Technology. The ESI working standards and testing apparatus used are calibrated against the reference standards in a rigorously maintained program of measurement control.

The manufacture and final calibration of all ESI instruments are controlled by the use of ESI referenced and working standards and testing apparatus in accordance with established procedures with documented results.

ESI reserves the right to change specifications and other product information without notice.

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