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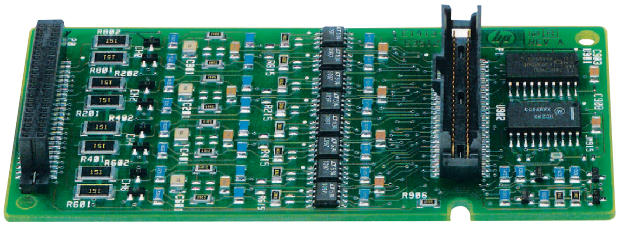
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8-Channel Low-Pass Filter SCP HP E1502A

Technical Specifications

- **Use with HP E1313A/E1413C/E1415A/E1419A**
- **Fixed, 2-pole low-pass 7 Hz filter**
- **± 16 V maximum sensor voltage with over-voltage protection**
- **Open transducer detection**



HP E1502A

Description

The HP E1502A 8-Channel Low-Pass Filter SCP provides eight fixed, 2-pole, low-pass filters with a 3 dB cutoff frequency of 7 Hz. It also provides input over-voltage protection and open transducer detection on each channel.

Measurement applications include voltage, temperature, resistance, and strain measurements and general measurements of voltage output sensors.

Use the HP E1502A with the following VXI modules:

Model	Description
HP E1313A	32-Channel Scanning A/D Converter
HP E1413C	64-Channel Scanning A/D Converter
HP E1415A	Algorithmic Closed Loop Controller
HP E1419A	Multifunction Measurement and Control Module

Refer to the HP Website for recent product updates, if applicable.

Voltage Measurements

The HP E1502A is ideal for measuring signals from sensors with full-scale voltage outputs from 62 mV to 16 V. The 2-pole, low pass filter reduces sensor-based noise in the measurement.

Temperature Measurements

The HP E1502A can be used to make temperature measurements with thermocouples, thermistors, or RTDs. The HP E1502A can directly read thermocouples, however, the HP E1503A/E1508A/E1509A SCPs provide higher resolution thermocouple measurements.

Temperature measurements with thermistors or RTDs require the HP E1505A 8-Channel Current Source SCP. Engineering units conversion to degrees C are made on-card at full speed.

Resistance Measurements

Resistance is measured using the HP E1505A 8-Channel Current Source SCP with the HP E1502A SCP. Measurements are made by applying a dc current to the resistance and measuring the voltage drop across the unknown. The current source is provided through the HP E1505A. The recommended application is as shown here using 4-wire Ω connections. Two-wire Ω measurement is possible but not recommended since two 150 Ω series resistors protecting the input FET multiplexer are included in the measurement.

Strain Measurements

The HP E1502A can be used to make strain measurements when combined with either of the HP E1506A/E1507A Strain Completion SCPs. However, the HP E1503A, E1508A and E1509A SCPs provide higher accuracy strain measurements. Refer to the HP E1506A/E1507A *Technical Specifications* for more information.

Product Specifications

These specifications for the HP E1502A reflect the combined performance of the scanning A/D and the HP E1502A SCP.

Measurement Ranges

DC Volts:	± 62.5 mV to ± 16 V Full Scale
Temperature:	
Thermocouples:	−200 to + 1700 °C
Thermistors: *	−80 to + 160 °C
RTD's: *	−200 to + 850 °C
Resistance: *	128 Ω to 131K Ω FS
Strain: **	25,000 με or limit of linear range of strain gage

*Requires HP E1505A.
**Requires HP E1506A/E1507A.

Input Characteristics

Maximum input voltage (normal mode plus common mode):	
Operating:	<± 16 V peak
Damage level:	>± 42 V peak
Maximum common mode voltage:	
Operating:	<± 16 V peak
Damage level:	>± 42 V peak
Input impedance:	Greater than 100 MΩ differential

Maximum Tare Cal Offset

Maximum tare offset depends on A/D range and SCP gain.

A/D Range ±V F. Scale	Maximum Offset
16	3.2213
4	.82101
1	.23061
0.25	.07581
0.0625	.03792

Measurement Accuracy DC Volts

If autoranging is ON, add ± .02% FS to accuracy specifications.
For HP E1313A, multiply noise specification by 1.4

A/D Range ±V F. Scale	Linearity % of Reading	Offset Error	Noise 3σ	Noise* 3σ
.0625	0.01%	7.2 μV	34 μV	15 μV
.25	0.01%	12.2 μV	60 μV	28 μV
1	0.01%	33 μV	110 μV	92 μV
4	0.01%	122 μV	450 μV	366 μV
16	0.01%	488 μV	1.8 mV	1.5 mV

*A/D filter ON (min sample period ≥145 μs: ≤100 Hz scan rate 64 ch).

Temperature Coefficients

	Temp Range	Tempco
Gain:		10 ppm/°C
Offset:	0-30 °C	No additional error
	30-40 °C	0.1 μV/°C
	40-55 °C	0.27 μV/°C + 2.4 μV

Normal Mode Rejection

10 Hz LP filter:	
10 Hz:	− 6 dB
50 Hz:	>− 23 dB
60 Hz:	>− 25 dB

Common Mode Rejection

0 to 60 Hz:	
Typical:	>− 108 dB
Minimum:	>− 100 dB

Temperature Measurement Accuracy

The thermocouple graphs following this description include the errors due to measuring the voltage output of the thermocouple, and the algorithm errors due to converting the thermocouple voltage to temperature or the Measurement/Conversion Error (MCE). To this error the Reference Junction Measurement Error (RJME) must be added due to measuring the reference junction temperature with an RTD or thermistor (this measurement requires an HP E1505A). Also, the Isothermal Reference Gradient Errors (IRGE) must be added due to gradients across the isothermal reference. If an external isothermal reference panel is used, consult the manufacturer's specifications. If HP terminal blocks are used as the isothermal reference, see the notes below.

Total Temperature Error = $[(MCE)^2 + (RJME)^2 + (IRGE)^2]^{1/2}$

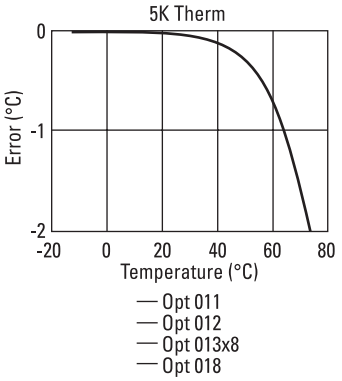
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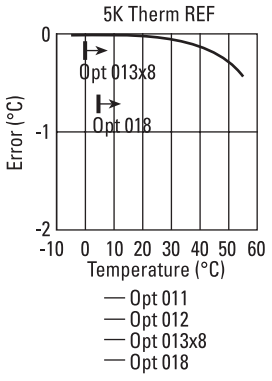
1) When using the Terminal Block as the isothermal reference, add ± 0.6 °C to the thermocouple accuracy specs to account for temperature gradients across the Terminal Block. The ambient temperature of the air surrounding the Terminal Block must be within ± 2 °C of the temperature of the inlet cooling air to the VXI mainframe.

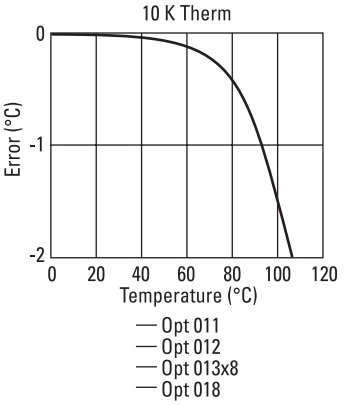
2) When using the HP E1586A Rack Mount Terminal Panel as the isothermal reference, add ± 0.2 °C to the thermocouple accuracy specs to account for temperature gradients across the HP E1586A. The HP E1586A should be mounted in the bottom part of the rack, below and away from other heat sources, for best performance.

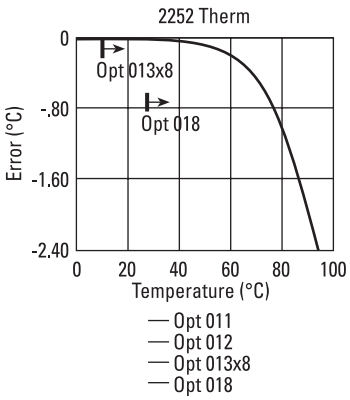
All specifications for the following were measured with the A/D filter off.

The following temperature accuracy graphs include instrument and firmware linearization errors. The linearization algorithm used is based on the ITS-90 transducer curves. Add your transducer accuracy to determine total measurement error.



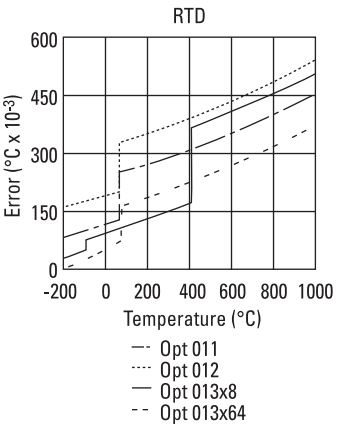




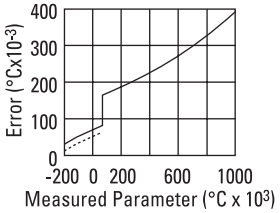


Conversion Chart

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Opt 012	=	HP E1502A
Opt 013	=	HP E1503A
Opt 014	=	HP E1504A
Opt 015	=	HP E1505A
Opt 016	=	HP E1506A
Opt 017	=	HP E1507A
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Opt 020	=	HP E1510A
Opt 021	=	HP E1511A

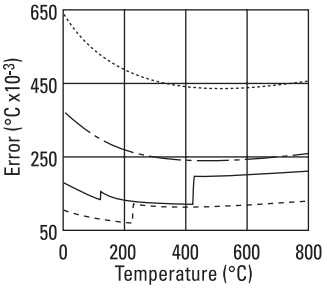


RTD



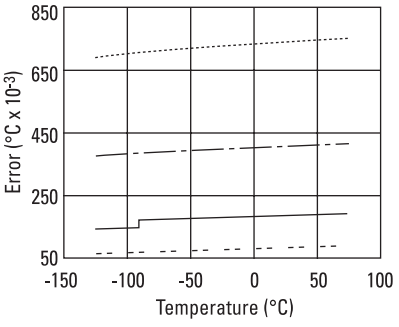
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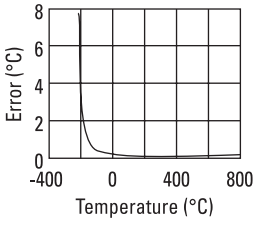
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— Opt 013x8
– – Opt 013x64

RTD REF



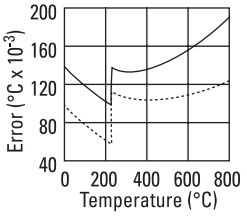
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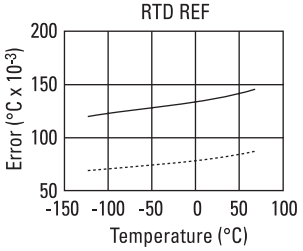
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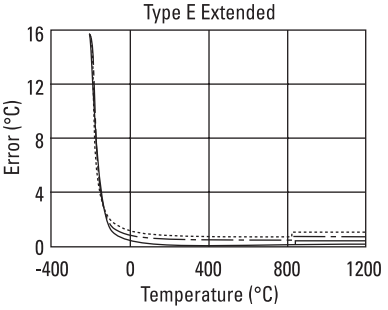
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RTD REF



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···· Opt 019

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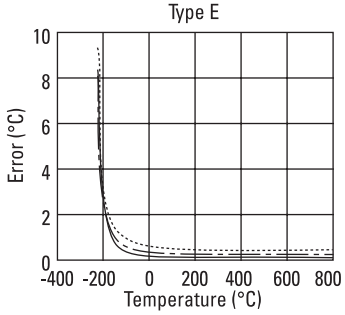


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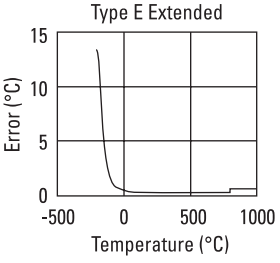
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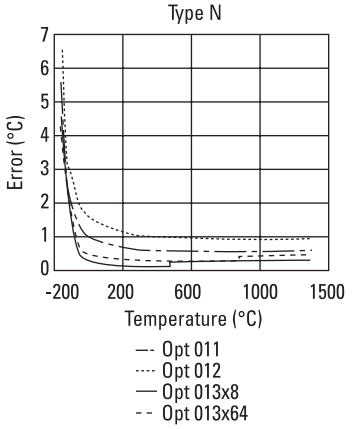
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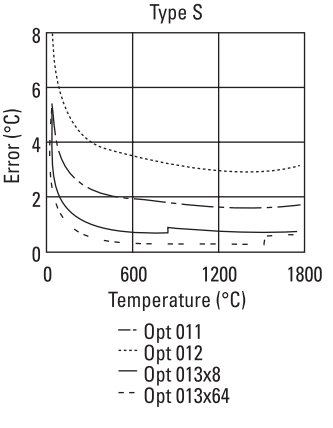


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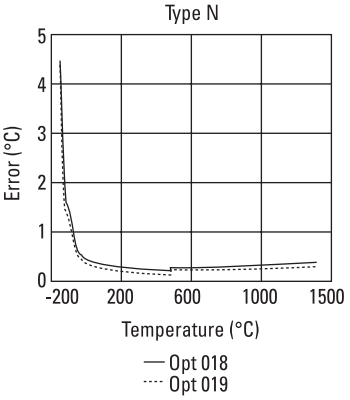
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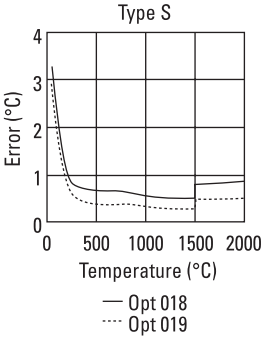
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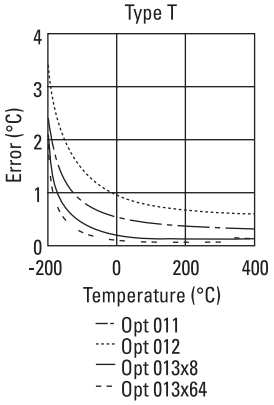
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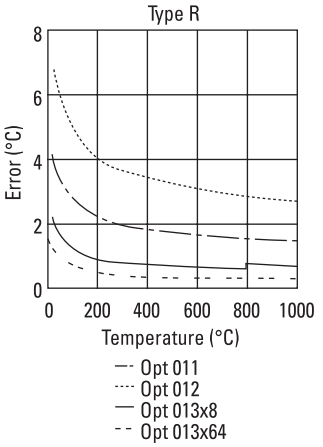
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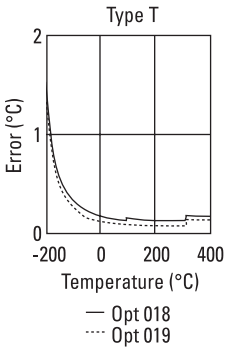
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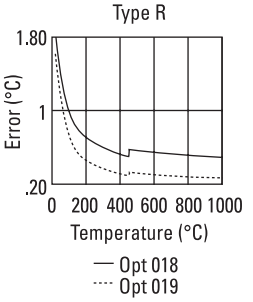
Conversion Chart

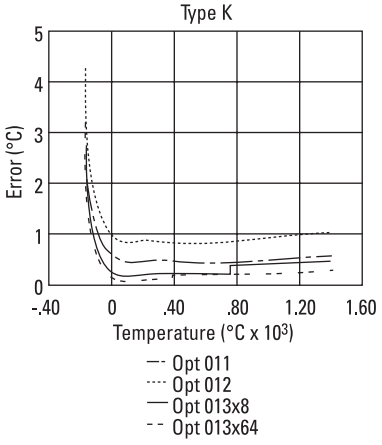
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Opt 012	=	HP E1502A
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Opt 015	=	HP E1505A
Opt 016	=	HP E1506A
Opt 017	=	HP E1507A
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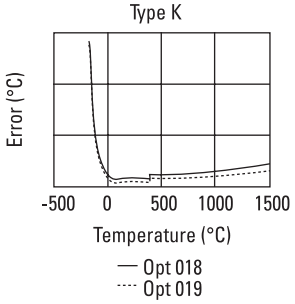
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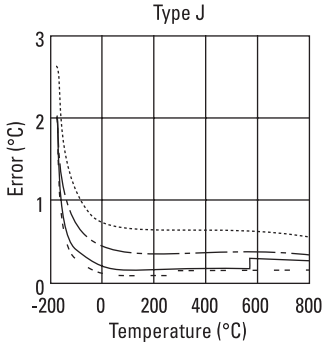


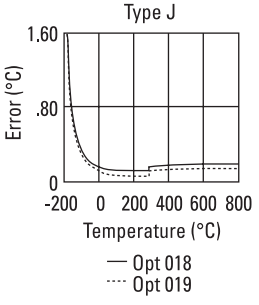
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Conversion Chart

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Opt 012	=	HP E1502A
Opt 013	=	HP E1503A
Opt 014	=	HP E1504A
Opt 015	=	HP E1505A
Opt 016	=	HP E1506A
Opt 017	=	HP E1507A
Opt 018	=	HP E1508A
Opt 019	=	HP E1509A
Opt 020	=	HP E1510A
Opt 021	=	HP E1511A

Current Requirements (Amps)

5 V typ	5 V max	24 V typ	24 V max	-24 V typ	024 V max
0.01	0.01	0.015	0.02	0.015	0.02

Ordering Information

Description	Product No.
8-Channel Low-Pass Filter SCP	HP E1502A

Related Literature

1998 Test System and VXI Products Data Book,
HP Pub. No. 5966-2812E

1999 Test System and VXI Products Catalog,
HP Pub. No. 5968-3698

Warranty

Standard Hewlett-Packard VXIbus hardware products are warranted against defects in materials and workmanship for a period of three years unless otherwise noted. HP software and firmware products that are designated by HP for use with a hardware product, when properly installed on that hardware product, are warranted not to fail to execute their programming instructions due to defects in materials and workmanship.

For a complete and detailed warranty statement please see the HP *Test System and VXI Products Data Book* or visit the HP Website at http://www.hp.com/go/vxi.

Website Directory

HP VXI Product Information
http://www.hp.com/go/vxi

HP VXI Channel Partners
http://www.hp.com/go/vxichanpart

HP VEE Application Website
http://www.hp.com/go/hpvee

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