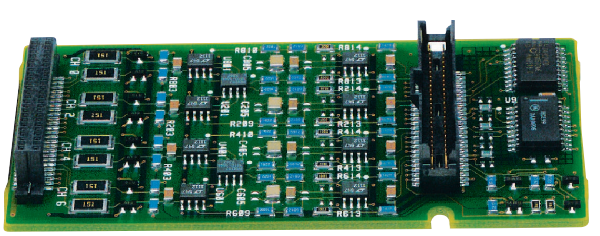
Agilent E1509A
8-Channel x64 Gain & 7 Hz Fixed Filter SCP

Data Sheet

- **Use with Agilent E1413C/E1415A/E1419A**
- **Fixed 7 Hz filter, x64 amplifier**
- **± 0.25 V input with over-voltage protection**
- **Open transducer detection**



Agilent E1509A

Description

The Agilent E1509A 8-Channel x64 Gain & 7 Hz Fixed Filter SCP provides eight fixed low-pass filters with a 3 dB cutoff frequency of 7 Hz and eight amplifiers with a gain of 64. It also provides input over-voltage protection and open transducer detection on each channel.

Use the E1509A with the following VXI modules:

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

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

Voltage Measurements

The E1509A is ideal for measuring signals from sensors with full-scale voltage outputs from 3.9 mV to 256 mV. The 2-pole, low-pass filter reduces sensor based noise in the measurement.

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Temperature Measurements

The E1509A can be used to make temperature measurements with thermocouples, thermistors, or RTDs.

Note: The 256 mV maximum voltage input is not high enough to measure the on-board thermistor reference temperature. A higher-voltage SCP must be used for this measurement.

Temperature measurements with thermistors or RTDs require the 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 E1505A 8–Channel Current Source SCP with the E1509A SCP. Measurements are made by applying a dc current to the unknown and measuring the voltage drop across the unknown. The current source is provided through the E1505A. The recommended application is as shown here using four-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 E1509A can be used to make strain measurements when combined with either the E1506A or E1507A Strain Completion SCPs. Refer to the E1506A/E1507A *Technical Specifications* for more information.

Product Specifications

These specifications for the E1509A reflect the combined performance of the scanning A/D and the E1509A SCP.

Measurement Ranges

DC Volts:	± 3.9 mV to ± 256 mV Full Scale
Temperature:	
Thermocouples:	–200 to + 1700 °C
Thermistors:*	–80 to + 160 °C
RTD's:*	–200 to + 850 °C
Resistance: **	128 Ω to 131 kΩ FS
Strain: **	25,000 με or limit of linear range of strain gage

* Requires Agilent E1505A.
** Requires Agilent 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
Common mode rejection:	
0 to 60 Hz:	–100 dB
Input impedance:	>100 MΩ differential

Maximum Tare Cal Offset

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

A/D Range ±V F. Scale	Maximum Offset
16	0.04970
4	0.01220
1	0.00297
0.25	0.00055
0.0625	n/a

Measurement Accuracy DC Volts

If autoranging is ON, add ± .02% FS to accuracy specifications.

Fixed Gain x64 Range ±V FS	Linearity % of Reading	Offset Error	Noise 3σ	Noise* 3σ
.0039	0.01%	2.3 μV	1.7 μV	1.4 μV
.0156	0.01%	2.4 μV	2.5 μV	2.2 μV
.0625	0.01%	3.0 μV	7.0 μV	5.7 μV
.256	0.01%	8.0 μV	28 μV	23 μV

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

Temperature Coefficients:

	Temp Range	Tempco
Gain:		15 ppm/°C
Offset:	0-30 °C	0.16 μV/°C
	30-40 °C	0.18 μV/°C
	40-55 °C	0.39 μV/°C

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 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 Agilent terminal blocks are used as the isothermal reference, see the notes below.

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

NOTES:

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.

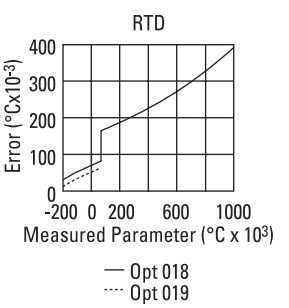
2) When using the Agilent E1586A Rack Mount Terminal Panel as the isothermal reference, add ± 0.2 °C to the thermocouple accuracy specs to account for temperature gradients across the E1586A. The E1586A should be mounted in the bottom part of the rack, below and away from other heat sources, for best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

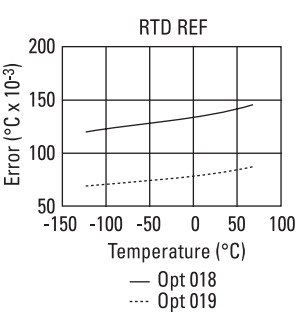
All specifications for the following were measured with the A/D filter off.

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

Opt 011	=	E1501A
Opt 012	=	E1502A
Opt 013	=	E1503A
Opt 015	=	E1505A
Opt 016	=	E1506A
Opt 017	=	E1507A
Opt 018	=	E1508A
Opt 019	=	E1509A
Opt 020	=	E1510A
Opt 021	=	E1511A





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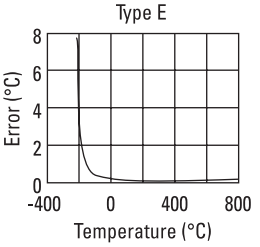

— Opt 018
— Opt 019

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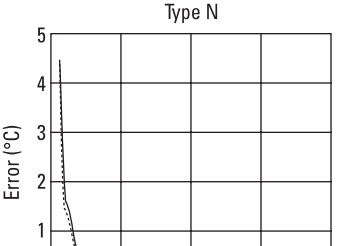

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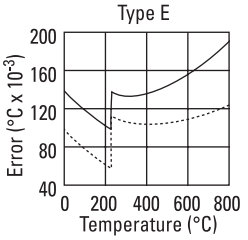

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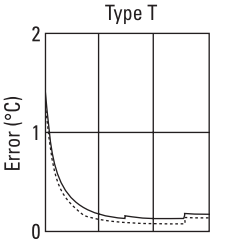

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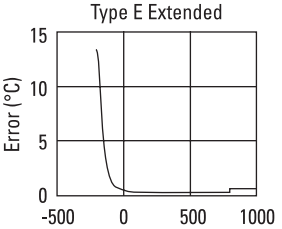

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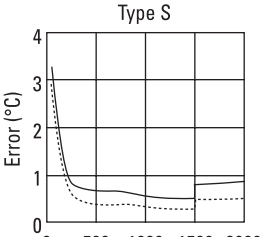

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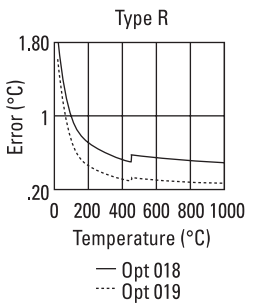

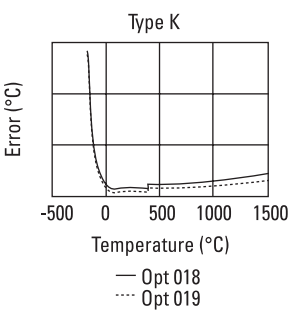

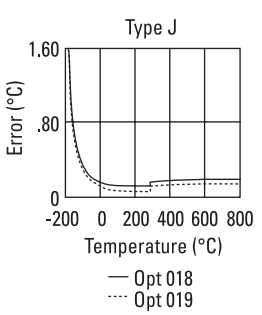

Current Requirements (Amps)

5 V max	24 V max	-24 V max
0.01	0.02	0.02

Ordering Information

Description	Product No.
8-Channel x64 Gain & 7 Hz fixed Filter SCP	E1509A

Related Literature

2000 Test System and VXI Catalog CD-ROM,
Agilent Pub. No. 5980-0308E (detailed specifications for VXI products)

2000 Test System and VXI Catalog,
Agilent Pub. No. 5980-0307E (overview of VXI products)

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

Online

Internet access for Agilent product information, services and support
www.agilent.com/find/tmdir

VXI product information
www.agilent.com/find/vxi

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