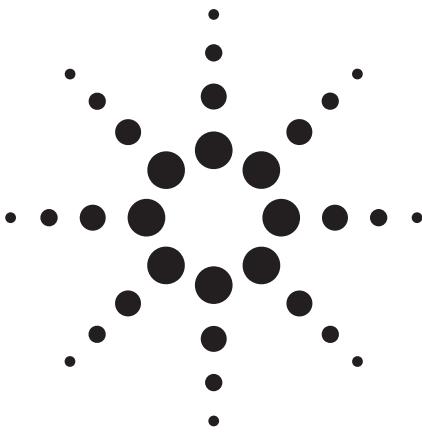


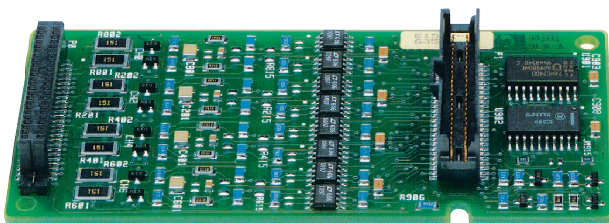


# Agilent E1512A

## 8-Channel 25 Hz Fixed Filter SCP

### Data Sheet

- Use with Agilent E1413C/E1415A/E1419A
- Fixed 25 Hz filter per channel
- $\pm 16$  V inputs with over-voltage protection
- Open transducer detection



Agilent E1512A

### Description

The Agilent E1512A 8-Channel 25 Hz Fixed Filter SCP provides eight fixed low-pass filters with a 3 dB cutoff frequency of 25 Hz. It also provides input over-voltage protection and open transducer detection on each channel.

Use the E1512A 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 E1512A 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 E1512A can be used to make temperature measurements with thermocouples, thermistors, or RTDs. The E1512A can directly read thermocouples, however, the E1503A/E1508A/E1509A SCPs provide higher accuracy thermocouple measurements.

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.



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## Resistance Measurements

Resistance is measured using the E1505A 8-Channel Current Source SCP with the E1512A 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  $\Omega$  connections. Two-wire  $\Omega$  measurement is possible but not recommended since two 150  $\Omega$  series resistors protecting the input FET multiplexer are included in the measurement.

## Strain Measurements

The E1512A 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.

## Temperature Measurement Accuracy

The thermocouple specifications 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.

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

### NOTES:

1) When using the Terminal Block as the isothermal reference, add  $\pm 0.6^\circ\text{C}$  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  $\pm 2^\circ\text{C}$  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  $\pm 0.2^\circ\text{C}$  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.

The following temperature accuracy specifications 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.

### Thermistors

#### 2252 $\Omega$

| A/D Filter: | 0 to 30 °C: | 30 to 70 °C: | 70 to 80 °C: | 80 to 100 °C: |
|-------------|-------------|--------------|--------------|---------------|
| OFF         | 0.012 °C    | 0.013 °C     | 0.014 °C     | 0.024 °C      |
| ON*         | 0.010 °C    | 0.012 °C     | 0.010 °C     | 0.014 °C      |

#### 5 k $\Omega$

| A/D Filter: | 0 to 30 °C: | 30 to 70 °C: | 70 to 85 °C: |
|-------------|-------------|--------------|--------------|
| OFF         | 0.014 °C    | 0.027 °C     | 0.048 °C     |
| ON*         | 0.011 °C    | 0.017 °C     | 0.027 °C     |

#### 5 k $\Omega$ Reference

| A/D Filter: | -10 to 65 °C: | 65 to 85 °C: |
|-------------|---------------|--------------|
| OFF         | 0.011 °C      | 0.021 °C     |
| ON*         | 0.0095 °C     | 0.0115 °C    |

#### 10 k $\Omega$

| A/D Filter: | 0 to 30 °C: | 30 to 60 °C: | 60 to 90 °C: | 90 to 115 °C: |
|-------------|-------------|--------------|--------------|---------------|
| OFF         | 0.015 °C    | 0.024 °C     | 0.034 °C     | 0.059 °C      |
| ON*         | 0.013 °C    | 0.016 °C     | 0.021 °C     | 0.032 °C      |

### RTDs

#### 100 $\Omega$

| A/D Filter: | -200 to 75 °C: | 75 to 300 °C: | 300 to 600 °C: | 600 to 970 °C: |
|-------------|----------------|---------------|----------------|----------------|
| OFF         | 0.19 °C        | 0.37 °C       | 0.43 °C        | 0.53 °C        |
| ON*         | 0.11 °C        | 0.21 °C       | 0.36 °C        | 0.46 °C        |

#### 100 $\Omega$ Reference

| A/D Filter: | -125 to 75 °C: |
|-------------|----------------|
| OFF         | 0.75 °C        |
| ON*         | 0.36 °C        |

### Thermocouples

#### Type E

| A/D Filter: | -200 to 0 °C: | 0 to 200 °C: | 200 to 400 °C: | 400 to 800 °C: |
|-------------|---------------|--------------|----------------|----------------|
| OFF         | 2.25 °C       | 0.65 °C      | 0.50 °C        | 0.45 °C        |
| ON*         | 1.65 °C       | 0.34 °C      | 0.24 °C        | 0.23 °C        |

#### Type E Extended

| A/D Filter: | -200 to 0 °C: | 0 to 200 °C: | 200 to 600 °C: | 600 to 800 °C: |
|-------------|---------------|--------------|----------------|----------------|
| OFF         | 14.7 °C       | 0.80 °C      | 0.50 °C        | 0.80 °C        |
| ON*         | 13.8 °C       | 0.49 °C      | 0.30 °C        | 0.45 °C        |

**Type T**

| A/D Filter: | –200 to –100 °C: | –100 to 0 °C: | 0 to 200 °C: | 200 to 400 °C: |
|-------------|------------------|---------------|--------------|----------------|
| OFF         | 3.40 °C          | 1.90 °C       | 0.90 °C      | 0.70 °C        |
| ON*         | 2.25 °C          | 0.78 °C       | 0.46 °C      | 0.33 °C        |

**Type S**

| A/D Filter: | 0 to 100 °C: | 100 to 200 °C: | 200 to 800 °C: | 800 to 1750 °C: |
|-------------|--------------|----------------|----------------|-----------------|
| OFF         | 8.00 °C      | 5.60 °C        | 4.45 °C        | 3.30 °C         |
| ON*         | 5.20 °C      | 3.25 °C        | 2.40 °C        | 1.60 °C         |

**Type R**

| A/D Filter: | 0 to 100 °C: | 100 to 200 °C: | 200 to 600 °C: | 600 to 1000 °C: |
|-------------|--------------|----------------|----------------|-----------------|
| OFF         | 6.90 °C      | 5.00 °C        | 4.00 °C        | 3.10 °C         |
| ON*         | 3.80 °C      | 2.60 °C        | 1.95 °C        | 1.70 °C         |

**Type K**

| A/D Filter: | –200 to 0 °C: | 0 to 400 °C: | 400 to 800 °C: | 800 to 1400 °C: |
|-------------|---------------|--------------|----------------|-----------------|
| OFF         | 4.30 °C       | 0.90 °C      | 0.85 °C        | 1.10 °C         |
| ON*         | 3.35 °C       | 0.50 °C      | 0.40 °C        | 0.52 °C         |

**Type J**

| A/D Filter: | –200 to 0 °C: | 0 to 200 °C: | 200 to 600 °C: | 600 to 775 °C: |
|-------------|---------------|--------------|----------------|----------------|
| OFF         | 2.65 °C       | 0.75 °C      | 0.63 °C        | 0.63 °C        |
| ON*         | 2.00 °C       | 0.38 °C      | 0.32 °C        | 0.32 °C        |

## Product Specifications

These specifications for the E1512A reflect the combined performance of the scanning A/D and the E1512A SCP.

### Measurement Ranges

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

\* Requires Agilent E1505A.

\*\* Requires Agilent E1506A/E1507A.

### Input Characteristics

|                                                              |                      |
|--------------------------------------------------------------|----------------------|
| <b>Maximum input voltage (normal mode plus common mode):</b> |                      |
| <b>Operating</b>                                             | <± 16 V peak         |
| <b>Damage level:</b>                                         | >± 42 V peak         |
| <b>Maximum common mode voltage:</b>                          |                      |
| <b>Operating:</b>                                            | <± 16 V peak         |
| <b>Damage level:</b>                                         | >± 42 V peak         |
| <b>Common mode rejection:</b>                                |                      |
| <b>0 to 60 Hz:</b>                                           | –100 dB              |
| <b>Input impedance:</b>                                      | >100 MΩ differential |

| Maximum Tare Cal Offset                                    |                |
|------------------------------------------------------------|----------------|
| Maximum tare cal offset depends on A/D range and SCP gain. |                |
| A/D Range $\pm$ 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 $\pm .02\%$ FS to accuracy specifications. |                        |              |                 |                  |
| A/D Range $\pm$ V F. Scale                                           | Linearity % of Reading | Offset Error | Noise $3\sigma$ | Noise* $3\sigma$ |
| .0625                                                                | 0.01%                  | 7.2 $\mu$ V  | 34 $\mu$ V      | 15 $\mu$ V       |
| .25                                                                  | 0.01%                  | 12.2 $\mu$ V | 60 $\mu$ V      | 28 $\mu$ V       |
| 1                                                                    | 0.01%                  | 33 $\mu$ V   | 110 $\mu$ V     | 92 $\mu$ V       |
| 4                                                                    | 0.01%                  | 122 $\mu$ V  | 450 $\mu$ V     | 366 $\mu$ V      |
| 16                                                                   | 0.01%                  | 488 $\mu$ V  | 1.8 $\mu$ V     | 1.5 $\mu$ V      |

\*A/D filter ON (min sample period  $\geq 145 \mu$ s:  $\leq 100$  Hz scan rate 64 ch).

| Temperature Coefficients: |                    |                                          |
|---------------------------|--------------------|------------------------------------------|
|                           | Temp Range         | Tempco                                   |
| Gain:                     |                    | 10 ppm/ $^{\circ}$ C                     |
| Offset:                   | 0-30 $^{\circ}$ C  | No additional error                      |
|                           | 30-40 $^{\circ}$ C | 0.1 $\mu$ V/ $^{\circ}$ C                |
|                           | 40-55 $^{\circ}$ C | 2.4 $\mu$ V + 0.27 $\mu$ V/ $^{\circ}$ C |

| Normal Mode Rejection |           |
|-----------------------|-----------|
| 25 Hz LP filter:      |           |
| 25 Hz:                | -3 dB     |
| 60 Hz:                | $>-20$ dB |

| Common Mode Rejection |           |
|-----------------------|-----------|
| 0 to 60 Hz:           |           |
| Typical:              | $>108$ dB |
| Minimum:              | $>100$ dB |

| 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 25 Hz Fixed Filter SCP | E1512A      |

## 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](http://www.agilent.com/find/tmdir)

VXI product information  
[www.agilent.com/find/vxi](http://www.agilent.com/find/vxi)

Defense Electronics Applications  
[www.agilent.com/find/defense\\_ATE](http://www.agilent.com/find/defense_ATE)

Agilent Technologies VXI Channel Partners  
[www.agilent.com/find/vxichanpart](http://www.agilent.com/find/vxichanpart)

Agilent Technologies' HP VEE Application Website  
[www.agilent.com/find/vee](http://www.agilent.com/find/vee)

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United States:  
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Europe:  
Agilent Technologies  
Test & Measurement  
European Marketing Organisation  
(tel) (31 20) 547 2000

Japan:  
Agilent Technologies Japan Ltd.  
(tel) (81) 426 56 7832  
(fax) (81) 426 56 7840

Latin America:  
Agilent Technologies  
Latin American Region Headquarters, U.S.A.  
(tel) (305) 267 4245  
(fax) (305) 267 4286

Australia/New Zealand:  
Agilent Technologies Australia Pty Ltd.  
(tel) 1 800 629 485 (Australia)  
(fax) (61 3) 9272 0749  
(tel) 0 800 738 378 (New Zealand)  
(fax) (64 4) 802 6881

Asia Pacific:  
Agilent Technologies, Hong Kong  
(tel) (852) 3197-7777  
(fax) (852) 2506-9284

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