

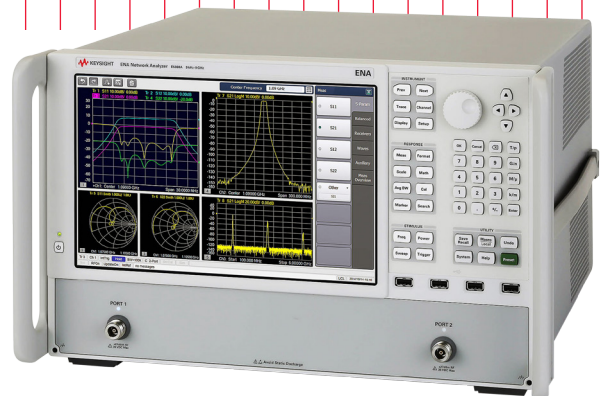
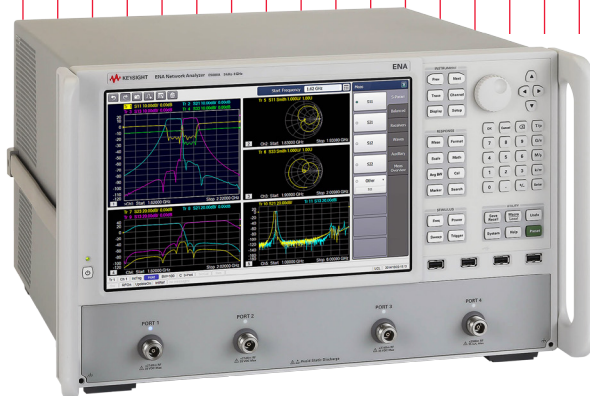
Keysight Technologies

E5080A ENA Series Network Analyzer

- 9 kHz to 4.5/6.5/9 GHz

E5092A Configurable Multiport Test Set

Data Sheet



Unlocking Measurement Insights

Options

This document provides technical specifications for the E5080A ENA network analyzer.

| | |
|------------|---|
| E5080A-245 | 2-port test set, 9 kHz to 4.5 GHz, with bias tees |
| E5080A-265 | 2-port test set, 9 kHz to 6.5 GHz, with bias tees |
| E5080A-295 | 2-port test set, 9 kHz to 9 GHz, with bias tees |
| E5080A-445 | 4-port test set, 9 kHz to 4.5 GHz, with bias tees |
| E5080A-465 | 4-port test set, 9 kHz to 6.5 GHz, with bias tees |
| E5080A-495 | 4-port test set, 9 kHz to 9 GHz, with bias tees |

Calibration kits and ECal modules

This E5080A data sheet also provides technical specifications for the following calibration kits and ECal modules. For models not listed in this data sheet, please download the free Uncertainty Calculator from http://www.keysight.com/find/na_calculator to generate the curves for your calibration kit and enable ENA setup.

| | |
|--------|--------------------------------------|
| 85032F | Calibration kit |
| 85033E | Calibration kit |
| 85092C | Electronic calibration (ECal) module |
| 85093C | Electronic calibration (ECal) module |

Definitions

Specification (spec.):

Warranted performance. All specifications apply at 25 °C (± 5 °C), unless otherwise stated, and 90 minutes after the instrument has been turned on. Specifications include guard bands to account for the expected statistical performance distribution, measurement uncertainties, and changes in performance due to environmental conditions.

Typical (typ.):

Expected performance of an average unit which does not include guardbands. It is not covered by the product warranty.

General characteristics:

A general, descriptive term that does not imply a level of performance.

Corrected System Performance

The specifications in this section apply to measurements made with the Keysight E5080A network analyzer under the following conditions:

- No averaging applied to data
- Environmental temperature of 23 °C (± 3 °C) with less than 1 °C deviation from the calibration temperature
- Response and isolation calibration performed

System dynamic range¹

| | Specification (10 Hz IFBW) | Typical (3 Hz IFBW) |
|-----------------|----------------------------|---------------------|
| 9 k to 100 kHz | 120 dB | 137 dB |
| 100 k to 50 MHz | 129 dB | 146 dB |
| 50 M to 6 GHz | 135 dB | 152 dB |
| 6 G to 8.5 GHz | 132 dB | 145 dB |
| 8.5 G to 9 GHz | 120 dB | 135 dB |



System dynamic range (specification and actual measurement data example)

1. The test port dynamic range is calculated as the difference between the test port rms noise floor and the source maximum output power. The effective dynamic range must take measurement uncertainty and interfering signals into account.

Corrected System Performance with Calibration Kit

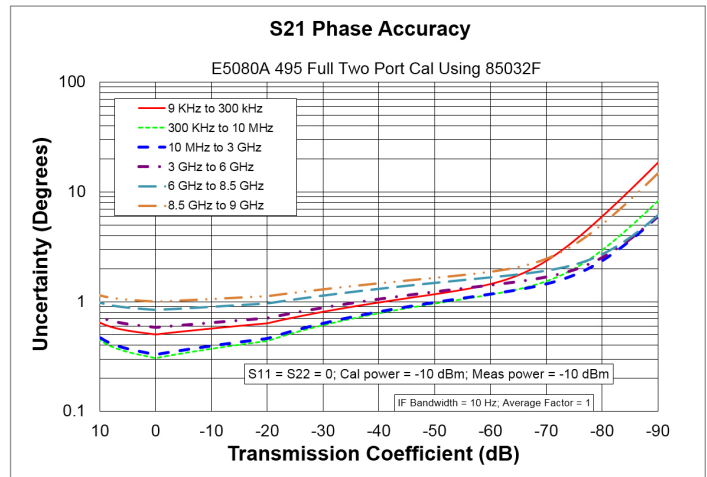
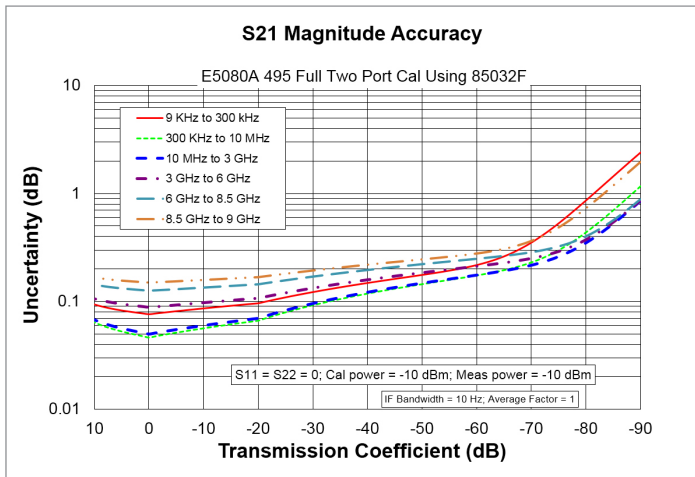
Corrected system performance with type-N device connectors, 85032F calibration kit

Network analyzer : E5080A
 Calibration kit : 85032F (Type-N, 50 Ω)
 Calibration : full 2-port

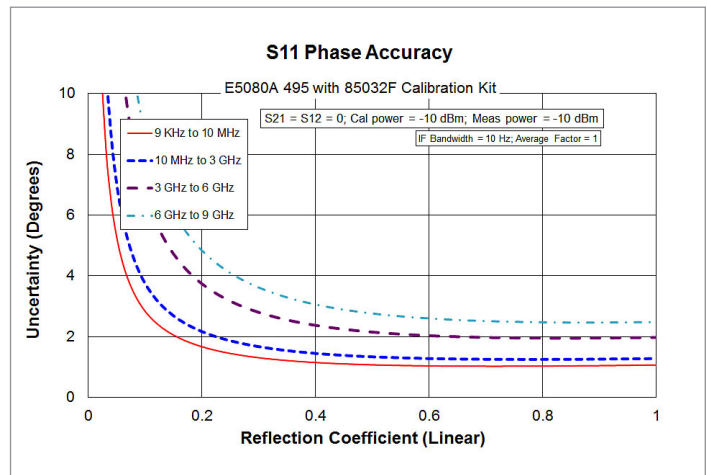
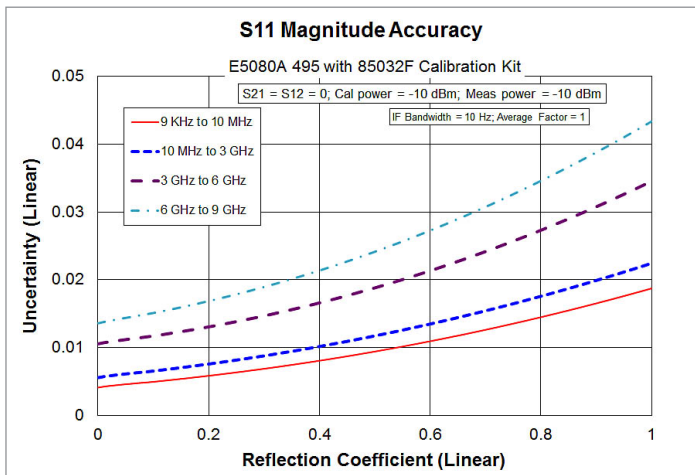
IF bandwidth = 10 Hz, no averaging applied to data, environmental temperature = 23 °C (± 3 °C) with < 1 °C deviation from calibration temperature, isolation calibration performed

| Description | Specification | | | | | |
|-----------------------|----------------|-----------------|---------------|--------------|----------------|----------------|
| | 9 k to 300 kHz | 300 k to 10 MHz | 10 M to 3 GHz | 3 G to 6 GHz | 6 G to 8.5 GHz | 8.5 G to 9 GHz |
| Directivity | 49 | 49 | 46 | 40 | 38 | 38 |
| Source match | 41 | 41 | 40 | 36 | 35 | 35 |
| Load match | 48 | 49 | 46 | 40 | 37 | 36 |
| Reflection tracking | ± 0.011 | ± 0.011 | ± 0.021 | ± 0.032 | ± 0.054 | ± 0.054 |
| Transmission tracking | ± 0.045 | ± 0.015 | ± 0.018 | ± 0.056 | ± 0.088 | ± 0.113 |

Transmission uncertainty (Specification)



Reflection uncertainty (Specification)



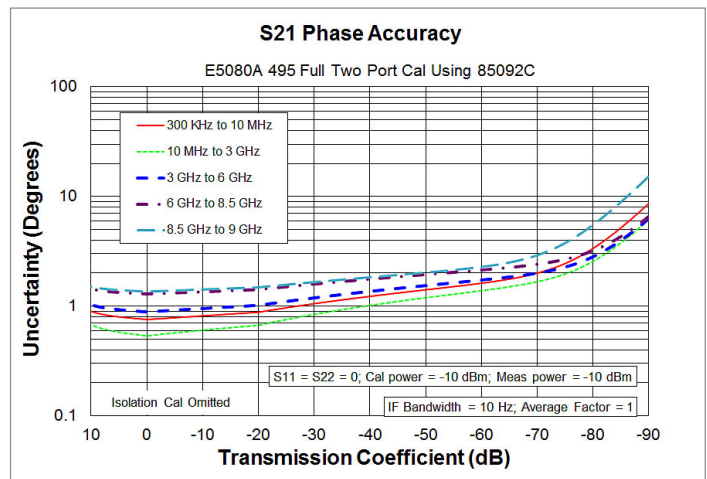
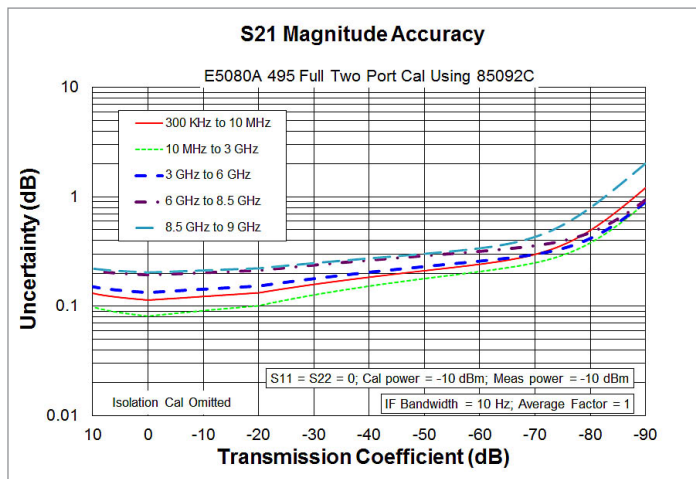
Corrected system performance with type-N device connectors, 85092C electronic calibration (ECal) module

Network analyzer : E5080A
 Calibration kit : 85092C (Type-N, 50 Ω) Electronic calibration (ECal) module
 Calibration : full 2-port

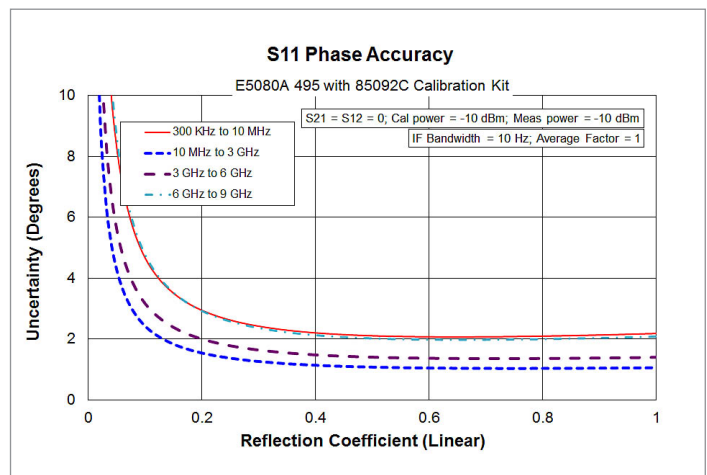
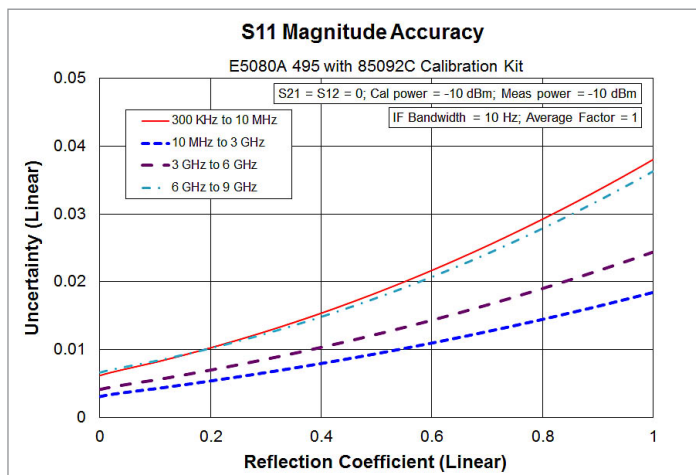
IF bandwidth = 10 Hz, no averaging applied to data, environmental temperature = 23 °C (± 3 °C) with < 1 °C deviation from calibration temperature , isolation calibration is not performed

| Description | Specification | | | | |
|-----------------------|----------------|-----------------|---------------|--------------|----------------|
| | 9 k to 300 kHz | 300 k to 10 MHz | 10 M to 3 GHz | 3 G to 6 GHz | 6 G to 8.5 GHz |
| Directivity | 45 | 52 | 49 | 45 | 45 |
| Source match | 36 | 44 | 41 | 36 | 36 |
| Load match | 37 | 47 | 44 | 38 | 38 |
| Reflection tracking | ± 0.1 | ± 0.04 | ± 0.06 | ± 0.07 | ± 0.07 |
| Transmission tracking | ± 0.082 | ± 0.028 | ± 0.053 | ± 0.157 | ± 0.167 |

Transmission uncertainty (Specification)



Reflection uncertainty (Specification)



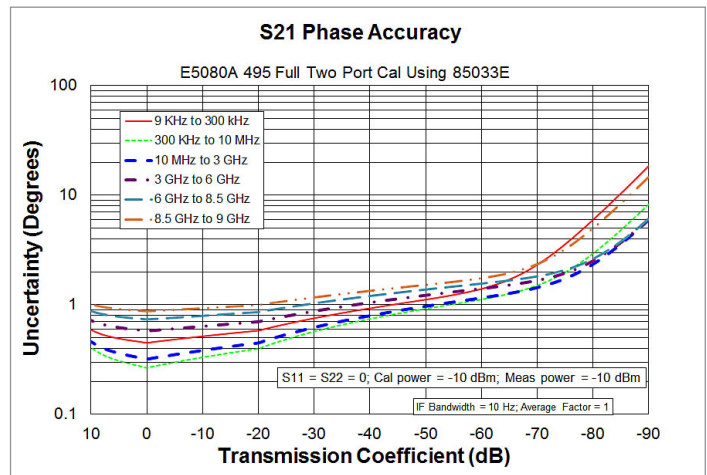
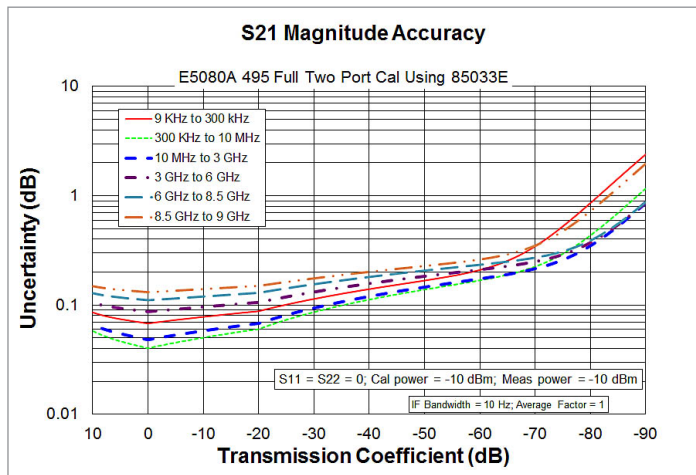
Corrected system performance with 3.5 mm device connector type, 85033E calibration kit

Network analyzer : E5080A
 Calibration kit : 85033E (3.5 mm, 50 Ω)
 Calibration : full 2-port

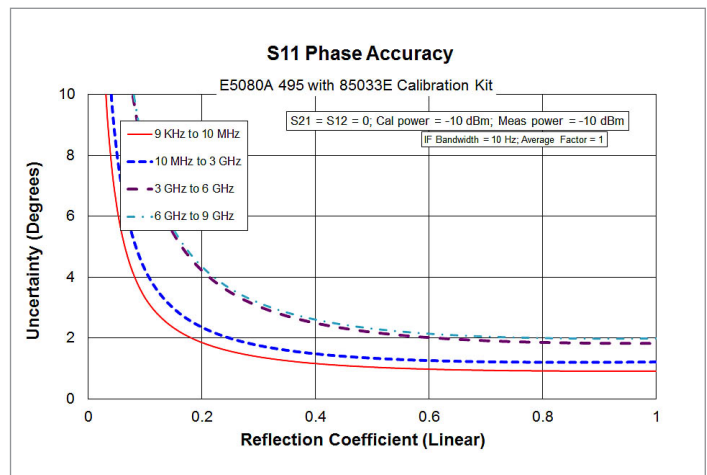
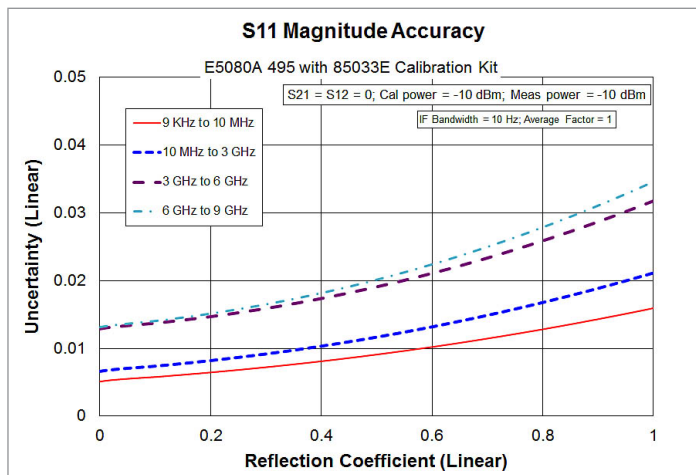
IF bandwidth = 10 Hz, no averaging applied to data, environmental temperature = 23 °C (± 3 °C) with < 1 °C deviation from calibration temperature, isolation calibration performed

| Description | Specification | | | | | |
|-----------------------|----------------|-----------------|---------------|--------------|----------------|----------------|
| | 9 k to 300 kHz | 300 k to 10 MHz | 10 M to 3 GHz | 3 G to 6 GHz | 6 G to 8.5 GHz | 8.5 G to 9 GHz |
| Directivity | 46 | 46 | 44 | 38 | 38 | 38 |
| Source match | 43 | 43 | 40 | 37 | 36 | 36 |
| Load match | 46 | 46 | 44 | 38 | 38 | 38 |
| Reflection tracking | ± 0.006 | ± 0.006 | ± 0.007 | ± 0.009 | ± 0.010 | ± 0.010 |
| Transmission tracking | ± 0.043 | ± 0.015 | ± 0.020 | ± 0.058 | ± 0.079 | ± 0.099 |

Transmission uncertainty (Specification)



Reflection uncertainty (Specification)



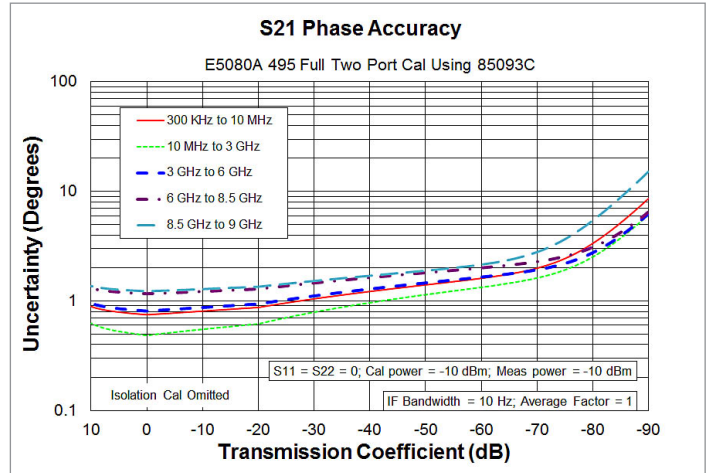
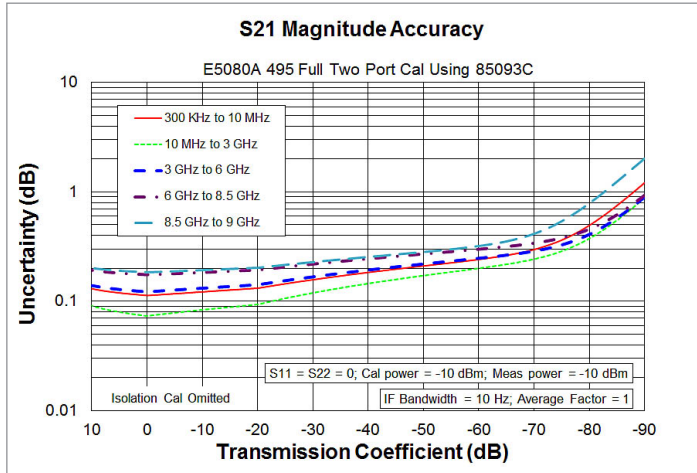
Corrected system performance with 3.5 mm device connector type, 85093C electronic calibration (ECal) module

Network analyzer : E5080A
 Calibration kit : 85093C (3.5 mm, 50 Ω) Electronic calibration (ECal) module
 Calibration : full 2-port

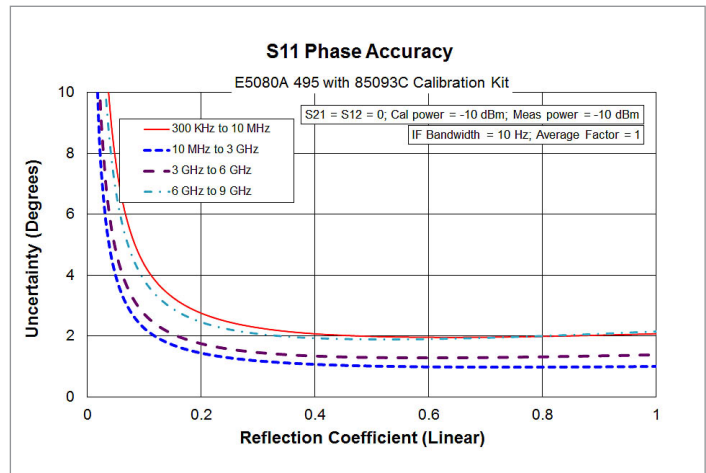
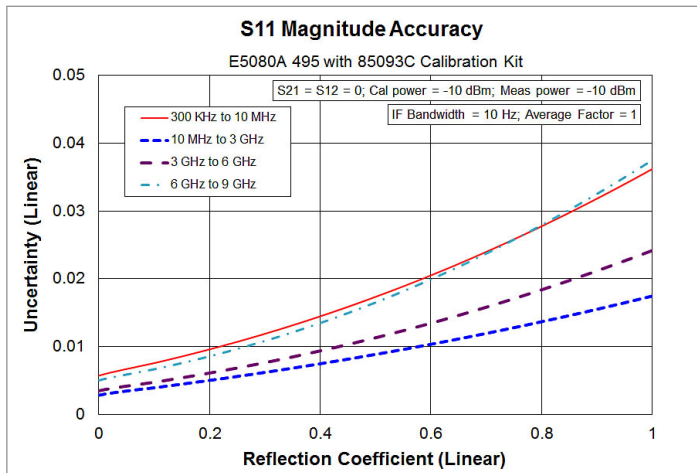
IF bandwidth = 10 Hz, no averaging applied to data, environmental temperature = 23 °C (± 3 °C) with < 1 °C deviation from calibration temperature , isolation calibration is not performed

| Description | Specification | | | | |
|-----------------------|-----------------|---------------|--------------|----------------|----------------|
| | 300 k to 10 MHz | 10 M to 3 GHz | 3 G to 6 GHz | 6 G to 8.5 GHz | 8.5 G to 9 GHz |
| Directivity | 45 | 52 | 50 | 47 | 47 |
| Source match | 36 | 44 | 39 | 34 | 34 |
| Load match | 37 | 47 | 44 | 40 | 39 |
| Reflection tracking | ± 0.1 | ± 0.04 | ± 0.05 | ± 0.07 | ± 0.07 |
| Transmission tracking | ± 0.086 | ± 0.025 | ± 0.049 | ± 0.143 | ± 0.152 |

Transmission uncertainty (Specification)



Reflection uncertainty (Specification)



Uncorrected System Performance

User correction: OFF, system error correction: ON

| Description | Specification | | | | | |
|--------------|---------------|-----------------|----------------|--------------|----------------|----------------|
| | 9 k to 50 kHz | 50 k to 300 kHz | 300 k to 3 GHz | 3 G to 6 GHz | 6 G to 8.5 GHz | 8.5 G to 9 GHz |
| Directivity | 20 | 20 | 25 | 20 | 15 | 15 |
| Source match | 20 | 20 | 25 | 20 | 15 | 15 |
| Load match | 8 | 12 | 17 | 12 | 10 | 8 |

| Description | Typical | | | | | |
|-----------------------|---------------|-----------------|----------------|--------------|----------------|----------------|
| | 9 k to 50 kHz | 50 k to 300 kHz | 300 k to 3 GHz | 3 G to 6 GHz | 6 G to 8.5 GHz | 8.5 G to 9 GHz |
| Directivity | 40 | 40 | 40 | 35 | 35 | 35 |
| Source match | 40 | 40 | 40 | 35 | 35 | 35 |
| Load match | 12 | 18 | 20 | 20 | 16 | 14 |
| Transmission tracking | ± 0.1 | ± 0.1 | ± 0.1 | ± 0.1 | ± 0.2 | ± 0.2 |
| Reflection tracking | ± 0.1 | ± 0.1 | ± 0.1 | ± 0.1 | ± 0.2 | ± 0.2 |

| Description | Typical | | | | |
|-------------|----------------|-----------------|---------------|----------------|----------------|
| | 9 k to 100 kHz | 100 k to 50 MHz | 50 M to 6 GHz | 6 G to 8.5 GHz | 8.5 G to 9 GHz |
| Crosstalk | 132 | 141 | 147 | 140 | 130 |

Test Port Output (Source)

Test port output frequency

| Description | Specification | Typical |
|-------------------------|---------------------|---|
| Frequency range | | |
| Option 245, 445 | 9 k to 4.5 GHz | |
| Option 265, 465 | 9 k to 6.5 GHz | |
| Option 295, 495 | 9 k to 9 GHz | |
| Resolution | 1 Hz | |
| CW accuracy | | |
| Standard | ± 7 ppm (23 ± 3 °C) | ± 3.0 ppm (25 ± 5 °C) |
| Option 1E5 | ± 0.45 ppm | |
| Source stability | | |
| Standard | | ± 7 ppm (0 to 40 °C) |
| Option 1E5 | | ± 0.05 ppm (0 to 40 °C) ± 0.4 ppm/year |

Test port output power¹

| Description | Specification | Typical |
|-------------------------------------|---------------|----------------|
| Nominal power (preset power) | 0 dBm | |
| Range | | |
| 9 k to 100 kHz | -90 to 10 dBm | -110 to 12 dBm |
| 100 k to 50 MHz | -90 to 12 dBm | -110 to 14 dBm |
| 50 M to 6 GHz | -90 to 15 dBm | -110 to 17 dBm |
| 6 G to 8.5 GHz | -90 to 12 dBm | -110 to 14 dBm |
| 8.5 G to 9 GHz | -90 to 8 dBm | -110 to 12 dBm |
| Max leveled power | | |
| 9 k to 100 kHz | 10 dBm | 12 dBm |
| 100 k to 50 MHz | 12 dBm | 14 dBm |
| 50 M to 6 GHz | 15 dBm | 17 dBm |
| 6 G to 8.5 GHz | 12 dBm | 14 dBm |
| 8.5 G to 9 GHz | 8 dBm | 12 dBm |
| Resolution | 0.01 dB | |
| Level accuracy² | | |
| Sweep type: stepped | | |
| 9 k to 50 kHz | ± 2.0 dB | |
| 50 k to 9 GHz | ± 1.5 dB | |
| Sweep type: auto | | |
| 9 k to 9 GHz | | ± 2.0 dB |
| Level linearity | | |
| -20 dBm to maximum power | | |
| Sweep type: stepped | ± 0.75 dB | |
| Sweep type: auto | | ± 1.0 dB |
| -110 dBm to -20 dBm | | ± 1.0 dB |
| Power sweep range | | |
| 9 k to 100 kHz | -90 to 10 dBm | |
| 100 k to 50 MHz | -90 to 12 dBm | |
| 50 M to 6GHz | -90 to 15 dBm | |
| 6 G to 8.5 GHz | -90 to 12 dBm | |
| 8.5 G to 9 GHz | -90 to 8 dBm | |

Test port output signal purity

| Description | Specification | Typical |
|---|---------------|-----------|
| Harmonics (2nd or 3rd) (at 0 dBm) | | |
| 9 k to 2 GHz | | < -25 dBc |
| 2 G to 9 GHz | | < -20 dBc |
| Non-harmonic spurious (at 0 dBm) | | < -30 dBc |

1. Source output performance on all ports.
2. Power calibration using an external power meter improves level accuracy of the test port output power.
3. Level linearity given is relative to 0 dBm.

Test Port Input

| Description | Specification | Typical |
|---|---------------|-------------------------|
| Damage Level | | +27 dBm or \pm 35 VDC |
| Test port noise floor¹ | | |
| 9 k to 100 kHz | -120 dBm/Hz | -130 dBm/Hz |
| 100 k to 50 MHz | -127 dBm/Hz | -137 dBm/Hz |
| 50 M to 6 GHz | -130 dBm/Hz | -140 dBm/Hz |
| 6 G to 8.5 GHz | -130 dBm/Hz | -136 dBm/Hz |
| 8.5 G to 9 GHz | -122 dBm/Hz | -128 dBm/Hz |
| Compression level (@+10dBm input) | | |
| Magnitude | | |
| 9 k to 6 GHz | 0.207 dB | 0.04 dB |
| 6 G to 9 GHz | 0.207 dB | 0.08 dB |
| Phase | | |
| 9 k to 6 GHz | 0.503 deg | 0.3 deg |
| 6 G to 9 GHz | 0.503 deg | 0.6 deg |
| 0.1 dB compression input level | | |
| 9 k to 100 k | | 10 dBm |
| 100 k to 50 MHz | | 12 dBm |
| 50 M to 6 GHz | | 15 dBm |
| 6 G to 8.5 GHz | | 12 dBm |
| 8.5 G to 9 GHz | | 10 dBm |

1. FOM is off.

Trace noise

| Description | Specification | Typical |
|--|---------------|--------------|
| (test port input level = maximum power in Specification) | | |
| Magnitude | | |
| (Transmission) | | |
| 9 k to 30 kHz, 1 kHz IFBW | 0.003 dBrms | 0.001 dBrms |
| 30 k to 10 MHz, 1 kHz IFBW | 0.0015 dBrms | 0.0005 dBrms |
| 10 M to 6 GHz, 10 kHz IFBW | 0.0015 dBrms | 0.0005 dBrms |
| 6 G to 9 GHz, 10 kHz IFBW | 0.002 dBrms | 0.0006 dBrms |
| (Reflection) | | |
| 9 k to 30 kHz, 1 kHz IFBW | 0.004 dBrms | 0.002 dBrms |
| 30 k to 10 MHz, 1 kHz IFBW | 0.003 dBrms | 0.001 dBrms |
| 10 M to 1.5 GHz, 10 kHz IFBW | 0.003 dBrms | 0.001 dBrms |
| 1.5 G to 6 GHz, 10 kHz IFBW | 0.0015 dBrms | 0.0005 dBrms |
| 6 GHz to 9 GHz, 10 kHz IFBW | 0.002 dBrms | 0.0006 dBrms |
| Phase | | |
| (Transmission) | | |
| 9 k to 30 kHz, 1 kHz IFBW | 0.03 degrms | 0.015 degrms |
| 30 k to 100 kHz, 1 kHz IFBW | 0.02 degrms | 0.008 degrms |
| 100 k to 10 MHz, 1 kHz IFBW | 0.01 degrms | 0.003 degrms |
| 10 M to 6 GHz, 10 kHz IFBW | 0.01 degrms | 0.003 degrms |
| 6 GHz to 9 GHz, 10 kHz IFBW | 0.02 degrms | 0.006 degrms |
| (Reflection) | | |
| 9 k to 30 kHz, 1 kHz IFBW | 0.06 degrms | 0.02 degrms |
| 30 k to 100 kHz, 1 kHz IFBW | 0.035 degrms | 0.01 degrms |
| 100 k to 10 MHz, 1 kHz IFBW | 0.02 degrms | 0.005 degrms |
| 10 M to 1.5 GHz, 10 kHz IFBW | 0.02 degrms | 0.005 degrms |
| 1.5 G to 6 GHz, 10 kHz IFBW | 0.01 degrms | 0.003 degrms |
| 6 GHz to 9 GHz, 10 kHz IFBW | 0.02 degrms | 0.006 degrms |

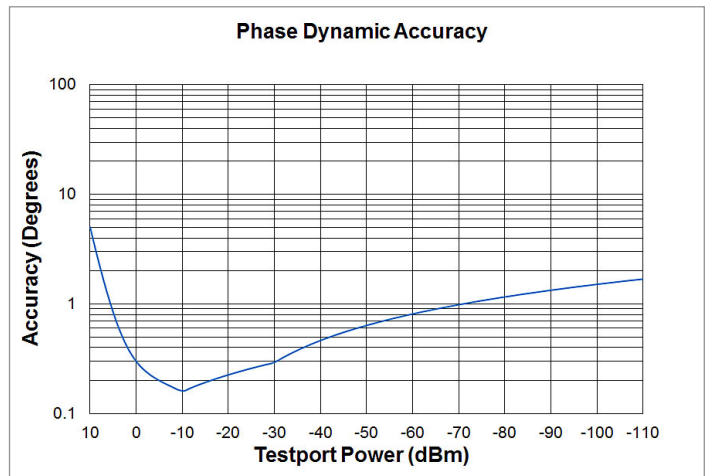
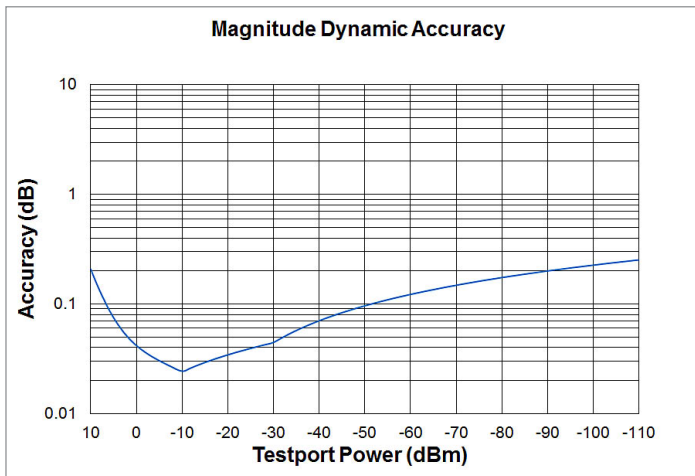
Stability

| Description | Specification | Typical |
|------------------|---------------|---------------|
| Magnitude | | |
| 9 k to 3 GHz | | ± 0.005 dB/°C |
| 3 G to 6 GHz | | ± 0.01 dB/°C |
| 6 G to 9 GHz | | ± 0.04 dB/°C |
| Phase | | |
| 9 k to 3 GHz | | ± 0.1 deg/°C |
| 3 G to 6 GHz | | ± 0.2 deg/°C |
| 6 G to 9 GHz | | ± 0.8 deg/°C |

Dynamic accuracy¹

| Description | Specification | Typical |
|------------------|---------------|---------|
| Magnitude | | |
| 10 dBm | ± 0.207 dB | |
| 5 dBm | ± 0.075 dB | |
| 0 dBm | ± 0.042 dB | |
| -5 dBm | ± 0.030 dB | |
| -10 dBm (Ref.) | ± 0.025 dB | |
| -15 dBm | ± 0.029 dB | |
| -20 dBm | ± 0.034 dB | |
| -30 dBm | ± 0.045 dB | |
| -40 dBm | ± 0.070 dB | |
| -50 dBm | ± 0.096 dB | |
| -60 dBm | ± 0.122 dB | |
| -70 dBm | ± 0.148 dB | |
| -80 dBm | ± 0.174 dB | |
| -90 dBm | ± 0.200 dB | |
| -100 dBm | ± 0.226 dB | |
| Phase | | |
| 10 dBm | ± 5.03 deg | |
| 5 dBm | ± 0.85 deg | |
| 0 dBm | ± 0.30 deg | |
| -5 dBm | ± 0.20 deg | |
| -10 dBm (Ref.) | ± 0.16 deg | |
| -15 dBm | ± 0.19 deg | |
| -20 dBm | ± 0.23 deg | |
| -30 dBm | ± 0.30 deg | |
| -40 dBm | ± 0.46 deg | |
| -50 dBm | ± 0.64 deg | |
| -60 dBm | ± 0.81 deg | |
| -70 dBm | ± 0.99 deg | |
| -80 dBm | ± 1.16 deg | |
| -90 dBm | ± 1.34 deg | |
| -100 dBm | ± 1.51 deg | |

1. Accuracy of the test port input power reading is relative to -10 dBm reference input power level.



Group delay¹

| Description | Specification | Typical |
|-----------------------|---|---|
| Aperture (selectable) | (frequency span)/(number of points - 1) | |
| Maximum aperture | 25% of frequency span | |
| Minimum delay | | Limited to measuring no more than 180° of phase change within the minimum aperture. |
| Accuracy | | See graph below (typical) |

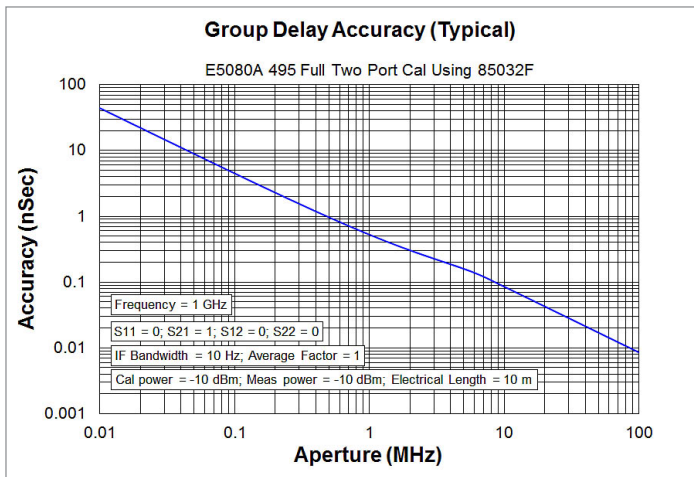
1. Group delay is computed by measuring the phase change within a specified step (determined by the frequency span and the number of points per sweep).

The following graph shows group delay accuracy with type-N connectors, full 2-port calibration and a 10 Hz IF bandwidth.

- Calibration kit (85032F).
- Insertion loss is assumed to be < 2 dB.

In general, the following formula can be used to determine the accuracy, in seconds, of a specific group delay measurement:

$$\pm \text{phase accuracy (degrees)} / [360 \times \text{aperture (Hz)}]$$



General Information

| Description | General characteristic |
|---------------|---|
| IF band width | 1 Hz to 1.5 MHz Nominal settings are: 1, 2, 3, 4, 5, 7, 10, 15, 20, 30, 40, 50, 70, 100, 150, 200, 300, 400, 500, 700, 1 k, 1.5 k, 2 k, 3 k, 4 k, 5 k, 7 k, 10 k, 15 k, 20 k, 9 k, 40 k, 50 k, 70 k, 100 k, 150 k, 200 k, 300 k, 400 k, 500 k, 700 k, 1M, 1.5 M |
| Range | |

Front panel

| Description | Typical | General characteristic |
|---------------|---------|---|
| Test Ports | | Type -N, female, 50 Ω (nominal) |
| Display | | 12.1 inch TFT color LCD with touch screen WXGA (1280 x 800) ¹ |
| Type | | |
| Resolution | | |
| USB host port | | Universal serial bus jack, Type A configuration; female; provides connection to mouse, key board, printer, ECal module, USB power sensor, or USB/ GPIB interface |

Rear panel

| Description | Typical | General characteristic |
|--|-----------------------------------|---|
| External trigger input connector | | BNC, female Low threshold voltage: 0.5 V High threshold voltage: 2.1 V Input level range: 0 to + 5 V $\geq 2 \mu\text{sec}$ Positive or negative |
| Type | | |
| Input level | | |
| Pulse width | | |
| Polarity | | |
| External trigger output connector | | |
| Type | | BNC, female 50 mA Low level voltage: 0 V High level voltage: 5 V 1 μsec Positive or negative |
| Maximum output current | | |
| Output level | | |
| Pulse width | | |
| Polarity | | |
| External reference signal input connector | | |
| Type | | |
| Input frequency | | |
| Input level | | |
| Internal reference signal output connector | | BNC, female 50 Ω |
| Type | | |
| Output frequency | 10 MHz \pm 7 ppm | |
| Signal Type | Sinewave | |
| Output level | 0 dBm \pm 3 dB into 50 Ω | |
| Output Impedance | | |

1. Valid pixels are 99.99% and more. Below 0.02% of fixed points of black, blue, green or red are not regarded as failure.

| Description | Typical | General characteristic |
|--|----------------------------------|--|
| Internal reference signal oven connector (option 1E5) | | |
| Type | | BNC, female |
| Output frequency | 10 MHz \pm 0.45 ppm | |
| Output level | 0 dBm minimum | |
| Bias tee input connector | | |
| Type | | BNC, female |
| Damage level | \pm 35 V, 500 mA DC | |
| Max. current (no degradation in RF specifications) | \pm 300 mA at 100 kHz to 9 GHz | |
| Over current protection | 500 mA (with Fuse) | |
| Video output | | 15-pin mini D-Sub; female; drives WXGA compatible monitors |
| GPIB | | 24-pin D-Sub (Type D-24), female; compatible with IEEE-488 |
| USB host port | | Universal serial bus jack, Type A configuration; female; provides connection to mouse, key board, printer, ECal module, USB power sensor, or USB/GPIB interface |
| USB (USBTMC¹) interface port | | Universal serial bus jack, Type B configuration (4 contacts inline); female; provides connection to an external PC; compatible with USBTMC-USB488 and USB 2.0.LA |
| LAN | | 10/100BaseT Ethernet, 8-pin configuration; auto selects between the two data rates |
| Handler I/O port | | 36-pin centronics, female; provides connection to handler system |
| Line power² | | |
| Frequency | | 47 Hz to 63 Hz |
| Power consumption ³ | 2-port: 135 W 4-port: 165 W | |
| Voltage | | 90-264 VAC ($V_{peak} > 120$ V) |
| VA max | | 300 VA max. |

1. USB Test and Measurement Class (TMC) interface that communicates over USB, complying with the IEEE 488.1 and IEEE 488.2 standards.

2. A third-wire ground is required.

3. At preset.

| Description | Specification | Typical |
|----------------------------|--|------------------------------------|
| AUX input connector | | |
| Type | | BNC, female x 2 ports |
| Input range | | \pm 1 V or \pm 10 V selectable |
| Accuracy | 1 % \pm 1 mV for 1 V input range 1 % \pm 10 mV for 10 V input range | |

EMC, safety, environment and compliance

EMC



European Council Directive 2004/108/EC
IEC 61326-1:2012
EN 61326-1:2013
CISPR 11:2003+A1:2004
EN 55011:2007
Group 1, Class A
IEC 61000-4-2:1995 +A2:2000
EN 61000-4-2:1995 +A2:2001
4 kV CD/8 kV AD
IEC 61000-4-3:2006
EN 61000-4-3:2006
1-3 V/m, 80-1000 MHz/1.4 GHz - 2.7 GHz, 80% AM
IEC 61000-4-4:2004
EN 61000-4-4:2004
1 kV power lines/0.5 kV signal lines
IEC 61000-4-5:2005
EN 61000-4-5:2006
0.5 kV line-line/1 kV line-ground
IEC 61000-4-6:2003 + A1:2004+ A2:2006
EN 61000-4-6:2007
3 V, 0.15-80 MHz, 80% AM
IEC 61000-4-11:2004
EN 61000-4-11:2004
0.5-300 cycle, 0%/70%

ICES/NMB-001



ICES-001:2006 Group 1, Class A

AS/NZS CISPR11:2004
Group 1, Class A

Safety



European Council Directive 2006/95/EC
IEC 61010-1:2010 / EN 61010-1:2010
Measurement Category I
Pollution Degree 2
Indoor Use



CAN/CSA C22.2 No. 61010-1-04
Measurement Category I
Pollution Degree 2
Indoor Use

Environment



This product complies with the WEEE Directive (2002/96/EC) marking requirements. The affixed label indicates that you must not discard this electrical/electronic product in domestic household waste.

Product Category: With reference to the equipment types in the WEEE Directive Annex I, this product is classed as a "Monitoring and Control instrumentation" product.

Do not dispose in domestic household waste.

To return unwanted products, contact your local Keysight office, or see <http://www.keysight.com/environment/product/> for more information.

Compliance

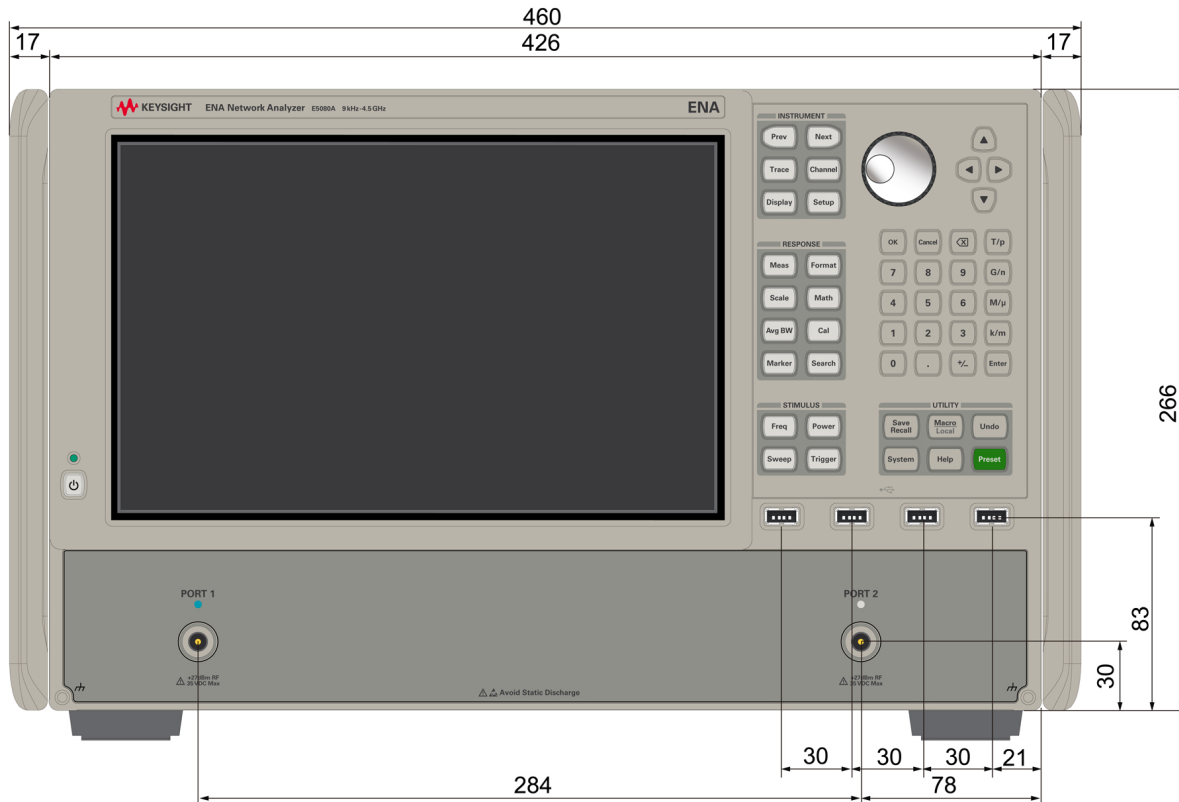


Class C

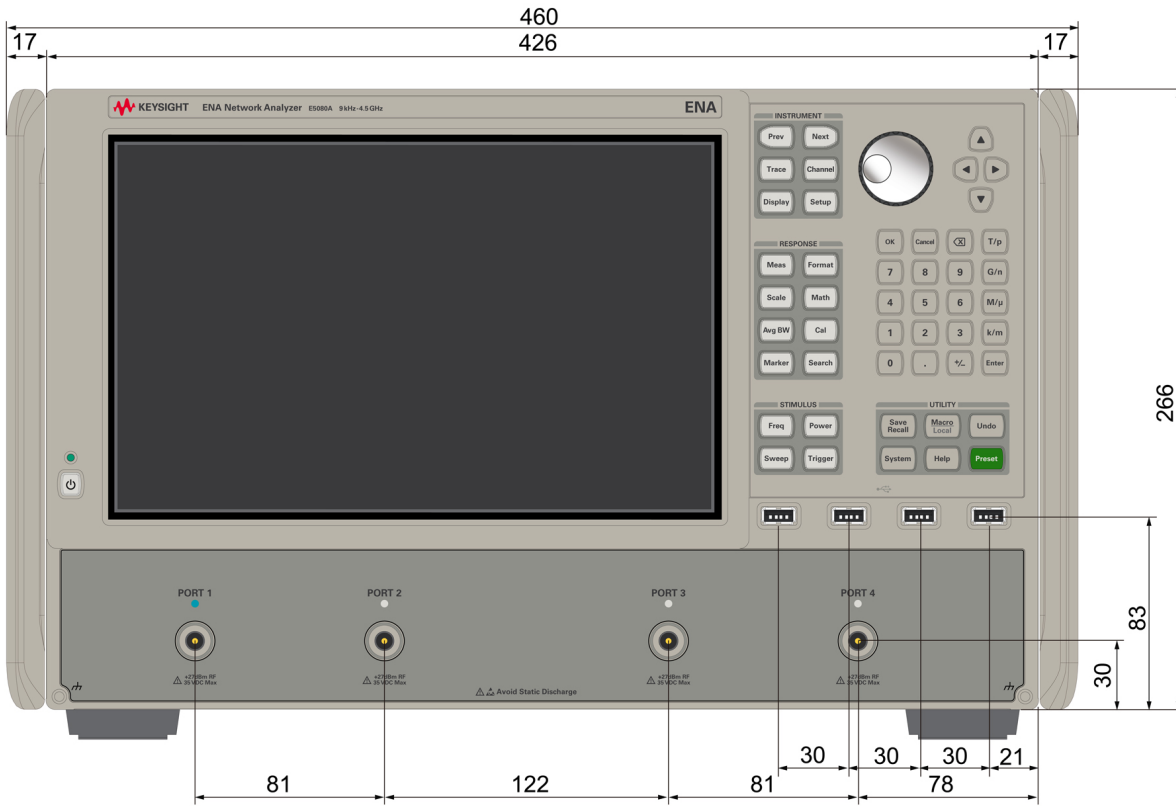
Analyzer environmental specifications and dimensions

| Description | General characteristic |
|-----------------------------------|---|
| Operating environment | |
| Temperature | 0 °C to +40 °C |
| Error-corrected temperature range | 23 °C (± 3 °C) with < 1 °C deviation from calibration temperature |
| Humidity | 20% to 80 % at wet bulb temperature < +29 °C (non-condensation) |
| Altitude | 0 to 2,000 m (0 to 6561 feet) |
| Vibration | 0.21 G maximum, 5 Hz to 500 Hz |
| Non-operating environment | |
| Temperature | -10 °C to +60 °C |
| Humidity | 20 % to 90 % at wet bulb temperature < +40 °C (non-condensation) |
| Altitude | 0 to 4,572 m (0 to 15,000 feet) |
| Vibration | 0.5 G maximum, 5 Hz to 500 Hz |
| Weight (net) | Option 245/265/295: 20.3 kg Option 445/465/495: 22.7 kg |

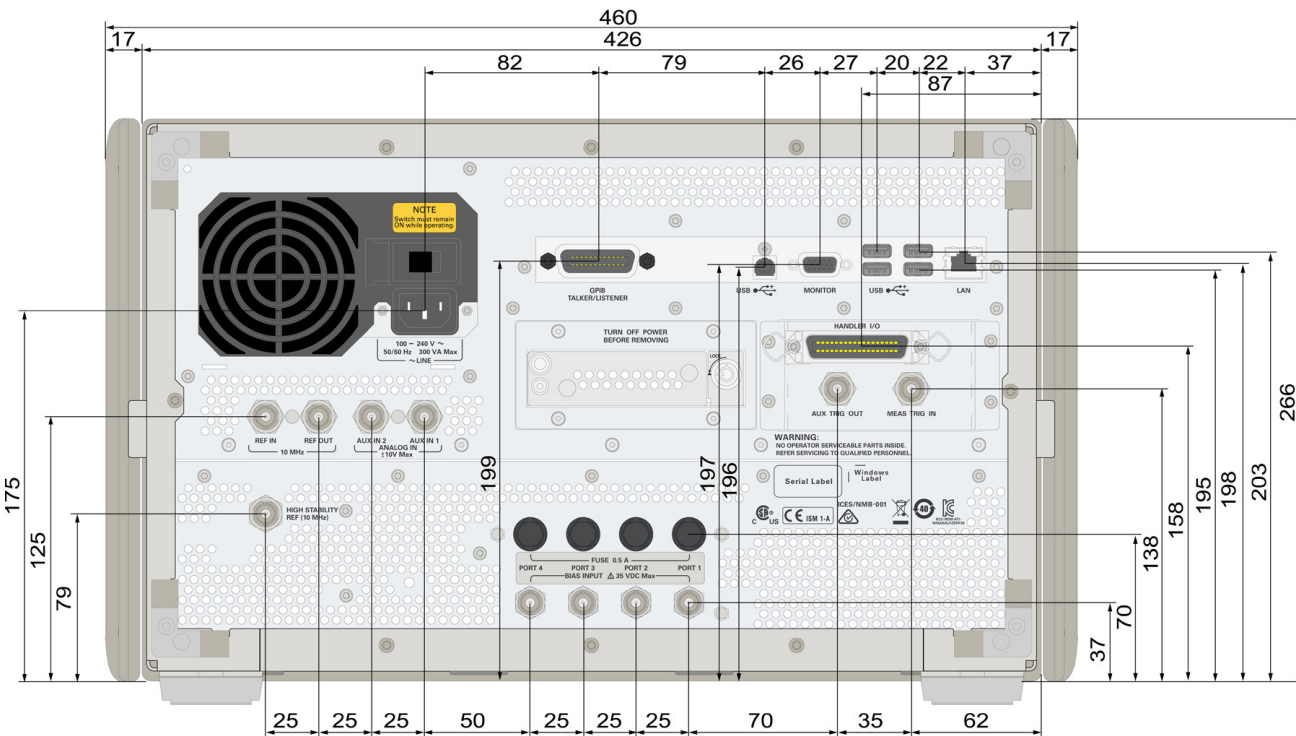
Dimensions



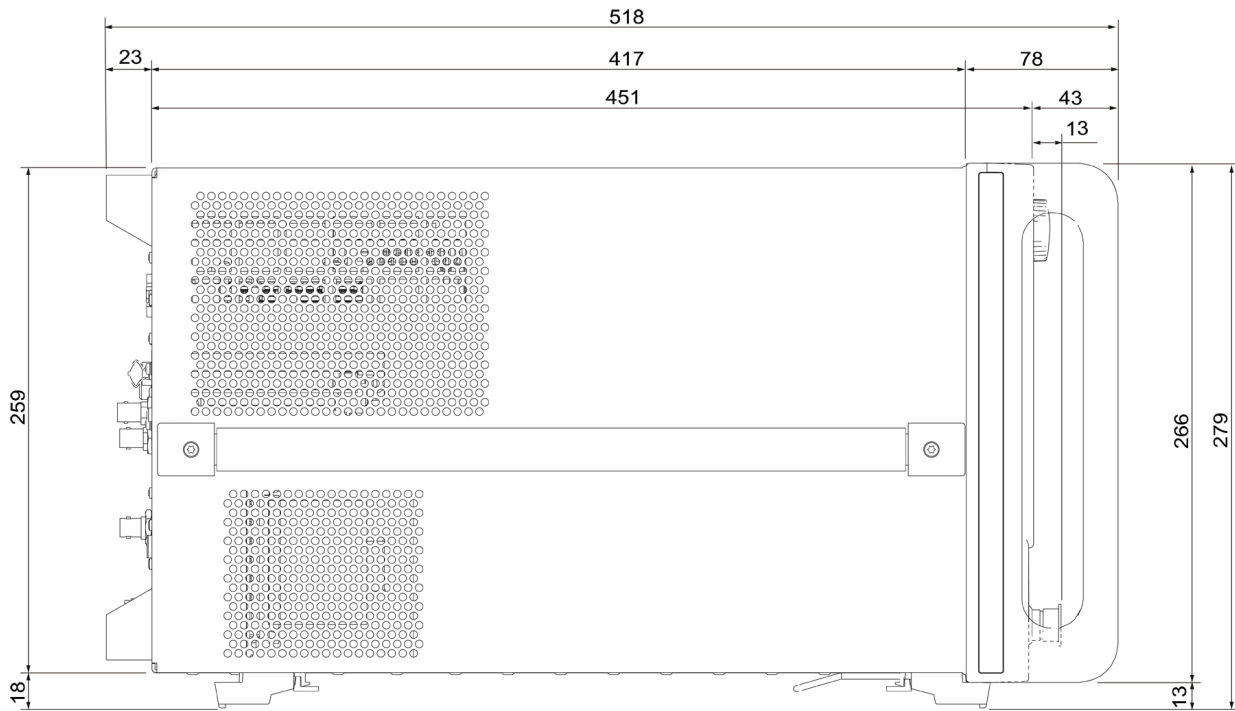
Dimensions (front view, E5080A with option 245/265/295, in millimeters)



Dimensions (front view, E5080A with option 445/465/495, in millimeters)



Dimensions (rear view with option 1E5, in millimeters)



Dimensions (rear view with option 1E5, in millimeters)

Measurement Throughput Summary

Measurement throughput data is supplemental performance data.
Common condition for the measurement throughput data:

- Analyzer display turned off with: DISPlay:ENABle OFF, DISPlay:VISible OFF
- Number of traces = 1
- firmware version: A.11.00

Cycle time for measurement completion

| | Sweep type: Auto System error correction: OFF | | | | Sweep type: Stepped System error correction: ON | | | |
|--|--|-----|------|------|--|-----|------|------|
| | Number of Points | | | | | | | |
| | 51 | 201 | 401 | 1601 | 51 | 201 | 401 | 1601 |
| Start 800 MHz, stop 1 GHz, 500 kHz IF bandwidth | | | | | | | | |
| Uncorrected | 1.3 | 1.8 | 2.5 | 7.0 | 1.5 | 2.8 | 4.3 | 13 |
| 2-port cal | 2.2 | 3.0 | 5.2 | 17 | 2.6 | 5.1 | 8.2 | 24 |
| 4-port cal | 4.0 | 6.2 | 12 | 31 | 4.7 | 11 | 18 | 51 |
| Start 800 MHz, stop 1 GHz, 1 kHz IF bandwidth | | | | | | | | |
| Uncorrected | 51 | 196 | 389 | 1546 | 51 | 196 | 389 | 1546 |
| 2-port cal | 101 | 391 | 777 | 3092 | 101 | 391 | 777 | 3092 |
| 4-port cal | 201 | 781 | 1554 | 6187 | 201 | 781 | 1554 | 6187 |
| Start 100 kHz, stop 4.5 GHz, 500 kHz IF bandwidth | | | | | | | | |
| Uncorrected | 3.1 | 5.4 | 7.7 | 12 | 3.1 | 5.4 | 7.8 | 20 |
| 2-port cal | 5.7 | 11 | 15 | 24 | 5.8 | 11 | 15 | 39 |
| 4-port cal | 11 | 21 | 31 | 50 | 11 | 21 | 31 | 81 |

Unit: ms

| Start 100 kHz, stop 4.5 GHz, 1 kHz IF bandwidth | | | | | | | | |
|---|-----|-----|------|------|-----|-----|------|------|
| Uncorrected | 53 | 199 | 393 | 1554 | 53 | 199 | 393 | 1554 |
| 2-port cal | 104 | 396 | 784 | 3107 | 104 | 396 | 784 | 3107 |
| 4-port cal | 207 | 792 | 1569 | 6217 | 207 | 792 | 1569 | 6217 |
| Start 100 kHz, stop 9 GHz, 500 kHz IF bandwidth | | | | | | | | |
| Uncorrected | 3.8 | 6.1 | 8.4 | 18 | 3.8 | 6.1 | 8.4 | 20 |
| 2-port cal | 7.0 | 12 | 17 | 35 | 7.0 | 12 | 17 | 40 |
| 4-port cal | 14 | 23 | 33 | 73 | 14 | 23 | 34 | 83 |
| Start 100 kHz, stop 9 GHz, 1 kHz IF bandwidth | | | | | | | | |
| Uncorrected | 53 | 199 | 393 | 1554 | 53 | 199 | 393 | 1554 |
| 2-port cal | 105 | 397 | 785 | 3108 | 105 | 397 | 785 | 3108 |
| 4-port cal | 210 | 794 | 1571 | 6219 | 210 | 794 | 1571 | 6219 |

Unit: ms

Cycle time vs. number of points

Condition: Start = 800 MHz, Stop = 1 GHz, 500 kHz IF bandwidth

| Number of points | Sweep type: Auto System error correction: OFF | Sweep type: Stepped System error correction: ON |
|------------------|--|--|
| 3 | 1.1 | 1.0 |
| 11 | 1.1 | 1.1 |
| 51 | 1.3 | 1.5 |
| 101 | 1.4 | 2.0 |
| 201 | 1.8 | 2.8 |
| 401 | 2.5 | 4.3 |
| 801 | 3.9 | 7.0 |
| 1601 | 7.0 | 13 |

Unit: ms

Cycle time vs. IF bandwidth

Condition: Frequency = 4 GHz, NOP = 201, system error correction: OFF

| IF BW (Hz) | Cycle time (ms) | IF BW (Hz) | Cycle time (ms) | IF BW (Hz) | Cycle time (ms) | IF BW (Hz) | Cycle time (ms) | IF BW (Hz) | Cycle time (ms) | IF BW (Hz) | Cycle time (ms) |
|------------|-----------------|------------|-----------------|------------|-----------------|------------|-----------------|------------|-----------------|------------|-----------------|
| 10 | 19299 | 100 | 1932 | 1000 | 195 | 10000 | 21 | 100000 | 3.1 | 1000000 | 1.8 |
| 15 | 12867 | 150 | 1288 | 1500 | 131 | 15000 | 14 | 150000 | 2.4 | 1500000 | 1.8 |
| 20 | 9651 | 200 | 967 | 2000 | 98 | 20000 | 11 | 200000 | 2.1 | | |
| 30 | 6434 | 300 | 645 | 3000 | 66 | 30000 | 7.6 | 300000 | 1.9 | | |
| 40 | 4826 | 400 | 484 | 4000 | 50 | 40000 | 6.0 | 400000 | 1.8 | | |
| 50 | 3861 | 500 | 388 | 5000 | 40 | 50000 | 5.0 | 500000 | 1.8 | | |
| 70 | 2736 | 700 | 275 | 7000 | 29 | 70000 | 3.9 | 700000 | 1.8 | | |

Data transfer time (ms)¹

| | Number of Points | | | |
|--|------------------|-----|-----|------|
| | 51 | 201 | 401 | 1601 |
| SCPI over GPIB² | | | | |
| 64-bit floating point | 2.7 | 6.8 | 13 | 45 |
| 32-bit floating point | 1.9 | 4.0 | 6.8 | 23 |
| ASCII | 6.1 | 21 | 37 | 143 |
| SCPI over 1 Gbps LAN (Socket)² | | | | |
| REAL 64 | 1.4 | 1.4 | 1.4 | 2.0 |
| REAL 32 | 1.4 | 1.4 | 1.4 | 1.6 |
| ASCII | 4.3 | 13 | 23 | 86 |
| SCPI over 1 Gbps LAN (SICL-LAN)² | | | | |
| REAL 64 | 1.9 | 1.8 | 1.8 | 2.6 |
| REAL 32 | 2.0 | 1.9 | 1.9 | 2.1 |
| ASCII | 2.8 | 4.3 | 6.4 | 20 |
| SCPI over USB (SICL-USB)² | | | | |
| REAL 64 | 2.3 | 2.5 | 2.5 | 3.0 |
| REAL 32 | 2.3 | 2.3 | 2.5 | 2.7 |
| ASCII | 2.3 | 5.2 | 8.2 | 28 |
| SCPI over GPIB/USB (82357B) | | | | |
| REAL 64 | 5.9 | 9.5 | 15 | 44 |
| REAL 32 | 5.3 | 7.1 | 9.6 | 25 |
| ASCII | 36 | 133 | 265 | 1061 |

1. Supplemental performance data. Data transfer time varies depending on the type of PC and control software.
2. Transferred LogMag S11 data, using :CALC{ch}:MEAS{tr}:DATA:FDAT?.

E5092A Configurable multiport test set

The section provides test input/output performance without calibration by the E5080A.

Table 46. Test set input/output performance

| Description | Specification | Typical |
|-----------------|------------------|----------------------|
| Frequency range | 50 MHz to 20 GHz | |
| Damage level | | 20 dBm, \pm 35 VDC |

Table 47. Option E5092A-020 port performance

| Description | Specification | Typical |
|-------------------------------------|---------------|---------|
| Load match (selected port) | | |
| SPDT switch¹ | | |
| 50 MHz to 2 GHz | 17 dB | |
| 2 GHz to 4 GHz | 11 dB | |
| 4 GHz to 8 GHz | 8 dB | |
| 8 GHz to 10 GHz | 7 dB | |
| 10 GHz to 18 GHz | 4 dB | |
| 18 GHz to 20 GHz | 4 dB | |
| SP4T switch² | | |
| 50 MHz to 2 GHz | 17 dB | |
| 2 GHz to 3 GHz | 11 dB | |
| 3 GHz to 8 GHz | 8 dB | |
| 8 GHz to 10 GHz | 7 dB | |
| 10 GHz to 18 GHz | 4 dB | |
| 18 GHz to 20 GHz | 4 dB | |
| Load match (unselected port) | | |
| SPDT switch¹ | | |
| 50 MHz to 3 GHz | 17 dB | |
| 3 GHz to 10 GHz | 11 dB | |
| 10 GHz to 16 GHz | 8 dB | |
| 16 GHz to 18 GHz | 6 dB | |
| 18 GHz to 20 GHz | 4 dB | |
| SP4T switch² | | |
| 50 MHz to 3 GHz | 17 dB | |
| 3 GHz to 10 GHz | 11 dB | |
| 10 GHz to 16 GHz | 8 dB | |
| 16 GHz to 18 GHz | 6 dB | |
| 18 GHz to 20 GHz | 4 dB | |
| Load match (common port) | | |
| SPDT switch¹ | | |
| 50 MHz to 2 GHz | 16 dB | |
| 2 GHz to 4 GHz | 11 dB | |
| 4 GHz to 8 GHz | 8 dB | |
| 8 GHz to 10 GHz | 7 dB | |
| 10 GHz to 20 GHz | 4 dB | |
| SP4T switch² | | |
| 50 MHz to 1.3 GHz | 16 dB | |
| 1.3 GHz to 4 GHz | 11 dB | |
| 4 GHz to 8 GHz | 8 dB | |
| 8 GHz to 10 GHz | 7 dB | |
| 10 GHz to 20 GHz | 4 dB | |

1. SPDT: Single-pole-double-throw switches. Applies to SW5, SW6, SW7, SW8, SW9 and SW10 in the E5092A. (See Figure 20.)

2. SP4T: Single-pole-four-throw switches. Applies to SW1, SW2, SW3 and SW4 in the E5092A. (See Figure 20.)

Table 48. Option E5092A-020 port performance (continued)

| Description | Specification | Typical |
|--|-------------------------------------|-------------------|
| Insertion loss | | |
| SPDT switch¹ | | |
| 50 MHz to 100 MHz | 4 dB | |
| 100 MHz to 2 GHz | 3.5 dB | |
| 2 GHz to 3 GHz | 4.5 dB | |
| 3 GHz to 4 GHz | 5 dB | |
| 4 GHz to 6 GHz | 5.5 dB | |
| 6 GHz to 8 GHz | 7 dB | |
| 8 GHz to 10 GHz | 8 dB | |
| 10 GHz to 14 GHz | 8.5 dB | |
| 14 GHz to 18 GHz | 10 dB | |
| 18 GHz to 20 GHz | 11.5 dB | |
| SP4T switch² | | |
| 50 to 100 MHz | 4 dB | |
| 100 MHz to 2 GHz | 3.5 dB | |
| 2 GHz to 3 GHz | 4.5 dB | |
| 3 GHz to 4 GHz | 5.5 dB | |
| 4 GHz to 6 GHz | 6 dB | |
| 6 GHz to 8 GHz | 7.5 dB | |
| 8 GHz to 10 GHz | 8.5 dB | |
| 10 GHz to 14 GHz | 9.5 dB | |
| 14 GHz to 18 GHz | 10.5 dB | |
| 18 GHz to 20 GHz | 12 dB | |
| Stability per switch | | |
| Condition: Environment Temperature +23 °C ± 3 °C and Internal DC source: ≤ 100 mA (Sum of 4 channels), no heat source and no wall close to the unit. | | |
| 50 M to 4 GHz | | 0.003 dB/°C (SPD) |
| 4 G to 12 GHz | | 0.005 dB/°C (SPD) |
| 12 G to 20 GHz | | 0.008 dB/°C (SPD) |
| Condition: besides the above | | |
| 50 M to 4 GHz | | 0.007 dB/°C (SPD) |
| 4 G to 12 GHz | | 0.012 dB/°C (SPD) |
| 12 G to 20 GHz | | 0.017 dB/°C (SPD) |
| Isolation³ | | |
| 50 MHz to 500 MHz | 65 dB | |
| 500 MHz to 1 GHz | 80 dB | |
| 1 GHz to 2 GHz | 85 dB | |
| 2 GHz to 6 GHz | 90 dB | |
| 6 GHz to 10 GHz | 85 dB | |
| 10 GHz to 18 GHz | 75 dB | |
| 18 GHz to 20 GHz | 65 dB (Over arbitrarily test ports) | |

1. SPDT: Single-pole-double-throw switches. Applies to SW5, SW6, SW7, SW8, SW9 and SW10 in the E5092A. (See Figure 20.)

2. SP4T: Single-pole-four-throw switches. Applies to SW1, SW2, SW3 and SW4 in the E5092A. (See Figure 20.)

3. This specification is defined when all ports are terminated with a 50 ohm load.

Table 49. Control line

| Description | Specification | Typical |
|----------------------------------|---|---|
| Number of groups | 4 Group A: 8 bits Group B,C,D: 4 bits | |
| Input voltage range ¹ | 0 V to +5 V (positive input) –5 V to 0 V (negative input) | |
| Maximum current | Group A, B: 50 mA in total of each group Group C, D: 500 uA in total of each group | |
| Impedance | | Group A, B: < 10 ohm Group C, D: < 200 ohm |

Table 50. DC source

| Description | Specification | Typical |
|-------------------------|---|--------------------------------------|
| Number of sources | 4 | |
| Output voltage range | | 0 V to +5.2 V (nominal) ² |
| Output voltage accuracy | ± 3 % of setting (+1 V to +5 V) at 1 M ohm load impedance | |
| Voltage resolution | | 10 mV (nominal) ³ |
| Maximum current | 150 mA for each source | |
| Output impedance | | < 5 ohm |

Table 51. Operating storage environment

| Description | General characteristics |
|-------------|--|
| Temperature | +5 °C to +40 °C |
| Humidity | 20 to 80 % at wet bulb temperature < +29 °C (non-condensing) |
| Altitude | 0 to 2,000m (0 to 6,561 feet) |
| Vibration | 0.21 G max., 5 to 500 Hz |

Table 52. Non-operating storage environment

| Description | General characteristics |
|-------------|--|
| Temperature | –10 °C to +60 °C |
| Humidity | 20 to 90 % at wet bulb temperature < +40 °C (non-condensing) |
| Altitude | 0 to 4,572 m (0 to 15,000 feet) |
| Vibration | 0.5 G max., 5 Hz to 500 Hz |

Table 53. Front panel information

| Description | General characteristics |
|---------------|--|
| RF connectors | SMA (female) |
| Test ports | 38 ports |
| Control line | 15-pin D-sub, female 25-pin D-sub, female |

1. Input voltage will be clipped at about ± 5.2 V when over this range.
2. The output voltage can be set in this range.
3. The output voltage resolution becomes effective between 0 V to 5.2 V.

Table 54. Rear panel information

| Description | General characteristics |
|-------------------------|---|
| USB port | Type B-receptacle, provide connection to the E5080A |
| Line power ¹ | |
| Frequency | 47 to 63 Hz |
| Voltage | 90 to 132 VAC, or 198 to 264 VAC (automatically switched) |
| VA max | 300 VA max. |

- 1A third-wire ground is required.

Table 55. Test set dimensions and block diagram

| Description | General characteristics |
|-------------------|-------------------------|
| Weight | |
| E5092A Option 020 | 9 kg |

Dimensions

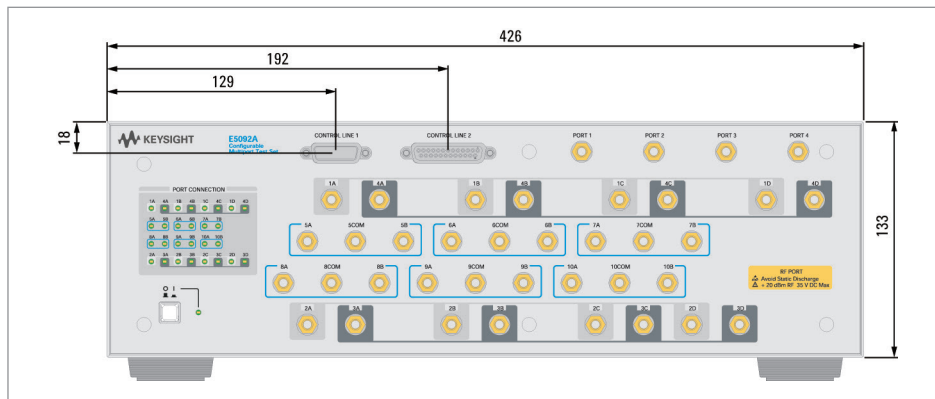


Figure 10. Dimensions (front view, with Option E5092A-020, in millimeters, nominal)

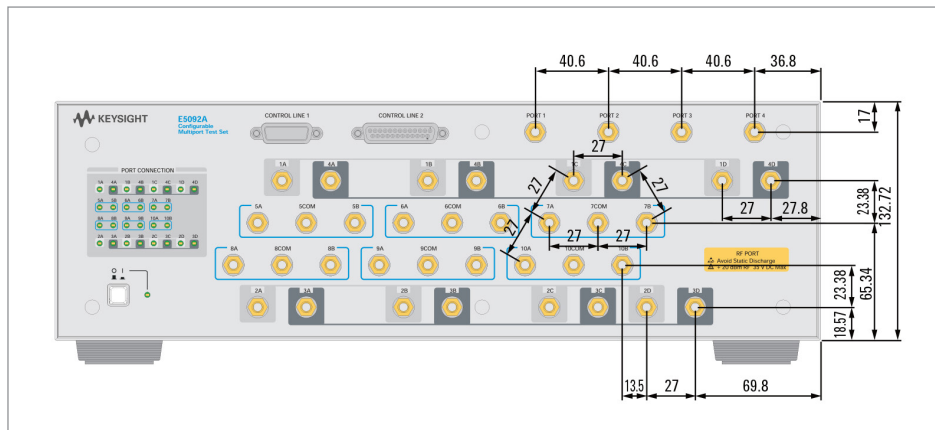


Figure 11. Dimensions (pitch between switches, with Option E5092A-020, in millimeters, nominal)

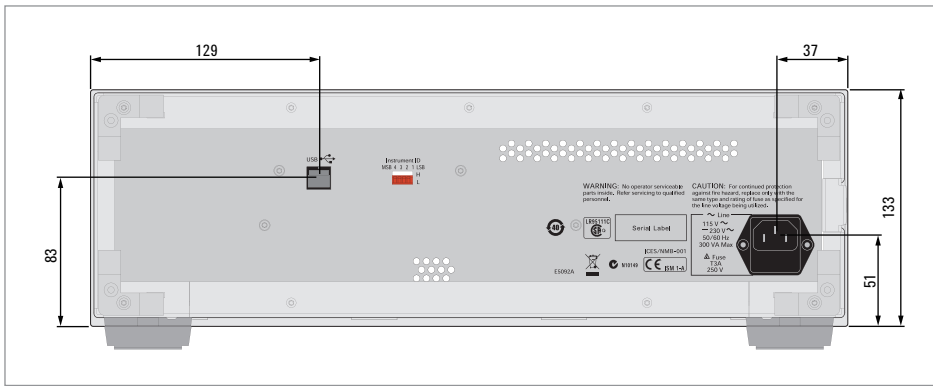


Figure 11. Dimensions (pitch between switches, with Option E5092A-020, in millimeters, nominal)

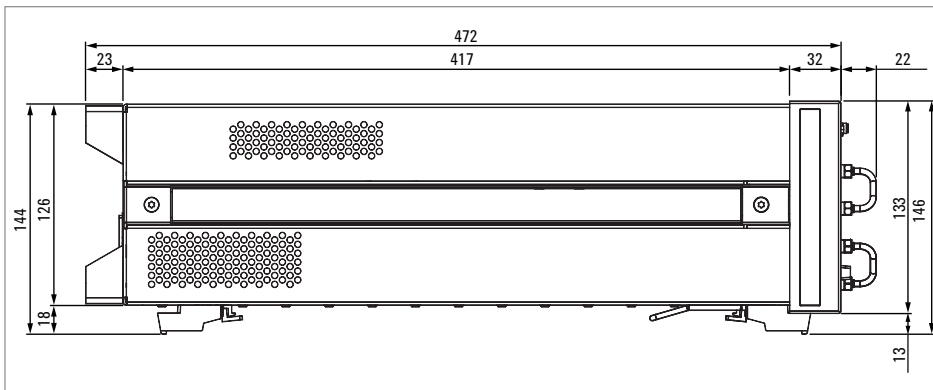


Figure 13. Dimensions (side view, with Option E5092A-020, in millimeters, nominal)

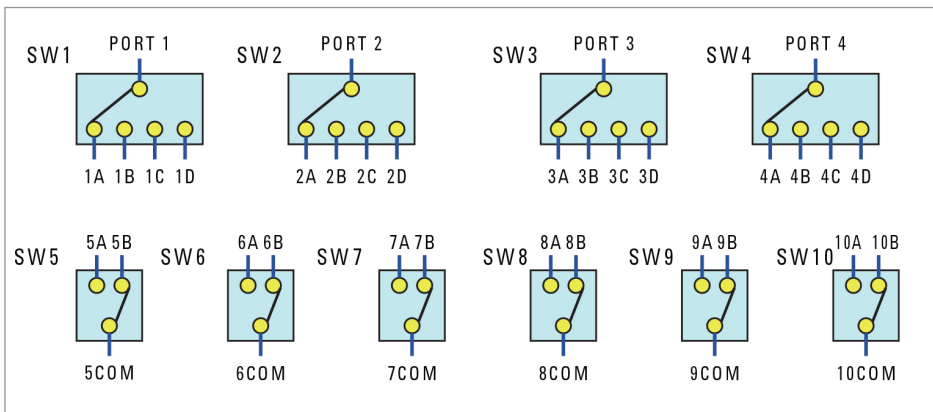


Figure 14. Switch configuration (E5092A-020)

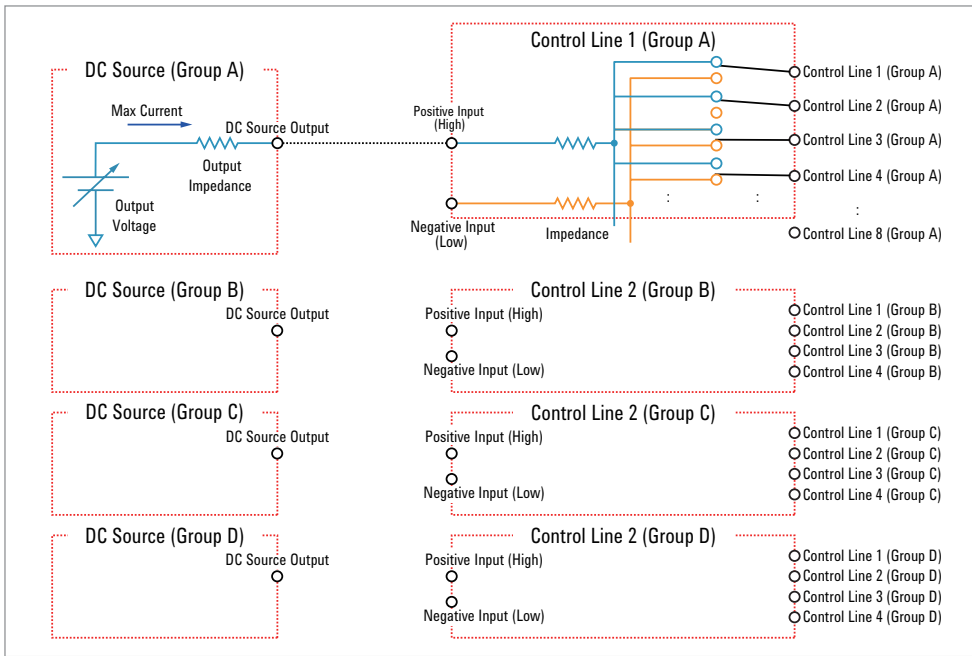


Figure 15. DC control line (E5092A-020)

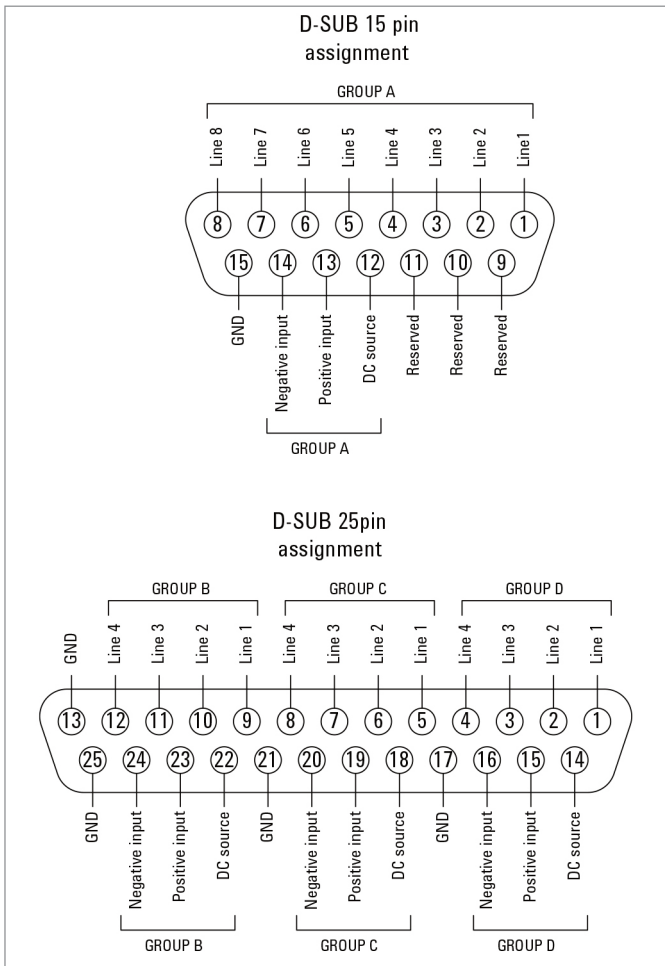


Figure 16. Control line pin assignment (E5092A-020)

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