

Section 1  
Introduction and Specifications

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## 1-1. INTRODUCTION

The Fluke Model 5700A Calibrator is a precise instrument that calibrates a wide variety of electrical measuring instruments. The 5700A maintains high accuracy over a wide ambient temperature range, allowing it to test instruments wherever they are, rather than only in a temperature-controlled standards laboratory. With a 5700A, you can calibrate precision multimeters that measure ac or dc voltage, ac or dc current, and resistance. Option 5700A-03 Wideband AC Voltage extends this workload to include many rf meters.

Specifications for the 5700A are provided at the end of this section. The 5700A is a fully-programmable precision source of the following:

- o DC voltage to 1100V
- o AC voltage to 1100V, with output available from 10 Hz to 1.2 MHz
- o AC and DC current to 2.2A, with output available from 10 Hz to 10 kHz.
- o Resistance in values of  $1 \times 10^n$  and  $1.9 \times 10^n$  from short to 100 megohms
- o Optional wideband ac voltage from 300  $\mu$ V to 3.5V (-57 dBm to +24 dBm) 10 Hz to 30 MHz.

The 5700A contains many features that make it an easy-to-use and powerful tool in and out of the standards lab. For a thorough list of these features, refer to the 5700A Operator Manual. The Operator Manual is the primary source of information on all topics relating to operating the instrument in local and remote modes. Descriptions of all the books supplied with the 5700A, including this Service Manual, are provided next.

## 1-2. HOW TO USE THE MANUAL SET

The 5700A Manual Set provides complete information for the operator and service or maintenance personnel. The set includes the following manuals:

- |   |  |            |
|---|--|------------|
| o | 5700A Getting Started Guide              | P/N 791962 |
| o | 5700A Operator Manual                    | P/N 791905 |
| o | 5700A Operator Reference Guide           | P/N 813568 |
| o | 5700A Remote Programming Reference Guide | P/N 813550 |
| o | 5700A Service Manual                     | P/N 791996 |

Each of the manuals listed above is shipped with every instrument. The two reference guides are packaged inside the 5700A Operator Manual. Order additional copies of the manuals or reference guides separately using the part number provided. For ordering instructions, refer to the Fluke Catalog, or ask a Fluke sales representative.

## INTRODUCTION

### 1-3. 5700A Service Manual

The 5700A Service Manual (this manual) is a maintenance guide for the 5700A. The following topics are included in the 5700A Service Manual:

- o Specifications; same as in the Operator Manual (Section 1)
- o Theory of operation (Section 2)
- o Full verification (recommended every two years) (Section 3)
- o Wideband AC (Option 5700-03) flatness calibration (Section 3)
- o Maintenance procedures (Section 4)
- o Access procedures (Section 4)
- o Routine Calibration (Section 3)
- o Module-level troubleshooting hints (Section 5)
- o Parts lists (Section 6)
- o Schematics (Section 7)

### 1-4. 5700A Getting Started Guide

The 5700A Getting Started Guide provides a step-by-step, hands-on approach to calibrator operation. The guide gives the new user a quick, positive feel for the 5700A and is the best place to start working with the 5700A. The guide also demonstrates both local and remote operation.

### 1-5. 5700A Operator Manual

The 5700A Operator Manual provides complete information for installing the 5700A and operating the 5700A from the front panel keys and in remote. It also provides a glossary of calibration-related terms as well as general items such as specifications and error code information. The following topics are covered in the 5700A Operator Manual:

- o Installation
- o Operating controls and features
- o Front panel operation
- o Remote operation (IEEE-488 bus or serial port remote control)
- o Serial port operation (printing, displaying, or transferring data, and setting up for serial port remote control)
- o Operator maintenance procedures
- o Options and accessories

The 5700A Operator Manual includes two pocket-sized reference booklets; one for front panel operation and one for remote programming.

## 1-6. 5700A Operator Reference Guide

The 5700A Operator Reference Guide contains a summary of operating instructions from the Operator Manual. This reference guide contains information needed to start up and operate the 5700A. It contains a front and rear feature reference and a softkey menu tree. The guide is included with the 5700A Operator Manual.

## 1-7. The 5700A Remote Programming Reference Guide

The 5700A Remote Programming Reference Guide contains a summary of remote commands for the 5700A. It also contains information needed to determine system status using the status byte and registers. This reference guide is also included with the 5700A Operator Manual.

## 1-8. SPECIFICATIONS

The following tables provide specifications for the 5700A, including operation with the Wideband AC Module (Option 5700A-03) and the 5725A Amplifier.

Specifications are valid after allowing a warm-up period of 30 minutes, or twice the time the 5700A has been turned off. For example, if the 5700A has been turned off for five minutes, the warm-up period is ten minutes.

To simplify evaluation of how the 5700A covers your calibration workload, use the 5700A Absolute Uncertainty specifications. Absolute uncertainty includes stability, temperature coefficient, linearity, line and load regulation, and the traceability to external standards. You do not need to add anything to absolute uncertainty to determine the ratios between 5700A uncertainties and the uncertainties of your calibration workload.

Relative Uncertainty specifications are provided for enhanced accuracy applications. These specifications apply when range constants are adjusted (see "Range Calibration"). To calculate absolute uncertainty, you must combine the uncertainties of your external standards and techniques with relative uncertainty.

Secondary Performance Specifications and Operating Characteristics are included in uncertainty specifications. They are provided for special calibration requirements such as stability or linearity testing.

# SPECIFICATIONS

## DC Voltage

Range	Resolution	Absolute Uncertainty ±5°C from calibration temperature				Relative Uncertainty ±1°C	
		24 Hours	90 Days	180 Days	1 Year	24 Hours	90 Days
		±(ppm output + μV)					
220 mV	10 nV	6.5 + .75	7 + .75	8 + .75	9 + .8	2.5 + .5	4 + .5
2.2V	100 nV	3.5 + 1.2	6 + 1.2	7 + 1.2	8 + 1.2	2.5 + 1.2	4 + 1.2
11V	1 μV	3.5 + 3	5 + 4	7 + 4	8 + 4	1.5 + 3	3.5 + 4
22V	1 μV	3.5 + 6	5 + 8	7 + 8	8 + 8	1.5 + 6	3.5 + 8
220V	10 μV	5 + 100	6 + 100	8 + 100	9 + 100	2.5 + 100	4 + 100
1100V	100 μV	7 + 600	8 + 600	10 + 600	11 + 600	3 + 600	4.5 + 600

## Secondary Performance Specifications and Operating Characteristics Included in Uncertainty Specifications

Range	Stability ±1°C	Temperature Coefficient [Note]		Linearity ±1°C	Noise	
		10°-40°C	0°-10°C and 40°-50°C		Bandwidth 0.1-10 Hz	Bandwidth 10-10 kHz
	24 Hours			pk-pk	RMS	
	±(ppm output + μV)	±(ppm output + μV)/°C		±(ppm output + μV)		μV
220 mV	.3 + .3	.4 + .1	1.5 + .5	1 + .2	.15 + .1	5
2.2V	.3 + 1	.3 + .1	1.5 + 2	1 + .6	.15 + .4	15
11V	.3 + 2.5	.15 + .2	1 + 1.5	.3 + 2	.15 + 2	50
22V	.4 + 5	.2 + .4	1.5 + 3	.3 + 4	.15 + 4	50
220V	.5 + 40	.3 + 5	1.5 + 40	1 + 40	.15 + 60	150
1100V	.5 + 200	.5 + 10	3 + 200	1 + 200	.15 + 300	500

Note: Temperature coefficient is an adder to uncertainty specifications that does *not* apply unless operating more than ±5°C from calibration temperature.

**Minimum output:** 0V for all ranges, except 100V for 1100V range

**Maximum load:** 50 mA for 2.2V through 220V ranges; 20 mA for 1100V range; 50Ω output impedance on 220 mV range; all ranges <1000 pF, >25Ω

**Load regulation:** <0.2 ppm + 0.2 μV change, full load to no load

**Line regulation:** <0.1 ppm change, ±10% of selected nominal line

**Settling time:** 3 seconds to full accuracy; +1 second for range or polarity change; +1 second for 1100V range

**Overshoot:** <5%

**Common mode rejection:** 140 dB, DC to 400 Hz

**Remote sensing:** Available 0V to ±1100V, on 2.2V through 1100V ranges

AC Voltage

Range	Resolution	Frequency	Absolute Uncertainty ± 5°C from calibration temperature				Relative Uncertainty ± 1°C	
			24 Hours	90 Days	180 Days	1 Year	24 Hours	90 Days
			Hz	± (ppm output + μV)				± (ppm output + μV)
2.2 mV	1 nV	10-20	500 + 5	550 + 5	600 + 5	600 + 5	500 + 5	550 + 5
		20-40	200 + 5	220 + 5	230 + 5	240 + 5	200 + 5	220 + 5
		40-20k	100 + 5	110 + 5	120 + 5	120 + 5	60 + 5	65 + 5
		20k-50k	340 + 5	370 + 5	390 + 5	410 + 5	100 + 5	110 + 5
		50k-100k	800 + 8	900 + 8	950 + 8	950 + 8	220 + 8	240 + 8
		100k-300k	.11% + 15	.12% + 15	.13% + 15	.13% + 15	400 + 15	440 + 15
		300k-500k	.15% + 30	.17% + 30	.17% + 30	.18% + 30	.10% + 30	.11% + 30
500k-1M	.30% + 30	.33% + 30	.35% + 30	.36% + 30	.3% + 30	.33% + 30		
22 mV	10 nV	10-20	500 + 6	550 + 6	600 + 6	600 + 6	500 + 6	550 + 6
		20-40	200 + 6	220 + 6	230 + 6	240 + 6	200 + 6	220 + 6
		40-20k	100 + 6	110 + 6	120 + 6	120 + 6	60 + 6	65 + 6
		20k-50k	340 + 6	370 + 6	390 + 6	410 + 6	100 + 6	110 + 6
		50k-100k	800 + 8	900 + 8	950 + 8	950 + 8	220 + 8	240 + 8
		100k-300k	.11% + 15	.12% + 15	.13% + 15	.13% + 15	400 + 15	440 + 15
		300k-500k	.15% + 30	.17% + 30	.17% + 30	.18% + 30	.10% + 30	.11% + 30
500k-1M	.30% + 30	.33% + 30	.35% + 30	.36% + 30	.3% + 30	.33% + 30		
220 mV	100 nV	10-20	500 + 16	550 + 16	600 + 16	600 + 16	500 + 16	550 + 16
		20-40	200 + 10	220 + 10	230 + 10	240 + 10	200 + 10	220 + 10
		40-20k	95 + 10	100 + 10	110 + 10	110 + 10	60 + 10	65 + 10
		20k-50k	300 + 10	330 + 10	350 + 10	360 + 10	100 + 10	110 + 10
		50k-100k	750 + 30	800 + 30	850 + 30	900 + 30	220 + 30	240 + 30
		100k-300k	940 + 30	.1% + 30	.11% + 30	.11% + 30	400 + 30	440 + 30
		300k-500k	.15% + 40	.17% + 40	.17% + 40	.18% + 40	.1% + 40	.11% + 40
500k-1M	.30% + 100	.33% + 100	.35% + 100	.36% + 100	.3% + 100	.33% + 100		
2.2V	1 μV	10-20	500 + 100	550 + 100	600 + 100	600 + 100	500 + 100	550 + 100
		20-40	150 + 30	170 + 30	170 + 30	180 + 30	150 + 30	170 + 30
		40-20k	70 + 7	75 + 7	80 + 7	85 + 7	40 + 7	45 + 7
		20k-50k	120 + 20	130 + 20	140 + 20	140 + 20	100 + 20	110 + 20
		50k-100k	230 + 80	250 + 80	270 + 80	280 + 80	200 + 80	220 + 80
		100k-300k	400 + 150	440 + 150	470 + 150	480 + 150	400 + 150	440 + 150
		300k-500k	.10% + 400	.11% + 400	.12% + 400	.12% + 400	.1% + 400	.11% + 400
500k-1M	.20% + 1 mV	.22% + 1 mV	.23% + 1 mV	.24% + 1 mV	.2% + 1 mV	.22% + 1 mV		
22V	10 μV	10-20	500 + 1 mV	550 + 1 mV	600 + 1 mV	600 + 1 mV	500 + 1 mV	550 + 1 mV
		20-40	150 + 300	170 + 300	170 + 300	180 + 300	150 + 300	170 + 300
		40-20k	70 + 70	75 + 70	80 + 70	85 + 70	40 + 70	45 + 70
		20k-50k	120 + 200	130 + 200	140 + 200	140 + 200	100 + 200	110 + 200
		50k-100k	230 + 400	250 + 400	270 + 400	280 + 400	200 + 400	220 + 400
		100k-300k	500 + 1.7 mV	550 + 1.7 mV	550 + 1.7 mV	600 + 1.7 mV	500 + 1.7 mV	550 + 1.7 mV
		300k-500k	.12% + 5 mV	.13% + 5 mV	.13% + 5 mV	.14% + 5 mV	.12% + 5 mV	.13% + 5 mV
500k-1M	.26% + 9 mV	.28% + 9 mV	.29% + 9 mV	.30% + 9 mV	.26% + 9 mV	.28% + 9 mV		
			± (ppm output + mV)				± (ppm output + mV)	
220V	100 μV	10-20	500 + 10	550 + 10	600 + 10	600 + 10	500 + 10	550 + 10
		20-40	150 + 3	170 + 3	170 + 3	180 + 3	150 + 3	170 + 3
		40-20k	75 + 1	80 + 1	85 + 1	90 + 1	45 + 1	50 + 1
		20k-50k	200 + 4	220 + 4	240 + 4	250 + 4	100 + 1	110 + 1
		50k-100k	500 + 10	550 + 10	600 + 10	600 + 10	300 + 10	330 + 10
		100k-300k	.15% + 110	.15% + 110	.16% + 110	.16% + 110	.15% + 110	.15% + 110
		300k-500k	.50% + 110	.52% + 110	.53% + 110	.54% + 110	.50% + 110	.52% + 110
500k-1M	1.20% + 220	1.25% + 220	1.25% + 220	1.30% + 220	1.20% + 220	1.20% + 220		
1100V	1 mV	50-1k	75 + 4	80 + 4	85 + 4	90 + 4	50 + 4	55 + 4
<b>5725A Amplifier:</b>								
1100V	1 mV	40-1k	75 + 4	80 + 4	85 + 4	90 + 4	50 + 4	55 + 4
		1k-20k	105 + 6	125 + 6	135 + 6	165 + 6	85 + 6	105 + 6
		20k-30k	230 + 11	360 + 11	440 + 11	600 + 11	160 + 11	320 + 11
750V		30k-50k	230 + 11	360 + 11	440 + 11	600 + 11	160 + 11	320 + 11
		50k-100k	600 + 45	.13% + 45	.16% + 45	.23% + 45	380 + 45	.12% + 45

SPECIFICATIONS

AC Voltage (continued)

Secondary Performance Specifications and Operating Characteristics  
Included in Uncertainty Specifications

Range	Frequency	Stability ±1°C 24 Hours	Temperature Coefficient		Output Impedance	Maximum Distortion Bandwidth 10 Hz-10 MHz
			10°-40°C	0°-10°C and 40°-50°C		
	Hz	± μV	± μV/°C		Ω	± (% output + μV)
2.2 mV	10-20	5	.05	.05	50	.05 + 10
	20-40	5	.05	.05		.035 + 10
	40-20k	2	.05	.05		.035 + 10
	20k-50k	2	.1	.1		.035 + 10
	50k-100k	3	.2	.2		.035 + 10
	100k-300k	3	.3	.3		.3 + 30
	300k-500k	5	.4	.4		.3 + 30
500k-1M	5	.5	.5	.5	1 + 30	
22 mV	10-20	5	.2	.3	50	.05 + 11
	20-40	5	.2	.3		.035 + 11
	40-20k	2	.2	.3		.035 + 11
	20k-50k	2	.4	.5		.035 + 11
	50k-100k	3	.5	.5		.035 + 11
	100k-300k	5	.6	.6		.3 + 30
	300k-500k	10	1	1		.3 + 30
500k-1M	15	1	1	1	1 + 30	
		± (ppm output + μV)	± (ppm output + μV)/°C			
220 mV	10-20	150 + 20	2 + 1	2 + 1	50	.05 + 16
	20-40	80 + 15	2 + 1	2 + 1		.035 + 16
	40-20k	12 + 2	2 + 1	2 + 1		.035 + 16
	20k-50k	10 + 2	15 + 2	15 + 2		.035 + 16
	50k-100k	10 + 2	15 + 4	15 + 4		.035 + 16
	100k-300k	20 + 4	80 + 5	80 + 5		.3 + 30
	300k-500k	100 + 10	80 + 5	80 + 5		.3 + 30
500k-1M	200 + 20	80 + 5	80 + 5	1 + 30		
				<b>Load Regulation</b> ± (ppm output + μV)		
2.2V	10-20	150 + 20	50 + 10	50 + 10	10 + 2	.05 + 80
	20-40	80 + 15	15 + 5	15 + 5	10 + 2	.035 + 80
	40-20k	12 + 4	2 + 1	5 + 2	10 + 4	.035 + 80
	20k-50k	15 + 5	10 + 2	15 + 4	30 + 10	.035 + 80
	50k-100k	15 + 5	10 + 4	20 + 4	120 + 16	.035 + 80
	100k-300k	30 + 10	80 + 15	80 + 15	300 ppm	.3 + 110
	300k-500k	70 + 20	80 + 40	80 + 40	600 ppm	.3 + 110
500k-1M	150 + 50	80 + 100	80 + 100	.12%	1 + 110	
22V	10-20	150 + 20	50 + 100	50 + 100	10 + 20	.05 + 700
	20-40	80 + 15	15 + 30	15 + 40	10 + 20	.035 + 700
	40-20k	12 + 8	2 + 10	4 + 15	10 + 30	.035 + 700
	20k-50k	15 + 10	10 + 20	20 + 20	30 + 50	.035 + 700
	50k-100k	15 + 10	10 + 40	20 + 40	80 + 80	.035 + 700
	100k-300k	30 + 15	80 + 150	80 + 150	100 + 700	.3 + 800
	300k-500k	70 + 100	80 + 300	80 + 300	200 + 1.1 mV	.3 + 800
500k-1M	150 + 100	80 + 500	80 + 500	600 + 3.0 mV	2 + 800	
220V	10-20	150 + 200	50 + 1 mV	50 + 1 mV	10 + .2 mV	.05 + 10 mV
	20-40	80 + 150	15 + 300	15 + 300	10 + .2 mV	.05 + 10 mV
	40-20k	12 + 80	2 + 80	4 + 80	10 + .3 mV	.05 + 10 mV
	20k-50k	15 + 100	10 + 100	20 + 100	30 + .6 mV	.05 + 10 mV
	50k-100k	15 + 100	10 + 500	20 + 500	80 + 3 mV	.1 + 13 mV
	100k-300k	30 + 400	80 + 600	80 + 600	250 + 25 mV	1.5 + 50 mV
	300k-500k	100 + 10 mV	80 + 800	80 + 800	500 + 50 mV	1.5 + 50 mV
500k-1M	200 + 20 mV	80 + 1 mV	80 + 1 mV	1000 + 110 mV	3.5 + 100 mV	
		± (ppm output + mV)	± (ppm output)/°C			± (% output)
1100V	50-1k	20 + .5	2	5	10 + 1	.07



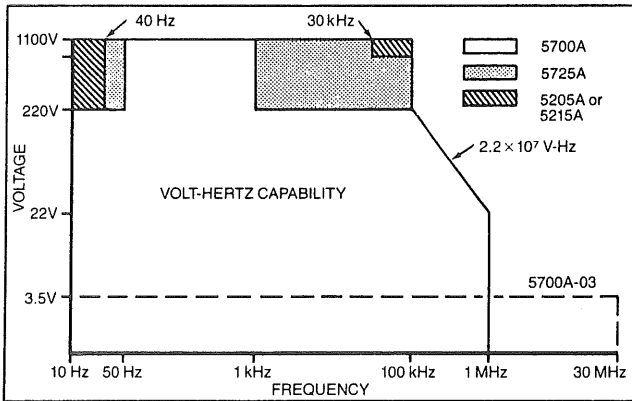
AC Voltage (continued)

Secondary Performance and Operating Characteristics (continued)  
Included in Uncertainty Specifications

5725A Amplifier:						
Range	Frequency	Stability ±1°C 24 Hours	Temperature Coefficient		Load Regulation [Note 2]	Distortion Bandwidth 10 Hz-10 MHz
			10°-40°C	0°-10°C and 40°-50°C		
	Hz	± (ppm output + mV)	± (ppm output)/°C		± (ppm output + mV)	± (% output)
						150 pF    1000 pF
1100V	40-1k	10 + .5	5	5	10 + 1	.07
	1k-20k	15 + 2	5	5	90 + 6	.10
	20k-50k	40 + 2	10	10	275 + 11	.30
	50k-100k	130 + 2	30	30	500 + 30	.30

Voltage Range	Maximum Current Limits	Load Limits
2.2V [Note 1] 22V 220V	50 mA, 0°C-40°C 20 mA, 40°C-50°C	>50Ω, 1000 pF
1100V	6 mA	600 pF
5725A Amplifier:		1000 pF [Note 2]
1100V	40 Hz-5 kHz	50 mA
	5 kHz-30 kHz	70 mA
	30 kHz-100 kHz	70 mA [Note 3]
		300 pF
		150 pF

- Notes:  
 1. 2.2V Range, 100 kHz-1.2 MHz only: uncertainty specifications cover loads to 10 mA or 1000 pF. For higher loads, load regulation is added  
 2. The 5725A will drive up to 1000 pF of load capacitance. Uncertainty specifications include loads to 300 pF and 150 pF as shown under "Load Limits." For capacitances up to the maximum of 1000 pF, add "Load Regulation."  
 3. Applies from 0°C to 40°C.



Output display formats: Voltage or dBm, dBm reference 600Ω.

Minimum output: 10% on each range

External sense: Selectable for 2.2V, 22V, 220V, and 1100V ranges; 5700A <100 kHz, 5725A <30 kHz

Settling time to full accuracy:

Frequency (Hz)	Settling time (seconds)
<120	7
120-120k	5
>120k	2

+ 1 second for amplitude or frequency range change; + 2 seconds for 5700A 1100V range; + 4 seconds for 5725A 1100V range

Overshoot: <10%

Common mode rejection: 140 dB, DC to 400 Hz

Frequency:

Range: 10 Hz to 1.1999 MHz

Uncertainty: ± 0.01%

Resolution: 4½ digits

Phase lock: Selectable rear panel BNC input

Phase uncertainty (except 1100V range):

>30 Hz: ± (1° + 0.05°/kHz), <30 Hz: ± 3°

Input voltage: 1V to 10V rms sine wave

Frequency range: 10 Hz to 1.1999 MHz

Lock range: ± 2% of frequency

Lock-in time: Larger of 10/frequency or 10 msec

Phase reference: Selectable, rear panel BNC output

Range: ± 180°

Phase Uncertainty (except 1100V range):

± 1° at quadrature points (0°, ± 90°, ± 180°) elsewhere ± 2°

Stability: ± 0.1°

Resolution: 1°

Output level: 2.5V rms ± 0.2V

Frequency range: 50 Hz to 1 kHz, useable 10 Hz to 1.1999 MHz

# SPECIFICATIONS

## Resistance

Nominal Value	Absolute Uncertainty of Characterized Value ± 5°C from calibration temperature [Note 1]				Relative Uncertainty ± 1°C	
	24 Hours	90 Days	180 Days	1 Year	24 Hours	90 Days
Ω	± ppm				± ppm	
0	50 μΩ	50 μΩ	50 μΩ	50 μΩ	50 μΩ	50 μΩ
1	85	95	100	110	32	40
1.9	85	95	100	110	25	33
10	26	28	30	33	5	8
19	24	26	28	31	4	7
100	15	17	18	20	2	4
190	15	17	18	20	2	4
1k	11	12	13	15	2	3.5
1.9k	11	12	13	15	2	3.5
10k	9	11	12	14	2	3.5
19k	9	11	12	14	2	3.5
100k	11	13	14	16	2	3.5
190k	11	13	14	16	2	3.5
1M	16	18	20	23	2.5	5
1.9M	17	19	21	24	3.5	6
10M	33	37	40	46	10	14
19M	43	47	50	55	20	24
100M	110	120	125	130	50	60

## Secondary Performance Specifications and Operating Characteristics Included in Uncertainty Specifications

Nominal Value	Stability ± 1°C	Temperature Coefficient [Note 2]		Full Spec Load Range [Note 3]	Maximum Peak Current	Maximum Difference of Characterized to Nominal Value	Two-Wire Adder active compensation [Note 4]	
		10°-40°C	0°-10°C and 40°-50°C				Lead Resistance	
	24 Hours	± ppm/°C	mA	mA	± ppm	0.1Ω	1Ω	
Ω	± ppm	± ppm/°C		mA	mA	± ppm	± mΩ	
0	—	—	—	8-500	500	—	2	4
1	32	4	5	8-100	700	500	2	4
1.9	25	6	7	8-100	500	500	2	4
10	5	2	3	8-11	220	300	2	4
19	4	2	3	8-11	160	300	2	4
100	2	2	3	8-11	70	150	2	4
190	2	2	3	8-11	50	150	2	4
1k	2	2	3	1-2	22	150	10	15
1.9k	2	2	3	1-1.5	16	150	10	15
10k	2	2	3	100-500 μA	7	150	50	60
19k	2	2	3	50-250 μA	5	150	100	120
100k	2	2	3	10-100 μA	1	150		
190k	2	2	3	5-50 μA	500 μA	150		
1M	2.5	2.5	6	5-20 μA	100 μA	200		
1.9M	3.5	3	10	2.5-10 μA	50 μA	200		
10M	10	5	20	.5-2 μA	10 μA	300		
19M	20	8	40	.25-1 μA	5 μA	300		
100M	50	12	100	50-200 nA	1 μA	500		

**Notes:**

1. Specifications apply to displayed value. 4-wire connections, except 100 MΩ, <80% RH to 30°C, <70% RH to 40°C, <60% RH to 50°C
2. Temperature coefficient is an adder to uncertainty specifications that does *not* apply unless operated more than 5°C from calibration temperature, or calibrated outside the range 19°C to 24°C. Two examples:
  - a) Calibrate at 20°C: Temperature coefficient adder is not required unless operated below 15°C or above 25°C.
  - b) Calibrate at 26°C: Add 2°C temperature coefficient adder. Additional temperature coefficient adder is *not* required unless operated below 21°C or above 31°C.
3. Refer to current derating factors table for loads outside of this range.
4. Active two-wire compensation may be selected for values less than 100 kΩ, with either the front panel or the meter input terminals as reference plane. Active compensation is limited to 11 mA load, and to 2V burden.

Current Derating Factors

Nominal Value	Value of Derating Factor K for Over or Under Current		
	Two-Wire Comp $I < I_L$ (Note 1)	Four-Wire $I < I_L$ (Note 1)	Four-Wire $I_U < I < I_{MAX}$ (Note 2)
$\Omega$			
SHORT	4.4	300	—
1	4.4	300	$4 \times 10^{-5}$
1.9	4.4	160	$1.5 \times 10^{-4}$
10	4.4	30	$1.6 \times 10^{-3}$
19	4.4	16	$3 \times 10^{-3}$
100	4.4	3.5	$1 \times 10^{-2}$
190	4.4	1.8	$1.9 \times 10^{-2}$
1k	4.4	0.4	0.1
1.9k	4.4	0.21	0.19
10k	5000	50	2.0
19k	5000	26	3.8
100k	—	7.5	$2 \times 10^{-5}$
190k	—	4.0	$3.8 \times 10^{-5}$
1M	—	1.0	$1.5 \times 10^{-4}$
1.9M	—	0.53	$2.9 \times 10^{-4}$
10M	—	0.2	$1 \times 10^{-3}$
19M	—	0.53	$1.9 \times 10^{-3}$
100M	—	0.1	—

Notes:

- For  $I < I_L$ , errors occur due to thermally generated voltages within the 5700A. Use the following equation to determine the error, and add this error to the corresponding UNCERTAINTY or STABILITY specification.

$$\text{Error} = K(I_L - I)/(I_L \times I)$$

Where: Error is in m $\Omega$  for all TWO-WIRE COMP values and FOUR-WIRE SHORT, and in ppm for the remaining FOUR-WIRE values.

K is the constant from the above table;

I and  $I_L$  are expressed in mA for SHORT to 1.9 k $\Omega$ ;

I and  $I_L$  are expressed in  $\mu$ A for 10 k $\Omega$  to 100 M $\Omega$

- For  $I_U < I < I_{MAX}$  errors occur due to self-heating of the resistors in the 5700A. Use the following equation to determine the error in ppm, and add this error to the corresponding UNCERTAINTY or STABILITY specification.

$$\text{Error in ppm} = K(I^2 - I_U^2)$$

Where: K is the constant from the above table;

I and  $I_U$  are expressed in mA for SHORT to 19 k $\Omega$ ;

I and  $I_U$  are expressed in  $\mu$ A for 100 k $\Omega$  to 100 M $\Omega$

# SPECIFICATIONS

## DC Current

Range	Resolution	Absolute Uncertainty ± 5°C from calibration temperature				Relative Uncertainty ± 1°C	
		24 Hours	90 Days	180 Days	1 Year	24 Hours	90 Days
	nA	± (ppm output + nA)				± (ppm output + nA)	
220 μA 2.2 mA 22 mA	.1 1 10	45 + 10 45 + 10 45 + 100	50 + 10 50 + 10 50 + 100	55 + 10 55 + 10 55 + 100	60 + 10 60 + 10 60 + 100	24 + 2 24 + 2 24 + 20	26 + 2 26 + 2 26 + 20
	μA	± (ppm output + μA)				± (ppm output + μA)	
220 mA 2.2A [Note 1]	.1 1	55 + 1 75 + 30	60 + 1 80 + 30	65 + 1 90 + 30	70 + 1 95 + 30	26 + .2 40 + 6	30 + .2 45 + 6
<b>5725A Amplifier:</b>							
11A	10	330 + 470	340 + 480	350 + 480	360 + 480	100 + 130	110 + 130

## Secondary Performance Specifications and Operating Characteristics Included in Uncertainty Specifications

Range	Stability ± 1°C  24 Hours	Temperature Coefficient [Note 2]		Compliance Limits	Burden Voltage Adder [Note 3]	Maximum Load For Full Accuracy [Note 4]	Noise	
		10°-40°C	0°-10°C and 40°-50°C				Bandwidth 0.1-10 Hz pk-pk	Bandwidth 10-10 kHz RMS
	± (ppm output + nA)	± (ppm output + nA)/°C		V	± nA/V	Ω	ppm output + nA	nA
220 μA 2.2 mA 22 mA 220 mA 2.2A	5 + 1 5 + 5 5 + 50 8 + 300 9 + 700	1 + .40 1 + 2 1 + 20 1 + 200 1 + 2.5 μA	3 + 1 3 + 10 3 + 100 3 + 1 μA 3 + 10 μA	10 10 10 10 3 [Note 5]	.2 .2 10 100 2 μA	20k 2k 200 20 2	6 + .9 6 + 5 6 + 50 9 + 300 12 + 1.5 μA	10 10 50 500 20 μA
<b>5725A:</b>	± (ppm output + μA)	± (ppm output + μA)/°C					ppm output + μA	μA
11A	25 + 100	20 + 75	30 + 120	4	0	4	15 + 70	175

### Notes:

Maximum output from 5700A terminals is 2.2A. Uncertainty specifications for 220 μA and 2.2 mA ranges are increased by 1.3 × when supplied through 5725A terminals. Specifications are otherwise identical for all output locations.

#### 1. Add to uncertainty specifications:

- ± 200 × I<sup>2</sup> ppm for >100 mA on 220 mA range
- ± 10 × I<sup>2</sup> ppm for >1A on 2.2A range

2. Temperature coefficient is an adder to uncertainty specifications. It does *not* apply unless operating more than ± 5°C from calibration temperature.

3. Burden voltage adder is an adder to uncertainty specifications that does *not* apply unless burden voltage is greater than 0.5V.

4. For higher loads, multiply uncertainty specification by:

$$1 + \frac{0.1 \times \text{actual load}}{\text{maximum load for full accuracy}}$$

5. 5700A compliance limit is 2V for outputs from 1A to 2.2A. 5725A Amplifier may be used in range-lock mode down to 0A.

**Minimum output:** 0 for all ranges, including 5725A.

**Settling time to full accuracy:** 1 second for μA and mA ranges; 3 seconds for 2.2A range; 6 seconds for 11A range; + 1 second for range or polarity change

**Overshoot:** <5%

AC Current

Range	Resolution	Frequency	Absolute Uncertainty ± 5°C from calibration temperature				Relative Uncertainty ± 1°C	
			24 Hours	90 Days	180 Days	1 Year	24 Hours	90 Days
			± (ppm output + nA)					
220 µA	1 nA	10-20	650 + 30	700 + 30	750 + 30	800 + 30	450 + 30	500 + 30
		20-40	350 + 25	380 + 25	410 + 25	420 + 25	270 + 25	300 + 25
		40-1k	120 + 20	140 + 20	150 + 20	160 + 20	110 + 20	120 + 20
		1k-5k	500 + 50	600 + 50	650 + 50	700 + 50	450 + 50	500 + 50
		5k-10k	.15% + 100	.16% + 100	.17% + 100	.18% + 100	.14% + 100	.15% + 100
2.2 mA	10 nA	10-20	650 + 50	700 + 50	750 + 50	800 + 50	450 + 50	500 + 50
		20-40	350 + 40	380 + 40	410 + 40	420 + 40	270 + 40	300 + 40
		40-1k	120 + 40	140 + 40	150 + 40	160 + 40	110 + 40	120 + 40
		1k-5k	500 + 500	600 + 500	650 + 500	700 + 500	450 + 500	500 + 500
		5k-10k	.15% + 1 µA	.16% + 1 µA	.17% + 1 µA	.18% + 1 µA	.14% + 1 µA	.15% + 1 µA
22 mA	100 nA	10-20	650 + 500	700 + 500	750 + 500	800 + 500	450 + 500	500 + 500
		20-40	350 + 400	380 + 400	410 + 400	420 + 400	270 + 400	300 + 400
		40-1k	120 + 400	140 + 400	150 + 400	160 + 400	110 + 400	120 + 400
		1k-5k	500 + 5 µA	600 + 5 µA	650 + 5 µA	700 + 5 µA	450 + 5 µA	500 + 5 µA
		5k-10k	.15% + 10 µA	.16% + 10 µA	.17% + 10 µA	.18% + 10 µA	.14% + 10 µA	.15% + 10 µA
		Hz	+ (ppm output + µA)				+ (ppm output + µA)	
220 mA	1 µA	10-20	650 + 5	700 + 5	750 + 5	800 + 5	450 + 5	500 + 5
		20-40	350 + 4	380 + 4	410 + 4	420 + 4	280 + 4	300 + 4
		40-1k	120 + 4	150 + 4	170 + 4	180 + 4	110 + 4	130 + 4
		1k-5k	500 + 50	600 + 50	650 + 50	700 + 50	450 + 50	500 + 50
		5k-10k	.15% + 100	.16% + 100	.17% + 100	.18% + 100	.14% + 100	.15% + 100
2.2A	10 µA	40-1k	600 + 40	650 + 40	700 + 40	750 + 40	600 + 40	650 + 40
		1k-5k	700 + 100	750 + 100	800 + 100	850 + 100	650 + 100	750 + 100
		5k-10k	.80% + 200	.90% + 200	.95% + 200	1.0% + 200	.75% + 200	.85% + 200
<b>5725A Amplifier:</b>								
11A	100 µA	40-1k	370 + 170	400 + 170	440 + 170	460 + 170	300 + 170	330 + 170
		1k-5k	800 + 380	850 + 380	900 + 380	950 + 380	700 + 380	800 + 380
		5k-10k	.3% + 750	.33% + 750	.35% + 750	.36% + 750	.28% + 750	.32% + 750

# SPECIFICATIONS

## AC Current (continued)

### Secondary Performance Specifications and Operating Characteristics Included in Uncertainty Specifications

Range	Frequency	Stability ±1°C  24 Hours	Temperature Coefficient [Note 1]		Compliance Limits	Maximum Resistive Load For Full Accuracy [Note 2]	Noise and Distortion  Bandwidth 10 Hz-50 kHz <0.5V Burden
			10°-40°C	0°-10°C and 40°-50°C			
		Hz	±(ppm output + nA)	±(ppm output + nA)/μC		V rms	Ω
220 μA	10-20	150 + 5	50 + 5	50 + 5	7	2k	.05 + .1
	20-40	80 + 5	20 + 5	20 + 5			.05 + .1
	40-1k	30 + 3	4 + .5	10 + .5			.05 + .1
	1k-5k	50 + 20	10 + 1	20 + 1			.25 + .5
	5k-10k	400 + 100	20 + 100	20 + 100			.5 + 1
2.2 mA	10-20	150 + 5	50 + 5	50 + 5	7	500	.05 + .1
	20-40	80 + 5	20 + 4	20 + 4			.05 + .1
	40-1k	30 + 3	4 + 1	10 + 2			.05 + .1
	1k-5k	50 + 20	10 + 100	20 + 100			.25 + .5
	5k-10k	400 + 100	50 + 400	50 + 400			.5 + 1
22 mA	10-20	150 + 50	50 + 10	50 + 10	7	150	.05 + .1
	20-40	80 + 50	20 + 10	20 + 10			.05 + .1
	40-1k	30 + 30	4 + 10	10 + 20			.05 + .1
	1k-5k	50 + 500	10 + 500	20 + 400			.25 + .5
	5k-10k	400 + 1 μA	50 + 1 μA	50 + 1 μA			.5 + 1
	Hz	±(ppm output + μA)	±(ppm output + μA)/°C				
220 mA	10-20	150 + .5	50 + .05	50 + .05	7	15	.05 + 10
	20-40	80 + .5	20 + .05	20 + .05			.05 + 10
	40-1k	30 + .3	4 + .1	10 + .1			.05 + 10
	1k-5k	50 + 3	10 + 2	20 + 2			.25 + 50
	5k-10k	400 + 5	50 + 5	50 + 5			.5 + 100
2.2A	40-1k	50 + 5	4 + 1	10 + 1	2 [Note 3]	2	.5 + 100
	1k-5k	80 + 20	10 + 5	20 + 5			.3 + 500
	5k-10k	800 + 50	50 + 10	50 + 10			1 + 1 mA
<b>5725A Amplifier:</b>							±(% output)
11A	40-1k	75 + 100	20 + 75	30 + 75	3	3	[Note 4] { .05 .12 .5
	1k-5k	100 + 150	40 + 75	50 + 75			
	5k-10k	200 + 300	100 + 75	100 + 75			

#### Notes:

Maximum output from 5700A terminals is 2.2A. Uncertainty specifications for 220 μA and 2.2 mA ranges are increased by 1.3 × when supplied through 5725A terminals. Specifications are otherwise identical for all output locations.

1. Temperature coefficient is an adder to uncertainty specifications that does not apply unless operating more than ±5°C from calibration temperature.

2. For larger resistive loads multiply uncertainty specifications by:

$$\left( \frac{\text{actual load}}{\text{maximum load for full accuracy}} \right)^2$$

3. 1.5V compliance limit above 1A. 5725A Amplifier may be used in range-lock mode down to 1A.

4. For resistive loads within rated compliance voltage limits.

**Minimum output:** 9 μA for 220 μA range, 10% on all other ranges. 1A minimum for 5725A.

**Inductive load limits:** 400 μH (5700A or 5725A). 20 μH for 5700A output >1A.

**Power factors:** 5700A, 0.9 to 1; 5725A, 0.1 to 1. Subject to compliance voltage limits.

**Frequency uncertainty:** ±0.01%

**Settling time to full accuracy:** 5 seconds for 5700A ranges; 6 seconds for 5725A 11A range; + 1 second for amplitude or frequency range

**Overshoot:** <10%

## Wideband AC Voltage (Option -03)

Specifications apply to the end of the cable and 50Ω termination used for calibration:

Range		Resolution	Absolute Uncertainty ±5°C from calibration temperature 30 Hz-500 kHz			
Volts	dBm		24 Hours	90 Days	180 Days	1 Year
± (% output + μV)						
1.1 mV	-46	10 nV	.4 + .4	.5 + .4	.6 + .4	.8 + 2
3 mV	-37	10 nV	.4 + 1	.45 + 1	.5 + 1	.7 + 3
11 mV	-26	100 nV	.2 + 4	.35 + 4	.5 + 4	.7 + 8
33 mV	-17	100 nV	.2 + 10	.3 + 10	.45 + 10	.6 + 16
110 mV	-6.2	1 μV	.2 + 40	.3 + 40	.45 + 40	.6 + 40
330 mV	+3.4	1 μV	.2 + 100	.25 + 100	.35 + 100	.5 + 100
1.1V	+14	10 μV	.2 + 400	.25 + 400	.35 + 400	.5 + 400
3.5V	+24	10 μV	.15 + 500	.2 + 500	.3 + 500	.4 + 500

Frequency	Frequency Resolution	Amplitude Flatness, 1 kHz Reference			Temperature Coefficient	Settling Time To Full Accuracy	Harmonic Distortion
		Voltage Range					
		1.1 mV	3 mV	>3 mV			
Hz	Hz	± %			± ppm/°C	Seconds	dB
10-30	.01	.3	.3	.3	100	7	-40
30-120	.01	.1	.1	.1	100	7	-40
120-1.2k	.1	.1	.1	.1	100	5	-40
1.2k-12k	1	.1	.1	.1	100	5	-40
12k-120k	10	.1	.1	.1	100	5	-40
120k-1.2M	100	.2 + 3 μV	.1 + 3 μV	.1 + 3 μV	100	5	-40
1.2M-2M	100k	.2 + 3 μV	.1 + 3 μV	.1 + 3 μV	100	0.5	-40
2M-10M	100k	.4 + 3 μV	.3 + 3 μV	.2 + 3 μV	100	0.5	-40
10M-20M	1M	.6 + 3 μV	.5 + 3 μV	.4 + 3 μV	150	0.5	-34
20M-30M	1M	1.5 + 15 μV	1.5 + 3 μV	1 + 3 μV	300	0.5	-34

### Additional Operating Information:

dBm reference = 50Ω

Range boundaries are at voltage points, dBm levels are approximate.

$$\text{dBm} = 10 \log \left( \frac{\text{Power}}{1 \text{ mW}} \right)$$

0.22361V across 50Ω = 1 mW or 0 dBm

**Minimum output:** 300 μV (-57 dBm)

**Frequency uncertainty:** ±0.01%

**Overload protection:** A short circuit on the wideband output will not result in damage. After settling time, normal operation is restored upon removal.

# SPECIFICATIONS

## General Specifications:

**Warm-up time:**  $2 \times$  the time since last warmed up, to a maximum of 30 minutes.

**System installation:** Rear output configuration and rack-mount kit available.

**Standard interfaces:** IEEE-488, RS-232, 5725A, 5205A or 5215A, 5220A, phase lock in (BNC), phase reference out (BNC).

**Temperature performance:** Operating:  $0^{\circ}\text{C}$  to  $50^{\circ}\text{C}$ . Calibration:  $15^{\circ}\text{C}$  to  $35^{\circ}\text{C}$ . Storage:  $-40^{\circ}\text{C}$  to  $75^{\circ}\text{C}$

**Relative humidity:** Operating:  $<80\%$  to  $30^{\circ}\text{C}$ ,  $<70\%$  to  $40^{\circ}\text{C}$ ,  $<40\%$  to  $50^{\circ}\text{C}$ . Storage:  $<95\%$ , non-condensing

**Safety:** Designed to comply with UL1244 (1987); IEC 348-1978; IEC 66E (CO) 4; CSA 556B.

**Guard isolation:** 20 volts

**EMI/RFI:** Designed to comply with FCC Rules Part 15, Subpart J, Class B; VDE 0871, Class B.

**Reliability:** MIL-T-28800D, para. 3.13.3.

**Line Power:** 47 to 63 Hz;  $\pm 10\%$  allowed about selectable nominal line voltage: 100V, 110V, 115V, 120V, 200V, 220V, 230V, 240V. Maximum power: 5700A, 300VA; 5725A, 750VA.

### Size:

5700A: Height 17.8 cm (7 in), standard rack increment, plus 1.5 cm (0.6 in) for feet; Width 43.2 cm (17 in), standard rack width; Depth 63.0 cm (24.8 in), overall; 57.8 cm (22.7 in), rack depth.

5725A: Height 13.3 cm (5.25 in); Width and depth same as 5700A. Both units project 5.1 cm (2 in) from rack front

**Weight:** 5700A: 27kg (62 lbs); 5725A: 32kg (70 lbs).

