Manual Supplement

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This supplement contains information necessary to ensure the accuracy of the above manual. This manual is distributed as an electronic manual on the following CD-ROM:

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Change #1

On page 4-12, replace Table 4-1 with the following:

Table 4-1. Power Input Fuse 1

Power Input Fuse F1	Fuse Action	Fuse Rating IEC 127 (UL/CSA)	Fluke Part No.	Manufacturer & Type No.
115 VAC, 230 VAC	TH Time delay HBC	1.25 A (2 A) @ 250 V	2059740	Schurter 0001.2505
				Bussman S505-1.25-R
				Littelfuse 215 1.25P
				Bel Fuse 5HT 1.25-R

Change #2

On page 4-13, replace Table 4-2 with the following:

Table 4-2. Current Function Rear Input Fuse 2

Fuse Action	Fuse Rating IEC 127 (UL / CSA)	Fluke Part No.	Manufacturer & Type No.
FH Fast acting HBC	1.6 A (2 A) @ 250 V	1582072	Bussman S501-1.6-R
			Littelfuse 021601.6HXP
			Littelfuse 021601.6MXP

Change #3, 63078, 64079, 64089, 64348

Replace the entire ***Specifications*** pages 1-7 through 1-21 with:

Specifications

General Specifications

Power

Voltage

115 V Setting ..... 100 V to 120 V rms designed for additional voltage fluctuations ±10 %.

230 V Setting ..... 200 V to 240 V rms designed for additional voltage fluctuations ±10 %.

Frequency ..... 50 Hz to 60 Hz designed for additional frequency variation of ±3 Hz.

Consumption ..... < 80 VA

Power Cord ..... NEMA 5-15 plug, IEC 60320-C13 receptacle, cable 3 core 18AWG to SVT

Dimensions

Height ..... 88 mm (3.5 inches)

Width ..... 427 mm (16.8 inches)

Depth ..... 487 mm (19.2 inches)

Weight ..... 11.5 kg (25.5 lbs)

Environment

Temperature

Operating ..... 0 °C to 50 °C

Specified Operation ..... 5 °C to 40 °C

Calibration (TCal) ..... 20 °C to 25 °C

Factory Cal Temp ..... 23 °C

Storage ..... -20 °C to 70 °C

Warm Up	4 hours to full uncertainty specification.
Relative Humidity (non- condensing)	
Operating[18]	5 °C to 40 °C < 90 %.
Storage	0 °C to 70 °C < 95 %
Altitude	
Operating	< 2000 meters
Storage	< 12000 meters
Vibration and Shock	Complies with MIL-PRF-28800F Class 3.
Safety	Designed and tested to IEC/EN61010-1: 2001, UL 61010-1:2004, CAN/CSA-C22.2 No.61010.1-04, CE marked and ETL (US & C) listed. Pollution Degree 2. Installation Category II. Equipment Class I (single insulation / Earthed metal case). Protection against water ingress IP20 (general indoor conditions).
EMC	EN61326-1:2006 class B, FCC Rules part 15 sub part B,

Measurement Isolation

Guard to Safety Ground	< 3300 pF, > 10 GΩ.
Lo to Guard	
In Remote Guard	< 2800 pF, > 10 GΩ (Not in Resistance function).
In Local Guard	Lo and Guard terminals are internally shorted (in Resistance < 2800 pF, > 10 GΩ).

Autorange

Range Up	100 % of range.
Range Down	9 % of range (18 % on 1000 V range).
Remote Interface	IEEE 488.2
Warranty	1 Year

Maximum Voltage and Current Inputs

Notes to maximum voltage and current input specifications

- Maximum DC input equal to maximum rms input. Maximum peak input is rms x 1.414
- Specifications apply equally to front and rear input terminals except where noted below.
- Front to rear isolation allows opposing polarity of maximum terminal voltage on each input.
- Digital I/O Ground (DigGnd) is internally connected to Safety Ground (Ground).
- Maximum Common Mode voltage with respect to Safety Ground is 1.7 x 10^5 VHz.

DC and AC Voltage

Maximum rms terminal voltages

							Sense Hi
						Hi	250 V
					Sense Lo	1000 V	1000 V
				Lo	250 V	1000 V	1000 V
			A	1000 V	1000 V	1000 V	1000 V
		Guard	1000 V	250 V	250 V	1000 V	1000 V
	DigGnd	650 V	650 V	650 V	650 V	1000 V	1000 V
Ground	0 V	650 V	650 V	650 V	650 V	1000 V	1000 V

Notes

- The A terminal is open circuit in these functions.
- In 4wV mode Sense Hi is internally connected to Hi and Sense Lo is internally connected to Lo.

DC and AC Current

Maximum rms terminal voltages

							Sense Hi
						Hi	250 V
					Sense Lo	1000 V	1000 V
				Lo	250 V	1000 V	1000 V
			A	5 V	250 V	1000 V	1000 V
		Guard	250 V	250 V	250 V	1000 V	1000 V
	DigGnd	650 V	650 V	650 V	650 V	1000 V	1000 V
Ground	0 V	650 V	650 V	650 V	650 V	1000 V	1000 V

Maximum rms terminal currents

	Guard	A	Lo	Sense Lo	Hi	Sense Hi
Front Input	n.a	20 A	20 A	n.a	n.a	n.a
Rear input	n.a	2 A	2 A	n.a	n.a	n.a

Notes

- The Sense Lo, Sense Hi, and Hi Terminals are open circuit in these functions.
- The front input A terminal protection is automatic and self-resetting, and does not interrupt current flow. Damage is likely to occur if more than 20 A is applied.
- The rear input A terminal is protected by a fuse mounted on the rear panel.

Resistance and Temperature

Maximum rms terminal voltages

							Sense Hi
						Hi	250 V
					Sense Lo	250 V	250 V
				Lo	250 V	250 V	250 V
			A	250 V	250 V	250 V	250 V
		Guard	250 V	250 V	250 V	250 V	250 V
	DigGnd	650 V	650 V	650 V	650 V	1000 V	1000 V
Ground	0 V	650 V	650 V	650 V	650 V	1000 V	1000 V

Note

- The A terminal is open circuit in these functions.

Electrical Measurement Specifications

Note

Fluke guarantees 8508A performance verification using specifications stated to 99 % confidence level.

DC Voltage

DC Voltage [1] [2] [3]

Range	Full Scale[15]	Uncertainty Relative to Cal Stds			Absolute Uncertainties	
		± (ppm Reading + ppm Range)[4]				
		24 hour TCal ±1 °C	90 day TCal ±1 °C	365 day TCal ±1 °C	365 day TCal ±1 °C	365 day TCal ±5 °C
95 % Confidence Level						
200 mV	199.990 000	0.7 + 0.5	1.4 + 0.5	2.7 + 0.5	4.5 + 0.5	5.0 + 0.5
2 V	1.999 900 00	0.5 + 0.2	1.4 + 0.2	2.7 + 0.2	3.0 + 0.2	3.5 + 0.2
20 V	19.999 000 0	0.5 + 0.2	1.4 + 0.2	2.7 + 0.2	3.0 + 0.2	3.5 + 0.2
200 V	199.990 000	1.0 + 0.2	2.6 + 0.2	4.0 + 0.2	4.5 + 0.2	5.5 + 0.2
1000 V	1050.000 00	1.0 + 0.5	2.6 + 0.5	4.0 + 0.5	4.5 + 0.5	5.5 + 0.5
99 % Confidence Level						
200 mV	199.990 000	0.8 + 0.6	2.0 + 0.6	3.5 + 0.6	6.0 + 0.6	6.5 + 0.6
2 V	1.999 900 00	0.6 + 0.25	1.8 + 0.25	3.5 + 0.25	4.0 + 0.25	4.5 + 0.25
20 V	19.999 000 0	0.6 + 0.25	1.8 + 0.25	3.5 + 0.25	4.0 + 0.25	4.5 + 0.25
200 V	199.990 000	1.2 + 0.25	3.5 + 0.25	5.2 + 0.25	6.0 + 0.25	7.0 + 0.25
1000 V	1050.000 00	1.2 + 0.6	3.5 + 0.6	5.2 + 0.6	6.0 + 0.6	7.0 + 0.6

DC Voltage (Secondary Specifications)[1] [2] [3]

Range	Transfer Uncertainty 20 mins ±1 °C ± (ppm Reading+ ppm Range)	Temperature Coefficient		
		15 °C - 30 °C	5 °C - 15 °C 30 °C - 40 °C	5 °C - 40 °C[16]
		± ppm Reading/°C		± V/°C
200 mV	0.4 + 0.3	0.4	0.6	100 n
2 V	0.12 + 0.1	0.3	0.5	200 n
20 V	0.12 + 0.1	0.3	0.5	1 µ
200 V	0.4 + 0.1	0.7	1.0	20 µ
1000 V	0.4 + 0.3	0.7	1.0	100 µ

Type ..... Multi-slope, multi-cycle A-D Converter

CMRR (1 kΩ unbalance) [5] ..... 140 dB at DC and 1 - 60 Hz

NMRR [5]

Filter Out ..... 60 dB at 50/60 Hz ±0.09 %

Filter In ..... 110 dB at 50/60 Hz ±0.09 %

Protection (All ranges)..... 1 kV rms

Input Impedance

200 mV to 20 V Ranges..... > 10 GΩ

200 V & 1000 V Ranges ..... 10.1 MΩ ± 1 %

Max Input Current..... 50 pA

Ratio Accuracy

Range to Range..... Apply an RSS summation of Net Front Input Accuracy and Net Rear Input Accuracy [17]

Within Range ..... Using the 24 hour or 20 minute Transfer Uncertainty specifications as appropriate, apply an RSS summation of specified accuracy of the Front Input signal and the specified accuracy of the Rear Input signal [17]

Settling Time (to 10 ppm step size)

Filter Out ..... < 50 ms

Filter In..... < 1 s

DC Current

DC Current [1] [2] [3]

Range	Full Scale[15]	Uncertainty Relative to Cal Stds			Absolute Uncertainties	
		± (ppm Reading + ppm Range)[4]				
		24 hour TCal ±1 °C	90 day TCal ±1 °C	365 day TCal ±1 °C	365 day TCal ±1 °C	365 day TCal ±5 °C
95 % Confidence Level						
200 µA	199.990 00	5.5 + 2.0	6.0 + 2.0	6.5 + 2.0	12 + 2.0	12 + 2.0
2 mA	1.999 900 0	5.5 + 2.0	6.0 + 2.0	6.5 + 2.0	12 + 2.0	12 + 2.0
20 mA	19.999 000	6.5 + 2.0	7.0 + 2.0	8.0 + 2.0	13 + 2.0	14 + 2.0
200 mA	199.990 00	28 + 4.0	30 + 4.0	33 + 4.0	36 + 4.0	48 + 4.0
2 A	1.999 900 0	80 + 8.0	125 + 8.0	170 + 8.0	170 + 8.0	185 + 8.0
20 A	19.999 000	200 + 20	290 + 20	380 + 20	380 + 20	400 + 20
99 % Confidence Level						
200 µA	199.990 00	7.0 + 2.0	7.5 + 2.0	8.0 + 2.0	15 + 2.0	16 + 2.0
2 mA	1.999 900 0	7.0 + 2.0	7.5 + 2.0	8.0 + 2.0	15 + 2.0	16 + 2.0
20 mA	19.999 000	8.0 + 2.0	9.0 + 2.0	10 + 2.0	16 + 2.0	18 + 2.0
200 mA	199.990 00	35 + 4.0	37 + 4.0	40 + 4.0	45 + 4.0	60 + 4.0
2 A	1.999 900 0	100 + 8.0	150 + 8.0	205 + 8.0	210 + 8.0	225 + 8.0
20 A	19.999 000	250 + 20	350 + 20	450 + 20	455 + 20	500 + 20

DC Current (Secondary Specifications) [1] [2] [3]

Range	Input Impedance (Ω)		Temperature Coefficient		
			15 °C - 30 °C	5 °C - 15 °C 30 °C - 40 °C	5 °C - 40 °C[16]
	Front	Rear	± ppm Reading/°C		± A/°C
200 µA	150	150	0.4	0.6	50 p
2 mA	15.2	15.2	0.4	0.6	300 p
20 mA	1.8	1.9	1.2	1.8	3 n
200 mA	1.2	1.3	6. 0	9.0	50 n
2 A	0.3	0.4	8.0	12	500 n
20 A	0.04	-	15	20	10 µ

Type ..... Multi-slope, multi-cycle A-D Converter

Protection

Front Input ..... 20 A rms

Rear Input..... 2 A rms, Rear Panel Fuse

Settling Time

200 µA to 200 mA Ranges, to 10 ppm step size .... Filter Out < 50 ms, Filter In < 1 s

2 A Range

to 100 ppm step size..... < 1 s
to 75 ppm step size..... < 30 s
to 30 ppm step size..... < 5 minutes

20 A Range (at 10 A)
to 300 ppm step size..... < 1 s
to 250 ppm step size..... < 30 s
to 100 ppm step size..... < 5 minutes

AC Voltage

AC Voltage [1] [2] [6] [7] [9]

Range	Full Scale[15]	Frequency (Hz)	Uncertainty Relative to Cal Stds ± (ppm Reading + ppm Range)[4]			Absolute Uncertainties ± (ppm Reading + ppm Range)[4]	
			24 hour TCal ±1 °C	90 day TCal ±1 °C	365 day TCal ±1 °C	365 day TCal ±1 °C	365 day TCal ±5 °C
95% Confidence Level							
200 mV	199.990 0	1 - 10	80 + 70	120 + 70	120 + 70	160 + 70	165 + 70
		10 - 40	80 + 20	120 + 20	120 + 20	130 + 20	140 + 20
		40 - 100	60 + 20	100 + 20	100 + 20	110 + 20	115 + 20
		100 - 2 k	40 + 10	100 + 10	100 + 10	105 + 10	110 + 10
		2k - 10 k	60 + 20	100 + 20	100 + 20	105 + 20	135 + 20
		10k - 30 k	250 + 30	300 + 40	300 + 40	305 + 40	340 + 40
		30k - 100 k	400 + 100	700 + 100	700 + 100	705 + 100	765 + 100
2 V, 20 V & 200 V	1.999 900 19.999 00 199.990 0	1 - 10	70 + 60	100 + 60	100 + 60	140 + 60	150 + 60
		10 - 40	70 + 10	100 + 10	100 + 10	105 + 10	115 + 10
		40 - 100	50 + 10	80 + 10	80 + 10	85 + 10	90 + 10
		100 - 2 k	30 + 10	60 + 10	60 + 10	65 + 10	75 + 10
		2 k - 10 k	50 + 10	80 + 10	80 + 10	85 + 10	110 + 10
		10 k - 30 k	100 + 20	200 + 20	200 + 20	205 + 20	220 + 20
		30 k - 100 k	250 + 100	500 +100	500 +100	505 + 100	570 + 100
		100 k - 300 k	0.15 % + 0.1 %	0.3 % + 0.1 %	0.3 % + 0.1 %	0.3 % + 0.1 %	0.3 % + 0.1 %
		300 k - 1 M	1 % + 0.5 %	1 % + 1 %	1 % + 1 %	1 % + 1 %	1 % + 1 %
1000 V[8]	1050.000	1 - 10	70 + 70	100 + 70	100 + 70	140 + 70	150 + 70
		10 - 40	70 + 20	100 + 20	100 + 20	110 + 20	120 + 20
		40 - 10 k	50 + 20	80 + 20	80 + 20	95 + 20	115 + 20
		10 k - 30 k	100 + 40	200 + 40	200 + 40	205 + 40	225 + 40
		30 k - 100 k	250 + 200	500 + 200	500 + 200	510 + 200	580 + 200
99% Confidence Level							
200 mV	199.990 0	1 - 10	90 + 80	140 + 80	140 + 80	200 + 80	210 + 80
		10 - 40	90 + 25	140 + 25	140 + 25	145 + 25	160 + 25
		40 - 100	70 + 25	115 + 25	115 + 25	125 + 25	135 + 25
		100 - 2 k	45 + 12	115 + 12	115 + 12	125 + 12	135 + 12
		2 k - 10 k	70 + 25	115 + 25	115 + 25	125 + 25	165 + 25
		10 k - 30 k	270 + 35	340 + 50	340 + 50	345 + 50	395 + 50
		30 k - 100 k	450 + 120	750 + 120	750 + 120	755 + 120	855 + 120
2 V, 20 V & 200 V	1.999 900 19.999 00 199.990 0	1 - 10	80 + 70	115 + 70	115 + 70	180 + 70	190 + 70
		10 - 40	80 + 12	115 + 12	115 + 12	120 + 12	135 + 12
		40 - 100	60 + 12	90 + 12	90 + 12	95 + 12	110 + 12
		100 - 2 k	35 + 12	70 + 12	70 + 12	75 + 12	90 + 12
		2 k - 10 k	60 + 12	90 + 12	90 + 12	95 + 12	135 + 12
		10 k - 30 k	115 + 25	240 + 25	240 + 25	245 + 25	260 + 25
		30 k - 100 k	270 + 120	550 + 120	550 +120	555 + 120	650 + 120
		100 k - 300 k	0.15 %+0.12 %	0.3 %+0.12 %	0.3 % + 0.12 %	0.3 % + 0.12 %	0.3 % + 0.12 %
		300 k - 1 M	1 % + 0.6 %	1 % + 1.2 %	1 % + 1.2 %	1 % + 1.2 %	1 % + 1.2 %

1000 V[8]	1050.000	1 - 10	80 + 80	115 + 80	115 + 80	180 + 80	190 + 80
		10 - 40	80 + 25	115 + 25	115 + 25	135 + 25	145 + 25
		40 - 10 k	60 + 25	90 + 25	90 + 25	110 + 25	140 + 25
		10 k - 30 k	115 + 50	240 + 50	240 + 50	250 + 50	265 + 50
		30 k - 100 k	270 + 250	600 + 250	600 + 250	615 + 250	700 + 250

AC Voltage (Secondary Specifications)[1] [2] [9]

Range	Frequency (Hz)	Temperature Coefficient	
		15 °C - 30 °C	5 °C - 15 °C 30 °C - 40 °C
		± ppm Reading/°C	
200 mV	1 - 10	5	10
	10 - 40	5	10
	40 - 100	5	10
	100 - 2 k	5	10
	2 k - 10 k	12	20
	10 k - 30 k	15	20
	30 k - 100 k	40	60
2 V 20 V 200 V	1 - 10	5	10
	10 - 40	5	10
	40 - 100	5	10
	100 - 2 k	5	10
	2 k - 10 k	10	15
	10 k - 30 k	12	20
	30 k - 100 k	40	60
	100 k - 300 k	60	90
	300 k - 1 M	80	120
1000 V	1 - 10	5	10
	10 - 40	5	10
	40 - 10 k	10	15
	10 k - 30 k	12	20
	30 k - 100 k	40	60

Type ..... True rms, AC coupled measures AC component with up to 1000 V DC bias on any range. DC coupled gives $\sqrt{(ac^2 + dc^2)}$

CMRR (1 kΩ unbalance) [5] ..... > 90 dB DC - 60 Hz

Crest Factor

200 mV to 200 V ranges ..... 10:1 at 12 % range, 5:1 at 50 % range, 2.5:1 at full range

1000 V range ..... 10:1 at 25 % range, 5:1 at full range

Protection (All ranges)..... 1 kV rms

Input Impedance ..... 1 MΩ in parallel with 150 pF

DC Accuracy (DC Coupled) ..... Add ±(50 ppm Reading + 50 ppm Range + 20 μV)

Ratio Accuracy

Range to Range..... Apply an RSS summation of Net Front Input and Rear Input Accuracy [17]

Within Range ..... Using the 24 hour specifications as appropriate, apply an RSS summation of specified accuracy of the Front Input signal and the specified accuracy of the Rear Input signal [17]

Settling Time (to 100 ppm step size)

100 Hz filter..... < 0.5 s

40 Hz filter..... < 1.25 s

10 Hz filter..... < 5 s

1 Hz filter..... < 50 s

Frequency Measurement

Signal Amplitude Range ..... 5 % of range to limit set by maximum V·Hz

Gate Mode	Normal	Fast

Resolution	6.5 digits	4.5 digits
Frequency Range	10 Hz - 1 MHz	200 Hz - 1 MHz
Accuracy (1 year, 13 °C - 33 °C)	± (10 ppm of Reading + 2 digits)	± 2 digits
Sample Interval	1 s	50 ms

AC Current

AC Current [1] [2] [6] [9]

Range	Full Scale[15]	Frequency (Hz)	Uncertainty Relative to Cal Stds ± (ppm Reading + ppm Range)[4]			Absolute Uncertainties ± (ppm Reading + ppm Range)[4]	
			24 hour TCal ±1 °C	90 day TCal ±1 °C	365 day TCal ±1 °C	365 day TCal ±1 °C	365 day TCal ±5 °C
95% Confidence Level							
200 µA	199.990 0	1 - 10	200 + 100	250 + 100	250 + 100	475 + 100	500 + 100
		10 - 10 k	200 + 100	250 + 100	250 + 100	475 + 100	500 + 100
		10 k - 30 k	500 + 100	600 + 100	600 + 100	650 + 100	710 + 100
		30 k - 100 k	0.35 % + 100	0.4 % + 100	0.4 % + 100	0.4 % + 100	0.4 % + 100
2 mA & 20 mA	1.999 900 19.9990 00	1 - 10	200 + 100	250 + 100	250 + 100	290 + 100	310+ 100
		10 - 10 k	200 + 100	250 + 100	250 + 100	280 + 100	300 + 100
		10 k - 30 k	500 + 100	600 + 100	600 + 100	650 + 100	710 + 100
		30 k - 100 k	0.35 % + 100	0.4 % + 100	0.4 % + 100	0.4 % + 100	0.4 % + 100
200 mA	199.990 0	1 - 10	200 + 100	250 + 100	250 + 100	290 + 100	310 + 100
		10 -10 k	200 + 100	250 + 100	250 + 100	250 + 100	290 + 100
		10 k - 30 k	500 + 100	600 + 100	600 + 100	600 + 100	625 + 100
2 A	1.999 900	10 - 2 k	500 + 100	600 + 100	600 + 100	600 + 100	620 + 100
		2 k - 10 k	600 + 100	700 + 100	700 + 100	710 + 100	735 + 100
		10 k - 30 k	0.25 % + 100	0.3 % + 100	0.3 % + 100	0.3 % + 100	0.3 % + 100
20 A	19.999 00	10 - 2 k	700 + 100	800 + 100	800 + 100	800 + 100	820 + 100
		2 k - 10 k	0.2 % + 100	0.25 % + 100	0.25 % + 100	0.25 % + 100	0.25 % + 100
99% Confidence Level							
200 µA	199.990 0	1 - 10	250 + 120	300 + 120	300 + 120	590 + 120	620 + 120
		10 - 10 k	250 + 120	300 + 120	300 + 120	590 + 120	620 + 120
		10 k - 30 k	600 + 120	700 + 120	700 + 120	775 + 120	800 + 120
		30 k - 100 k	0.35 % + 120	0.4 % + 120	0.4 % + 120	0.4 % + 120	0.4 % + 120
2 mA & 20 mA	1.999 900 19.999 00	1 - 10	250 + 120	300 + 120	300 + 120	380 + 120	400 + 120
		10 - 10 k	250 + 120	300 + 120	300 + 120	340 + 120	370 + 120
		10 k - 30 k	600+ 120	700 + 120	700 + 120	775 + 120	800 + 120
		30 k - 100 k	0.35 % + 120	0.4 % + 120	0.4 % + 120	0.4 % + 120	0.4 % + 120
200 mA	199.990 0	1 - 10	250 + 120	300 + 120	300 + 120	380 + 120	400 + 120
		10 - 10 k	250 + 120	300 + 120	300 + 120	305 + 120	360 + 120
		10 k - 30 k	600 + 120	700 + 120	700 + 120	700 + 120	740 + 120
2 A	1.999 900	10 - 2 k	600 + 120	700 + 120	700 + 120	705 + 120	725 + 120
		2 k - 10 k	700 + 120	800 + 120	800 + 120	815 + 120	860 + 120
		10 k - 30 k	0.25 % + 120	0.3 % + 120	0.3 % + 120	0.3 % + 120	0.3 % + 120
20 A	19.999 00	10 - 2 k	800 + 120	900 + 120	900 + 120	900 + 120	920 + 120
		2 k - 10 k	0.2 % + 120	0.25 % + 120	0.25 % + 120	0.25 % + 120	0.25 % + 120

AC Current (Secondary Specifications) [1] [2] [6] [9]

Range	Frequency (Hz)	Temperature Coefficient		Input Impedance (Ω)		
		15 °C - 30 °C	5 °C - 15 °C 30 °C - 40 °C			
		± ppm Reading/°C		Range	Front	Rear
200 μA, 2 mA & 20 mA	1 - 10	10	15	200 μA	150	150
	10 - 10 k	10	15	2 mA	15.2	15.2
	10 k - 30 k	12	20	20 mA	1.8	1.9
	30 k - 100 k	40	60			
200 mA	1 - 10	10	15		1.2	1.3
	10 - 10 k	15	20			
	10 k - 30 k	15	20			
2 A	10 - 2 k	10	15		0.3	0.4
	2 k - 10 k	15	20			
	10 k - 30 k	20	30			
20 A	10 - 2 k	20	25		0.04	-
	2 k - 10 k	25	30			

Type ..... True rms, AC coupled. DC coupled gives $\sqrt{(ac^2 + dc^2)}$

Crest Factor ..... 3:1 at 50 % range, 1.5:1 at full range

Protection

Front Input ..... 20 A rms

Rear Input ..... 2 A rms, Rear Panel Fuse

Settling Time	200 μA to 200 mA Ranges	2 A Range	20 A Range (at 10 A)
	to 100 ppm of step	to 100 ppm of step	to 300 ppm of step
100 Hz filter	< 0.5 s	< 1 s	< 1 s
40 Hz filter	< 1.25 s	< 2 s	< 2 s
10 Hz filter	< 5 s	< 10 s	< 10 s
1 Hz filter	< 50 s	< 50 s	< 50 s

Resistance

Resistance [1] [2] [3]

Range	Full Scale[15]	Mode[10]	Uncertainty Relative to Cal Stds			Absolute Uncertainties	
			± (ppm Reading + ppm Range)[4]				
			24 hour TCal ±1 °C	90 day TCal ±1 °C	365 day TCal ±1 °C	365 day TCal ±1 °C	365 day TCal ±5 °C
95% Confidence Level							
2 Ω	1.999 900 00	Normal	5.0 + 2.0	8.0 + 2.0	10 + 2.0	15 + 2.0	17 + 2.0
20 Ω	19.999 000 0	Normal	2.5 + 0.7	4.5 + 0.7	7.0 + 0.7	9.0 + 0.7	9.5 + 0.7
200 Ω	199.990 000	Normal	1.5 + 0.25	4.0 + 0.25	7.0 + 0.25	7.5 + 0.25	8.0 + 0.25
2 kΩ	1.999 900 00	Normal	1.0 + 0.25	3.5 + 0.25	7.0 + 0.25	7.5 + 0.25	8.0 + 0.25
20 kΩ	19.999 000 0	Normal	1.0 + 0.25	3.5 + 0.25	7.0 + 0.25	7.5 + 0.25	8.0 + 0.25
200 kΩ	199.990 000	Normal	1.0 + 0.25	3.5 + 0.25	7.0 + 0.25	7.5 + 0.25	8.0 + 0.25
2 MΩ	1.999 900 00	Normal	2.0 + 0.5	4.0 + 0.5	7.0 + 0.5	8.5 + 0.5	9.0 + 0.5
20 MΩ	19.999 000 0	Normal	3.5 + 5.0	6.0 + 5.0	9.0 + 5.0	15 + 5.0	20 + 5.0
200 MΩ	199.990 000	Normal	20 + 50	25 + 50	30 + 50	60 + 50	120 + 50
2 GΩ	1.999 900 00	Normal	250 + 500	350 + 500	500 + 500	525 + 500	1510 + 500
2 Ω	1.999 900 00	Lo Current	5.0 + 2.0	8.0 + 2.0	10 + 2.0	15 + 2.0	17 + 2.0
20 Ω	19.999 000 0	Lo Current	2.5 + 0.7	4.5 + 0.7	7.0 + 0.7	9.0 + 0.7	9.5 + 0.7
200 Ω	199.990 000	Lo Current	2.5 + 0.7	5.0 + 0.7	7.0 + 0.7	7.5 + 0.7	8.0 + 0.7
2 kΩ	1.999 900 00	Lo Current	2.5 + 0.7	5.0 + 0.7	7.0 + 0.7	7.5 + 0.7	8.0 + 0.7
20 kΩ	19.999 000 0	Lo Current	2.5 + 0.7	5.0 + 0.7	7.0 + 0.7	7.5 + 0.7	8.0 + 0.7
200 kΩ	199.990 000	Lo Current	5.0 + 0.5	6.5 + 0.5	7.0 + 0.5	7.5 + 0.5	8.0 + 0.5
2 MΩ	1.999 900 00	Lo Current	7.0 + 0.5	8.0 + 0.5	9.0 + 0.5	10 + 0.5	15 + 0.5
20 MΩ	19.999 000 0	Lo Current	20 + 5.0	20 + 5.0	25 + 5.0	35 + 5.0	90 + 5.0
200 MΩ	199.990 000	Lo Current	250 + 500	350 + 500	500 + 500	515 + 500	1505 + 500
2 GΩ	1.999 900 00	Lo Current	250 + 500	350 + 500	500 + 500	525 + 500	1510 + 500
20 MΩ	19.999 000 0	High Voltage	2.0 + 0.5	4.0 + 0.5	7.0 + 0.5	15 + 0.5	17 + 0.5
200 MΩ	199.990 000	High Voltage	3.5 + 5.0	6.0 + 5.0	9.0 + 5.0	60 + 5.0	65 + 5.0
2 GΩ	1.999 900 00	High Voltage	20 + 50	25 + 50	30 + 50	150 + 50	180 + 50
20 GΩ [18]	19.999 000 0	High Voltage	250 + 500	350 + 500	500 + 500	525 + 500	1510 + 500
99% Confidence Level							
2 Ω	1.999 900 00	Normal	6.0 + 2.5	10 + 2.5	12 + 2.5	19 + 2.5	22 + 2.5
20 Ω	19.999 000 0	Normal	3.0 + 0.9	5.5 + 0.9	8.5 + 0.9	11.5 + 0.9	12.0 + 0.9
200 Ω	199.990 000	Normal	1.8 + 0.3	5.0 + 0.3	8.5 + 0.3	9.5 + 0.3	10 + 0.3
2 kΩ	1.999 900 00	Normal	1.2 + 0.3	4.5 + 0.3	8.5 + 0.3	9.5 + 0.3	10 + 0.3
20 kΩ	19.999 000 0	Normal	1.2 + 0.3	4.5 + 0.3	8.5 + 0.3	9.5 + 0.3	10 + 0.3
200 kΩ	199.990 000	Normal	1.2 + 0.3	4.5 + 0.3	8.5 + 0.3	9.5 + 0.3	10 + 0.3
2 MΩ	1.999 900 00	Normal	2.5 + 0.6	5.0 + 0.6	8.5 + 0.6	10.5 + 0.6	12 + 0.6
20 MΩ	19.999 000 0	Normal	4.5 + 6.0	7.5 + 6.0	12 + 6.0	20 + 6.0	25 + 6.0
200 MΩ	199.990 000	Normal	25 + 60	30 + 60	35 + 60	75 + 60	150 + 60
2 GΩ	1.999 900 00	Normal	325 + 600	450 + 600	650 + 600	675 + 600	1810 + 600
2 Ω	1.999 900 00	Lo Current	6.0 + 2.5	10 + 2.5	12 + 2.5	19 + 2.5	22 + 2.5
20 Ω	19.999 000 0	Lo Current	3.0 + 0.9	5.5 + 0.9	8.5 + 0.9	11.5 + 0.9	12.0 + 0.9
200 Ω	199.990 000	Lo Current	3.0 + 0.9	6.5 + 0.9	8.5 + 0.9	9.5 + 0.9	10.0 + 0.9
2 kΩ	1.999 900 00	Lo Current	3.0 + 0.9	6.5 + 0.9	8.5 + 0.9	9.5 + 0.9	10.0 + 0.9
20 kΩ	19.999 000 0	Lo Current	3.0 + 0.9	6.5 + 0.9	8.5 + 0.9	9.5 + 0.9	10.0 + 0.9
200 kΩ	199.990 000	Lo Current	6.0 + 0.6	8.0 + 0.6	9.0 + 0.6	9.5 + 0.6	10.0 + 0.6
2 MΩ	1.999 900 00	Lo Current	8.0 + 0.6	10.0 + 0.6	12.0 + 0.6	13.0 + 0.6	17.0 + 0.6
20 MΩ	19.999 000 0	Lo Current	25 + 6.0	25 + 6.0	30 + 6.0	45 + 6.0	110 + 6.0
200 MΩ	199.990 000	Lo Current	325 + 600	450 + 600	650 + 600	670 + 600	1810 + 600
2 GΩ	1.999 900 00	Lo Current	325 + 600	450 + 600	650 + 600	675 + 600	1810 + 600
20 MΩ	19.999 000 0	High Voltage	2.5 + 0.6	5.0 + 0.6	8.5 + 0.6	19 + 0.6	20 + 0.6

200 MΩ	199.990 000	High Voltage	4.5 + 6.0	7.5 + 6.0	12 + 6.0	75 + 6.0	80 + 6.0
2 GΩ	1.999 900 00	High Voltage	25 + 60	30 + 60	35 + 60	195 + 60	230 + 60
20 GΩ [18]	19.999 000 0	High Voltage	325 + 600	450 + 600	650 + 600	675 + 600	1810 + 600

Resistance - Normal Mode (Secondary Specifications) [1] [2] [3] [10]

Range	Measurement Current	Transfer Uncertainty 20 mins ±1 °C ± (ppm Reading + ppm Range)	Temperature Coefficient		
			15 °C - 30 °C	5 °C - 15 °C 30 °C - 40 °C	5 °C - 40 °C[16]
			± ppm Reading/°C		± Ω/°C
2 Ω	100 mA	2.0 + 2.0	1.5	2.5	1.5 μ
20 Ω	10 mA	0.8 + 0.7	0.6	1.0	15 μ
200 Ω	10 mA	0.2 + 0.15	0.5	0.8	20 μ
2 kΩ	1 mA	0.2 + 0.15	0.5	0.8	200 μ
20 kΩ	100 μA	0.2 + 0.15	0.5	0.8	2 m
200 kΩ	100 μA	0.2 + 0.15	0.5	0.8	10 m
2 MΩ	10 μA	0.5 + 0.5	0.6	1.0	100 m
20 MΩ	1 μA	2.5 + 5	2	3	1
200 MΩ	100 nA	15 + 50	20	30	10
2 GΩ	10 nA	200 + 500	200	300	100

Resistance - Lo Current Mode (Secondary Specifications) [1] [2] [3] [10]

Range	Measurement Current	Transfer Uncertainty 20 mins ±1 °C ± (ppm Reading + ppm Range)	Temperature Coefficient		
			15 °C - 30 °C	5 °C - 15 °C 30 °C - 40 °C	5 °C - 40 °C[16]
			± ppm Reading/°C		± Ω/°C
2 Ω	100 mA	2.0 + 2.0	1.5	2.5	1.5 μ
20 Ω	10 mA	0.8 + 0.7	0.6	1.0	15 μ
200 Ω	1 mA	0.8 + 0.7	0.6	1.0	150 μ
2 kΩ	100 μA	0.8 + 0.7	0.6	1.0	1.5 m
20 kΩ	10 μA	0.8 + 0.7	0.6	1.0	15 m
200 kΩ	10 μA	0.5 + 0.5	0.6	1.0	20 m
2 MΩ	1 μA	2.0 + 0.5	2	3	200 m
20 MΩ	100 nA	15 + 5	20	30	2
200 MΩ	10 nA	200 + 500	200	300	20
2 GΩ	10 nA	200 + 500	200	300	100

Resistance - High Voltage Mode (Secondary Specifications) [1] [2] [3]

Range	Measurement Current	Transfer Uncertainty 20 mins ±1 °C ± (ppm Reading + ppm Range)	Temperature Coefficient		
			15 °C - 30 °C	5 °C - 15 °C 30 °C - 40 °C	5 °C - 40 °C[16]
			± ppm Reading/°C		± Ω/°C
20 MΩ	10 μA	0.5 + 0.5	0.6	1.0	2
200 MΩ	1 μA	2.0 + 0.5	2.0	3	20
2 GΩ	100 nA	15 + 50	20	30	200
20 GΩ [18]	10 nA	200 + 500	200	300	2k

Type ..... True 4-wire with Ohms guard. 2-wire selectable.

2 Wire Adder..... ±(10 pA/Ir) x 10^6 ppm of Reading ±50 mΩ ±3 mΩ/°C, where Ir is the measurement current, where the temperature related factor is based on the temperature difference between the present operating temperature and the temperature where the instrument was last zeroed.

Max Lead Resistance ..... 10 Ω in any or all leads, 1 Ω on 2 Ω range

Full Scale Measurement Voltage

Normal Mode ..... 200 mV/2 V/20 V

Lo Current Mode ..... 200 mV/2 V/20 V
High Voltage Mode ..... 200 V
Protection (All ranges) ..... 250 V rms, 360 V pk
Ratio Accuracy
Range to Range ..... Apply an RSS summation of Net Front Input and Rear Input Accuracy [17]
Within Range ..... Using the 24 hour or 20 minute Transfer Uncertainty specifications as appropriate, apply an RSS summation of specified accuracy of the Front Input signal and the specified accuracy of the Rear Input signal [17]
Settling Time ..... Up to 200 kΩ range generally the same as DC Voltage Filter In but depends on external connections

Temperature

Temperature Readout [1] [2] [3]

Resistance Range	Absolute Resistance Measurement Uncertainty 365 day Tcal ±1 °C[4] ±(ppm Reading + mΩ)[11]	Typical Equivalent Temperature Measurement Uncertainty[12]			
		Probe Type	Nominal Temperature (°C)	Resistance (Ω)	Accuracy ± (°C)
95% Confidence Level					
0 - 199.990 000 Ω	7.5 + 0.14	25 Ω PRT/SPRT	-200	5	0.0016
		25 Ω PRT/SPRT	0	25	0.0033
		25 Ω PRT/SPRT	660	84	0.0096
		100 Ω PRT/SPRT	-200	20	0.0007
		100 Ω PRT/SPRT	0	100	0.0023
		100 Ω PRT/SPRT	232	185	0.0042
200 - 1999.900 00 Ω	7.5 + 0.5	100 Ω PRT/SPRT	400	250	0.0069
99% Confidence Level					
0 - 199.990 000 Ω	9.5 + 0.18	25 Ω PRT/SPRT	-200	5	0.0021
		25 Ω PRT/SPRT	0	25	0.0042
		25 Ω PRT/SPRT	660	84	0.0122
		100 Ω PRT/SPRT	-200	20	0.0009
		100 Ω PRT/SPRT	0	100	0.0029
		100 Ω PRT/SPRT	232	185	0.0053
200 - 1999.900 00 Ω	9.5 + 0.6	100 Ω PRT/SPRT	400	250	0.0086

Temperature Readout (Secondary Specifications) [1] [2] [3]

Resistance Range	Resistance Measurement Uncertainty				
	Transfer Uncertainty 20 Minute ±1 °C ±(ppm Reading + mΩ)[11]	2-Wire Adder (Ω)	3-Wire Adder (Ω)	Temp Coeff. ± ppm Reading/°C	
				15 °C - 30 °C	5 °C - 15 °C 30 °C - 40 °C
0 - 199.990 000 Ω	0.8 + 0.14	0.1	0.005	0.6	1.0
200 - 1999.900 00 Ω	0.2 + 0.5	0.1	0.005	0.5	0.8

Type ..... 4-wire current reversal resistance measurement with readout of equivalent temperature. 2-wire and 3-wire selectable without current reversal. Refer to Resistance specifications for additional details.
Temperature Range ..... -200 °C to 660 °C, readout also available in °F or K.
Linearization ..... ITS-90 or Callendar van Dusen. Entry and storage of coefficients and nominal resistance for up to 100 probes.
Current Source ..... 1 mA

Read Rate and Additional Uncertainty

Read Rate and Additional Uncertainty

Function	Resolution	Filter Frequency (Hz)	Read Rate (readings/second)		Additional Errors[13] ± (ppm Reading + ppm Range)	
			Normal	Fast	Normal	Fast
DCV, DCI & Ohms [10]	8		1/25	1/6	0 + 0	0 + 0.1
	7		1/6	1/2	0 + 0.1	0 + 0.5
	6		2	35	1.0 + 0.5	0 + 2.5
	5		35	150	0 + 5	0 + 25
ACV & ACI [6]	6	1	1/50		0 + 0	
		10	1/5		0 + 0	
		40	1/2		0 + 0	
		100	1		0 + 0	
	5	1	1/50		0 + 5	
		10	1/5		0 + 5	
		40	1/2		0 + 5	
		100	2		0 + 5	
ACV Transfer Off [6]		1	1/25		200 + 20	
		10	1/2.5		200 + 20	
		40	1		200 + 20	
		100	4		200 + 20	
PRT & Tru Ohms [14]	8	-	1/90	1/30	0 + 0	
	7	-	1/30	1/10	0 + 0.1	
	6	-	1/4	1/3	1.0 + 0.5	
	5	-	1/3	1/3	0 + 5	

Notes to Performance Specifications

[1] Specifications apply for max resolution in each function, normal mode

[2] Assumes 4 hour warm-up period

[3] Input zero or offset null required whenever the temperature moves more than ±1 °C from the temperature at which the previous null/zero was performed.

[4] TCal = Ambient calibration temperature

[5] Integration time >1 Power Line cycle

[6] Valid for signals >1 % Full Scale, Transfer Mode On. Signals must be DC coupled <40 Hz.

[7] Max Volt.Hertz 3 x 10^7

[8] >300 V, <10 kHz add: ±0.0004 x $(\text{Reading-300})^2$ ppm >300 V, 10 kHz - 30 kHz add: ± (0.0004 + (Frequency - 10000) $x10^{-7}$) x $(\text{Reading-300})^2$ ppm >300 V, >30 kHz add: ±0.0024 x $(\text{Reading-300})^2$ ppm

[9] Typical below 10 Hz for ACV, below 10 Hz and above 10 kHz for ACI.

[10] Tru Ohms mode available on 2 Ω to 20 kΩ ranges. Read Rate reduced in Tru Ohms Mode. Specification for Tru Ohms same as corresponding Normal or Lo Current range

[11] Valid for 4-wire sensor

[12] Not including sensor uncertainty

[13] Assume Range and Full Scale = 2000 V when calculating for 1000 V Range. For DCI, additional errors only apply in 5 digit resolution

[14] Fast mode not available in PRT

[15] The maximum display value for the Analog to Digital converter is 199 990 000 counts. This sets the maximum value measurable on each range to be a one followed by four nines. For example, the maximum measured values on the 2 V range on DC Voltage are ±1.999 900 00 V. However, the 1000 V ranges are limited to a maximum 1050 V.

[16] The zero TC specification only needs to be applied if an input zero has not been performed within ±1 ºC of the current operating temperature.

[17] RSS (Root Sum Square). For more information refer to the Ratio Measurements portion of the “Applying the Specifications” area of these specifications

[18] >2 GΩ Relative Humidity Operating <80 % to 30°C <70 % to 40°C

Applying the Specifications

Introduction

The Fluke 8508A has been designed specifically for metrologists. Not only does it provide the performance metrologists need, but it is specified in a way to allow users to really understand the uncertainties of the measurements, and easily make allowance for those uncertainty contributions when performing measurement uncertainty analyses and compiling uncertainty budgets. Contemporary metrology practices, including ISO17025 based laboratory accreditation schemes, require uncertainty analysis to be performed in accordance with the statistically based techniques described in the ISO Guide to the Expression of Uncertainty in Measurement (often referred to as the 'GUM'). For convenience, the 8508A specifications are quoted at a coverage factor of k=2, equivalent to a confidence level of approximately 95 %, as required by these methods. Specifications are also provided at a confidence level of 99 %.

Performance specifications for the 8508A consist of two elements, the first is a contribution expressed as parts-per-million of the Reading, and the second contribution is expressed as parts-per-million of the Range. These must be evaluated and combined for the relevant reading and range values applicable to the measurement being made, ensuring that both elements are evaluated on the same basis, such as parts per million of the measured value or in absolute terms (volts, amps, ohms, etc). The two elements are combined by adding algebraically. For example measuring 10 V on the 20 VDC range and applying the 365 day
±1 °C specifications:

First, expressing the contributions in terms of parts-per-million of the measured value:

$$= \pm\left(3.0 + 0.2 \text{ x } \frac{20}{10}\right) = \pm(3.0 + 0.4) = \pm 3.4 \text{ ppm of } 10 \text{ V}$$

Second, expressing the contributions in volts:

$$= \pm\left(3.0 \text{ x } 10^{-6} \text{ x } 10 + 0.2 \text{ x } 10^{-6} \text{ x } 20\right) = \pm 3.4 \text{ x } 10^{-5} = \pm 34 \text{ µV}$$

The 8508A is designed to provide accuracy and stability without the need for internal auto or self calibration routines which may otherwise compromise the continuity and traceability of measurement performance history. To realise the full potential of the 8508A performance accepted metrology practices should be employed, such as performing a zeroing or null operation to remove any offsets present in the measurement setup when making DC measurements. The 8508A specifications assume that these methods are employed.

Absolute and Relative Specifications

The Relative to Calibration Standards specifications describe the performance of the 8508A itself for the time periods and temperature range listed excluding the uncertainty of the standards used to perform calibration of the 8508A during manufacture. The Absolute specifications include the uncertainty of the standards used to perform calibration of the 8508A at manufacture and may be used to determine the uncertainty of measurements made with the 8508A for periods up to 1 year and over a temperature range of ±5 °C from calibration. If the user has their 8508A calibrated with different uncertainties, the Relative specifications can be combined with the uncertainties applicable to that calibration to determine the effective absolute uncertainty following that calibration.

Applying User's Calibration Uncertainties

When the 8508A is calibrated by another laboratory the uncertainties of the calibration standards used may be applied by combining those uncertainties with the 8508A's Relative to Standards

specifications. The applicable calibration uncertainties and the 8508A relative specifications must both be expressed at the same confidence level, and be combined in a RSS (Root Sum Square) summation. Accepted metrology practice mandates that calibration uncertainties are stated at 95 %. Check the applicable calibration uncertainties are stated at 95 % and then combine them with the 8508A 95 % Relative specifications. For example, if the 8508A is calibrated at 10 V DC with an uncertainty of 1.5 ppm at 95 %: The absolute uncertainty at 10 V for a period of 90 days and ±1 °C from calibration is:

$$= \pm \sqrt{1.5^2 + \left(1.4 + 0.2 \times \frac{20}{10}\right)^2} = \pm 2.3 \text{ ppm of } 10 \text{ V}$$

Operating and Calibration Temperature Ranges

As a metrology tool, the 8508A will commonly be used in a calibration laboratory where the temperature would be controlled to ±1 °C, and the 8508A ±1 °C specifications are applicable to those situations. The majority of electrical calibration laboratories operate at a nominal temperature of 23 °C, the temperature at which the 8508A is calibrated by Fluke during manufacture and service. The 8508A is also capable of being calibrated at any temperature between 20 °C and 25 °C and the ±1 °C specifications will apply to operation within ±1 °C of that calibration temperature. In the 8508A specification tables the temperature of calibration is referred to as TCal. Specifications for ±5 °C are provided for situations where the 8508A is operated in environments with wider temperature variations up to ±5 °C. For applications where the knowledge of the effect of temperature on 8508A performance is important, temperature coefficients are listed in the 8508A specifications. If the operating temperature is within the range 15 °C to 30 °C the 15 °C to 30 °C temperature coefficient specifications are applicable otherwise use the 5 °C to 15 °C/30 °C to 40 °C figures, provided the temperature lies within that range. The 8508A may be operated at temperatures between 0 °C and 50 °C, but performance is not specified outside the range 5 °C to 40 °C.

Applying Temperature Coefficient Specifications

The 8508A specification tables include information for the typical operating conditions of ±1 °C for calibration laboratories with tight temperature control, and ±5 °C for calibration laboratories with looser temperature control or uncontrolled environments within that temperature range. For the majority of applications choosing the Absolute specifications for the most appropriate operating temperature range will be adequate. However performance at other temperatures may be determined by including an allowance for temperature coefficient over the additional temperature range. Care should be taken when making this calculation as an amount of temperature coefficient is already included in the 8508A specifications and those specifications are themselves based on combining contributions using techniques similar to those employed in uncertainty analysis. For example, consider operating at 33 °C, 10 °C from the 23 °C calibration temperature. The ±5 °C specifications already include a contribution for 5 °C of temperature difference, so this amount of temperature effect must be removed before the effect of the 10 °C difference is added. Consider 10 V on the 20 VDC range: 365 day absolute specification (95 %) at 33 °C expressed in parts-per-million of 10 V is:

$$= \pm \sqrt{\left(3.5 + 0.2 \times \frac{20}{10}\right)^2 - (5 \text{ x } 0.3)^2 + (10 \text{ x } 0.5)^2} = \pm 6.16 \text{ ppm of } 10 \text{ V}$$

Ratio Measurements

The 8508A Ratio mode will automatically take measurements of inputs applied to the front and rear terminals and display the result as a ratio in the voltage and resistance functions. The measurements can be made on the same range or different ranges. When making measurements on different ranges the error in each measurement is evaluated by applying the relevant specification for each range and combining the two specifications in an RSS summation, expressing the contributions in parts-per-million of the measured values. For example, making measurements of the ratio of 100 mV on the 200m VDC range and 100 V on the 200 VDC range, applying the 365 day ±1 °C Absolute specifications:

$$= \pm \sqrt{\left(4.5 + 0.5 \text{ x } \frac{200 \text{ x } 10^{-3}}{100 \text{ x } 10^{-3}}\right)^2 + \left(4.5 + 0.2 \text{ x } \frac{200}{100}\right)^2} = \pm 7.37 \text{ ppm of the ratio}$$

Making measurements on the same range will eliminate range to range errors, such as drift since the time of calibration, and improve the result. When making measurements on the same range these errors will affect both measurements and effectively cancel, leaving short term noise and linearity as the dominant errors. The 20 minute Transfer Uncertainty Specifications are provided to describe the performance obtained when making ratio measurements on the same range. The error in each measurement is evaluated by applying the relevant 20 minute Transfer Uncertainty Specification for each value and combining the two specifications in an RSS summation, expressing the contributions in parts-per-million of the measured values. If the measurements are made within the same range, but independently (not using the ratio mode) with an elapsed time greater than 20 minutes but less than 24 hours between the measurements, then the 24 hour specifications should be applied instead.

For example, making measurements of the ratio of 5 V and 10 V on the 20 VDC range, applying the 20 minute Transfer Uncertainty specifications:

$$= \pm \sqrt{\left(0.12 + 0.1 \text{ x } \frac{20}{5}\right)^2 + \left(0.12 + 0.1 \text{ x } \frac{20}{10}\right)^2} = \pm 0.61 \text{ ppm of the ratio}$$

Additional Errors

The 8508A specifications are listed for the maximum resolution in each function, using the Normal reading mode. For measurements taken in other resolutions or the Fast read mode additional error contributions listed in the Read Rate and Additional Uncertainty table must be included. These additional contributions must be added algebraically to the relevant specifications. For example measuring 10 V on the 20 VDC range at 5 digit resolution in Fast mode and applying the 365 day ±1 °C Absolute specifications:

$$= \pm \left((3.0 + 0) + (0.2 + 25) \text{ x } \frac{20}{10} \right) = \pm (3.0 + 50.4) = \pm 53.4 \text{ ppm of 10 V}$$

Other additional contributions apply in certain situations and are also to be added algebraically to the relevant specifications. These additional contributions include the DC Accuracy specification to be applied when making DC measurements on the AC Voltage function when DC coupled, and the High Voltage adder when making measurements above 300 V on the AC Voltage function.