SECTION 6 SPECIFICATIONS

GENERAL

POWER SUPPLY	Voltage: 100V-130V or 200V-260V (Selectable from Rear Panel). Line Frequency: 47Hz to 63Hz. Power: 50 VA max.
MECHANICAL	Height: 88mm (3.46ins). Width: 427mm (16.8ins). Overall Depth: 488mm max (19.2ins), which includes 18mm (0.71ins) of extended terminals. Rack Depth: 467mm (18.4ins) excluding Rear Panel connectors. Rack Mounting: Rack mounting ears to fit standard 19inch rack (ANSI-E1A-310-C). Conversion to accept 0.5ins wide slides, including MATE standard (Drg. No. 2806701, Sperry). Weight: 13.5kg (30 lbs) approx.
TEMPERATURE	Operating: 0°C to 50°C. Storage: -40°C to 75°C.
HUMIDITY RANGE	Operating (non-condensing): 0°C to 30°C : < 95% ± 5% RH. 30°C to 40°C : <75% ± 5% RH. 40°C to 50°C : < 45% ± 5% RH.
ALTITUDE	Operating: 0-3,050m (10,000 feet). Non-Operating: 0-12,000m (40,000 feet)
SHOCK AND VIBRATION	Meets the requirements of: MIL-T-28800C, Type III, Class 5, Style E equipment
SAFETY	Meets the requirements of : UL 1244 • ANSI C39.5 Draft 5 • • EN61010-1:1993/A2:1995 • BSI 4743.
WARM UP	4 hours to full accuracy.
AUTORANGE	Range Up: 200% of nominal range. Range Down: 18% of nominal range.
DIGITAL ERROR	Computation: ±1 digit (assumes no error in stored value). Spec. readout: <1% of displayed spec.
MEASUREMENT ISOLATION	'Guard' to Safety Ground: <300pF, >10GΩ; 'Lo' to 'Guard' in Remote Guard : <700pF, >10MΩ. In Local Guard, the 'Lo' and 'Guard' terminals are internally short circuited.

Final Width = 175mm

Maximum RMS Inputs

N.B. Refer to *page 6-4* for notes to these tables.

Front Terminals

DC and AC Voltage

	Hi	Lo	I+	I-	Guard	Ω Guard	Safety Ground	Logic Ground
Hi	1000V							
Lo	250V	1000V						
I+	1000V	250V	1000V					
I-	1000V	250V	1000V	250V				
Guard	1000V	250V	1000V	250V	250V			
Ω Guard	1000V	650V	1000V	650V	650V	650V		
Safety Ground	1000V	650V	1000V	650V	650V	650V	0V	

DC and AC Current

	Hi	Lo	I+	I-	Guard	Ω Guard	Safety Ground	Logic Ground
Hi	250V							
Lo	250V	250V						
I+	250V	250V	250V					
I-	250V	250V	250V	250V				
Guard	250V	250V	250V	0V	250V			
Ω Guard	900V	650V	900V	650V	650V	650V		
Safety Ground	900V	650V	900V	650V	650V	650V	0V	

Resistance

	Hi	Lo	I+	I-	Guard	Ω Guard	Safety Ground	Logic Ground
Hi	250V							
Lo	250V	250V						
I+	250V	250V	250V					
I-	250V	250V	250V	250V				
Guard	250V	250V	250V	250V	250V			
Ω Guard	900V	650V	900V	650V	650V	650V		
Safety Ground	900V	650V	900V	650V	650V	650V	0V	

Final Width = 175mm

Maximum RMS Inputs

N.B. Refer to *page 6-4* for notes to these tables.

Channels A and B (Rear Inputs)

DC and AC Voltage

	Hi	Lo	I+	I-	Guard	Ω Guard	Safety Ground	Logic Ground
Hi	50V							
Lo	50V	50V						
I+	50V	50V	50V					
I-	50V	50V	50V	50V				
Guard	50V	50V	50V	50V	50V			
Ω Guard	50V	50V	50V	50V	50V	50V		
Safety Ground	50V	50V	50V	50V	50V	50V	0V	
Logic Ground	50V	50V	50V	50V	50V	50V	0V	

DC and AC Current

	Hi	Lo	I+	I-	Guard	Ω Guard	Safety Ground	Logic Ground
Hi	50V							
Lo	50V	50V						
I+	50V	50V	50V					
I-	50V	50V	50V	50V				
Guard	50V	50V	50V	50V	50V			
Ω Guard	50V	50V	50V	0V	50V	50V		
Safety Ground	50V	50V	50V	50V	50V	50V	50V	
Logic Ground	50V	50V	50V	50V	50V	50V	0V	

Resistance

	Hi	Lo	I+	I-	Guard	Ω Guard	Safety Ground	Logic Ground
Hi	50V							
Lo	50V	50V						
I+	50V	50V	50V					
I-	50V	50V	50V	50V				
Guard	50V	50V	50V	50V	50V			
Ω Guard	50V	50V	50V	50V	50V	50V		
Safety Ground	50V	50V	50V	50V	50V	50V	50V	
Logic Ground	50V	50V	50V	50V	50V	50V	0V	

Final Width = 175mm

Maximum RMS Inputs

Notes to Maximum Input Tables

[1] Maximum RMS inputs specified assume a peak of < RMS x 1.414

[2] Maximum differential 'stand off' voltage between channels must not exceed the maximum specified voltage of the Front Terminals.

Maximum 'switched' voltage between channels must not exceed the maximum specified voltage of either channel (whichever is the lower input limit).

[3] All 'In-Guard' inputs are flash-tested with respect to 'Safety Ground' at 2.5kV in accordance with UL 1244.

[4] Maximum slew rate of 'Guard' with respect to 'Safety Ground' or 'Logic Ground' is:

Transient immunity (no corruption):	1kV/µs
Transient protection (no damage):	10kV/µs

[5] With 'Remote Guard' not selected, 'Guard' is internally linked to 'Lo', so for the selected channel(s), all limits between these terminals reduce to zero.

[6] 'Logic Ground' is internally connected to 'Safety Ground'.

[7] Current ranges are protected against overload by a rear panel fuse.

Final Width = 175mm

ACCURACY

DC Voltage

Range [1]	Accuracy Relative to Calibration Standards [2][3] ± [ppmR + ppmFS] [4]			Calibration Uncertainty [ppm]	Temperature Coefficient [ppm/°C] 13°C - 18°C 28°C - 33°C	
	24 hour	1 Year				
		Normal	Enhanced			
	23°C ± 1°C	23°C ± 5°C	23°C ± 5°C [5][6]	[7]	Normal	Enhanced[5]
100.000 00mV	1 + 0.5	7 + 0.5	6 + 0.5	6.5	0.6	0.3
1.000 000 00V	0.5 + 0.2	6 + 0.2	3 + 0.2	3.5	0.5	0.25
10.000 000 0V	0.5 + 0.1	6 + 0.1	3 + 0.1	2.5	0.5	0.25
100.000 000V	1 + 0.2	10 + 0.2	6 + 0.2	3.5	0.8	0.4
1000.000 00V	1 + 0.2	10 + 0.2	6 + 0.2	3.5	0.8	0.4

Final Width = 175mm

DC CURRENT (Option 30)

Range [1]	Accuracy Relative to Calibration Standards [2][3] ± [ppmR + ppmFS] [4]			Calibration Uncertainty [ppm]	Temperature Coefficient [ppm/°C] 13°C - 18°C 28°C - 33°C	
	24 hour	1 Year				
		Normal	Enhanced			
	23°C ± 1°C	23°C ± 5°C	23°C ± 5°C [5][6]	[7]	Normal	Enhanced[5]
100.000 0µA	20 + 2	100 + 2	25 + 2	35	12	8
1.000 000mA	20 + 2	100 + 2	25 + 2	20	12	8
10.000 00mA	20 + 2	100 + 2	25 + 2	20	12	8
100.000 0mA	30 + 5	100 + 5	50 + 5	25	12	8
1.000 000A	100 + 10	200 + 10	150 + 10	40	12	10

Final Width = 175mm

AC VOLTAGE - Option 10 [8][9][10]

Range [1] and Frequency	Accuracy Relative to Calibration Standards [2][3] ± [ppmR + ppmFS] [4]			Calibration Uncertainty [ppm] [7]	Temperature Coefficient [ppm/°C] 13°C - 18°C 28°C - 33°C	
	24 hour 23°C ± 1°C	1 Year Normal 23°C ± 5°C	1 Year Enhanced 23°C ± 5°C [5] [6]		Normal	Enhanced
100.000 0mV						
1Hz - 10Hz [16]	80 + 70	100 + 70	100 + 70		20	10
10Hz - 40Hz	80 + 20	120 + 20	120 + 20	155	20	10
40Hz - 100Hz	60 + 20	100 + 20	100 + 20	155	15	5
100Hz - 2kHz	40 + 10	100 + 10	100 + 10	155	15	5
2kHz - 10kHz	60 + 20	100 + 20	100 + 20	155	15	5
10kHz - 30kHz	250 + 30	300 + 40	300 + 40	220	20	10
30kHz - 100kHz	400 + 100	700 + 100	700 + 100	430	50	40
1.000 000V to 100.000 0V						
1Hz - 10Hz [16]	70 + 60	100 + 60	100 + 60		15	10
10Hz - 40Hz	70 + 10	100 + 10	100 + 10	80	15	10
40Hz - 100Hz	50 + 10	80 + 10	80 + 10	75	10	5
100Hz - 2kHz	30 + 10	60 + 10	60 + 10	35	10	5
2kHz - 10kHz	50 + 10	80 + 10	80 + 10	35	10	5
10kHz - 30kHz	100 + 20	200 + 20	200 + 20	50	15	10
30kHz - 100kHz	250 + 100	500 + 100	500 + 100	70	50	40
100kHz - 300kHz	0.15% + 0.1%	0.3% + 0.1%	0.3% + 0.1%	180	75	40
300kHz - 1MHz	1% + 0.5%	1% + 1%	1% + 1%	1400	100	40
1000.000V[11]						
1Hz - 10Hz [16]	70 + 35	100 + 35	100 + 35		20	15
10Hz - 40Hz	70 + 10	100 + 10	100 + 10	75	15	10
40Hz - 10kHz	50 + 10	80 + 10	80 + 10	75	10	10
10kHz - 30kHz	100 + 20	200 + 20	200 + 20	250	15	10
30kHz - 100kHz	250 + 100	500 + 100	500 + 100	700	50	40

SPOT FREQUENCY - AC VOLTAGE [8][9][10][12][13]

Range [1] and Frequency	Accuracy Relative to Calibration Standards [2][3] ± [ppmR + ppmFS] [4]			Calibration Uncertainty [ppm] [7]	Temperature Coefficient [ppm/°C] 13°C - 18°C 28°C - 33°C	
	24 hour 23°C ± 1°C	1 Year Normal 23°C ± 5°C	1 Year Enhanced 23°C ± 5°C [5] [6]		Normal	Enhanced [5]
100.000 0mV						
40Hz - 10kHz	40 + 10	200 + 10	100 + 10	155	15	5
10kHz - 30kHz	60 + 25	250 + 25	150 + 25	220	20	10
30kHz - 100kHz	100 + 100	500 + 100	500 + 100	430	50	40
1.000 000V to 100.000 0V						
40Hz - 10kHz	30 + 5	130 + 5	60 + 5	75	10	5
10kHz - 30kHz	50 + 15	200 + 15	150 + 15	50	15	10
30kHz - 100kHz	100 + 50	400 + 50	400 + 50	70	50	40
100kHz - 300kHz	0.1% + 0.05%	0.2% + 0.05%	0.2% + 0.05%	180	75	40
300kHz - 1MHz	0.2% + 0.3%	0.5% + 0.3%	0.5% + 0.3%	1400	100	40
1000.000V[11]						
40Hz - 10kHz	30 + 5	130 + 5	60 + 5	75	10	10
10kHz - 30kHz	50 + 15	200 + 15	150 + 15	250	15	10
30kHz - 100kHz	100 + 50	400 + 50	400 + 50	700	50	40

AC CURRENT(Option 30) [8]

Range [1]	Freq. (Hz)	Accuracy Relative to Calibration Standards [2][3] ± [ppmR + ppmFS] [4]			Calibration Uncertainty [ppm] [7]	Temperature Coefficient [ppm/°C] 13°C - 18°C 28°C - 33°C	
		24 hour 23°C ± 1°C	1 Year Normal 23°C ± 5°C	1 Year Enhanced 23°C ± 5°C [5] [6]		Normal	Enhanced [5]
100.000µA	10 - 5k	150 + 50	300 + 100	200 + 100	200	20	15
1.000 00mA	10 - 5k	150 + 50	300 + 100	200 + 100	200	20	15
10.000 0mA	10 - 5k	150 + 50	300 + 100	200 + 100	200	20	15
100.000mA	10 - 5k	150 + 50	300 + 100	200 + 100	200	20	15
1.000 00A	10 - 1k	400 + 100	600 + 200	500 + 200	200	20	15
	1k - 5k	0.1% + .03%	0.2% + .04%	0.15% + .04%	350	20	15

Final Width = 175mm

RESISTANCE (Option 20) [14]

Range [1]	Constant Current Value	Relative to Calibration Standards [2][3] ± [ppmR + ppmFS] [4]			Calibration Uncertainty [ppm] [7]	Temperature Coefficient [ppm/°C] 13°C - 18°C 28°C - 33°C	
		24 hour 23°C ± 1°C	1 Year Normal 23°C ± 5°C	1 Year Enhanced 23°C ± 5°C [5] [6]		Normal	Enhanced [5]
NORMAL MODE							
10.000 000Ω [15]	10mA	3 + 1	15 + 1	12 + 1	15	1.2	0.8
100.000 000Ω	10mA	1.5 + 0.3	11 + 0.3	8 + 0.3	7.5	1	0.5
1.000 000 00kΩ	1mA	1 + 0.3	9 + 0.3	6 + 0.3	6	1	0.5
10.000 000 0kΩ	100μA	1 + 0.3	9 + 0.3	6 + 0.3	5.5	1	0.5
100.000 000kΩ	100μA	1 + 0.3	9 + 0.3	6 + 0.3	10	1	0.8
1.000 000 00MΩ	10μA	2 + 0.7	14 + 0.7	10 + 0.7	20	1.5	1
10.000 000 0MΩ	1μA	4 + 4	30 + 4	20 + 4	30	2	1.5
100.000 0MΩ	100nA	30 + 45	300 + 45	200 + 45	140	20	15
1.000 000GΩ	10nA	300 + 450	0.3% + .045%	0.2% + .045%	350	200	150
LOW CURRENT MODE							
10.000 000Ω [15]	10mA	3 + 1	15 + 1	12 + 1	15	1.2	0.8
100.000 000Ω	1mA	5 + 1	15 + 1	12 + 1	7.5	1.2	0.8
1.000 000 00kΩ	100μA	5 + 1	15 + 1	12 + 1	6	1.2	0.8
10.000 000 0kΩ	10μA	5 + 1	20 + 1	15 + 1	5.5	1.5	1
100.000 000kΩ	1μA	50 + 3	80 + 3	70 + 3	10	2.5	2
1.000 000 00MΩ	100nA	200 + 10	500 + 10	400 + 10	20	20	15

Final Width = 175mm

Notes to Accuracy Specifications

[1] 100% overrange on all ranges (except 1kV DC & AC).

[2] Combined uncertainties to 95% minimum confidence level for maximum resolution in each function, normal read mode, internal trigger, zero offsets corrected (DCV, DCI, Ohms), optimum filter selected (ACV, ACI).

[3] Assumes 4 hour warm up period.

[4] FS = 2 x Full Range.

[5] Valid for 24 hours after Selfcal and within ±1°C of Selfcal temperature.

[6] Specification equivalent to 90 day performance (23°C ± 1°C) without Selfcal.

[7] Relative to National Standards. Better uncertainties are available - contact factory for details.

[8] Valid for signals >1% FS. Signal must be DC coupled <40Hz.

[9] Assumes transfer mode on.

[10] Max Volt x Hertz: 3×10^7.

[11] >300V, add $\pm 0.0024(R-300)^2$ ppm of reading.

[12] Valid within ±10% of calibrated RMS value and Spot Frequency.

[13] Instrument normally shipped with Spot Frequencies uncalibrated. Please contact the factory for available Spot Frequency calibration prices.

[14] True Ohms mode available from 10Ω to 100kΩ ranges.

[15] 10Ω range available only in True Ohms mode.

[16] Measurement results are invalid when using internal triggers in Transfer mode with the 1Hz filter selected. Results are valid using external triggers and 'Sample', and when triggering via the IEEE-488 interface.

Final Width = 175mm

Final Width = 175mm

TEN MINUTE STABILITY SPECIFICATIONS

FUNCTION and RANGE	FREQUENCY (Hz)	STABILITY AFTER SETTLING ±(ppmR + ppmFS)
DCV		
100.000 00mV		0.2 + 0.25
1.000 000 00V		0.2 + 0.075
10.000 000 0V		0.2 + 0.05
100.000 000V		0.2 + 0.075
1000.000 00V		0.2 + 0.05
ACV		
100.000 0mV	100Hz - 2kHz	20 + 2.5
	40Hz - 10kHz	20 + 5
	10Hz - 30kHz	40 + 5
	1Hz - 100kHz	60 + 5
1.000 000V	100Hz - 2kHz	20 + 2.5
10.000 00V	40Hz - 10kHz	20 + 2.5
100.000 0V	10Hz - 30kHz	40 + 2.5
	1Hz - 100kHz	60 + 2.5
1000.000V	40Hz - 10kHz	40 + 10
	10Hz - 30kHz	80 + 10
RESISTANCE		
10.000 000Ω		0.2 + 1
100.000 000Ω		0.2 + 0.1
1.000 000 00kΩ		0.2 + 0.1
10.000 000 0kΩ		0.2 + 0.1
100.000 000kΩ		0.2 + 0.05
1.000 000 00MΩ		0.3 + 0.05
10.000 000 0MΩ		2 + 0.05
100.000 0MΩ		40 + 1
1.000 000GΩ		400 + 1

NOTES

[1] The specifications above do not include any noise or drift in the source being measured.

[2] Valid for temperatures of 23°C ± 1°C.

ADDITIONAL ERRORS AS A FUNCTION OF MODE

FUNCTION	DIGITS	READ RATE (Readings/s) [5]				ADDITIONAL ERRORS ±(ppmR + ppmFS)	
		Normal		Fast		Normal	Fast
DCV	8	1/25		1/6		0 + 0	0 + 0.1
Resistance [1]	7	1/6		1/2		0 + 0.1	0 + 0.4
DCI [2]	6	2		35		0 + 0.5	0 + 3
	5	35		150		0 + 5	0 + 30
	4	35		150		0 + 50	0 + 50
		100Hz	**40Hz**	**10Hz**	**1Hz**		
ACV [3] **ACI** [4]							
Transfer Off	6	3	1	1/2.5	1/25	200 + 20	
	5	4	1	1/2.5	1/25	200 + 20	
	4	4	1	1/2.5	1/25	200 + 20	
Transfer On	6	1	1/2	1/5	1/50	0 + 0	
	5	2	1/2	1/5	1/50	0 + 5	
	4	2	1/2	1/5	1/50	0 + 50	

Final Width = 175mm

NOTES

[1] True Ohms - varies between 1 reading/sec and 1 reading/20 secs, depending on Filter and Range selections.

[2] Maximum DCI resolution is 6.5 digits.

[3] Assumes frequency monitor is set to Fast Gate.

[4] Maximum ACI resolution is 5.5 digits. Read rate same as ACV Transfer Off. Additional error is 0 + 0.

[5] Choice of system controller, algorithm and language can affect these figures.

OTHER SPECIFICATIONS

DCV	Type		Multi-slope, multi-cycle A-D converter.
	CMRR (1kΩ unbalanced):		140dB at DC >80dB + NMRR at 1-60Hz
	NMRR:	filter out	60dB at 50/60Hz ± 0.9%
		filter in	110dB at 50/60Hz
	Protection:	all ranges	1kV rms
	Input Impedance:		
	0.1V to 10V ranges		>10,000MΩ
	100V & 1000V ranges		10MΩ ± 0.1%
	Max Input Current:		50pA
	Ratio Accuracy:		±(Net ChA Accuracy + Net ChB Accuracy)
	Settling Time:		
	To 10ppm step size		
	filter out		<50ms
	filter in		<1s

Final Width = 175mm

DCI	Type:	Multi-slope, multi-cycle A-D converter.
	Protection:	<2A, internally clamped; >2A, rear panel fuse.
	Ratio accuracy:	±(Net ChA accuracy + Net ChB accuracy).
	Settling time:	As DVC.

RESISTANCE

Type:	True 4-wire with Ohms guard. 2-wire selectable.
Max Lead Resistance:	100Ω in any or all leads
Protection: all ranges	250Vrms
Ratio Accuracy:	±(Net ChA Accuracy + Net ChB Accuracy)
Settling Time:	Up to 100kΩ range generally the same as DCV, but depends on external connections.

OTHER SPECIFICATIONS *(Contd.)*

ACV	Type:	True RMS, AC coupled measures AC component with up to 1000V DC bias on any range. DC coupled gives $\sqrt{(AC^2 + DC^2)}$
	CMRR (1kΩ unbalanced):	>90dB at DC-60Hz
	Crest Factor:	5:1 at Full Range (10:1 at 25% of range)
	Protection: all ranges	1kV rms
	Input Impedance:	1MΩ in parallel with 150pF
	DC Accuracy: (DC coupled)	Add ±(50ppmR + 20ppmFS + 20μV)
	Ratio Accuracy:	±(Net ChA Accuracy + Net ChB Accuracy)
	Settling Time:	
	To 100ppm step size	
	100Hz	<500ms
	40Hz	<1.25s
	10Hz	<5s
	1Hz	<50s
	Frequency Resolution and Accuracy:	
	Normal Mode:	6.5 digits
	Frequency Range:	10Hz - 1.999 900MHz
	Accuracy: (1 year, 13°C - 33°C)	±10ppm of reading ±2 digits
	Fast Gate Mode:	4.5 digits
	Frequency Range:	200Hz - 1.999 9MHz
	Accuracy: (1 year, 13°C - 33°C)	± 2 digits

Final Width = 175mm

ACI	Type:	True RMS AC coupled. DC coupled gives $\sqrt{(AC^2 + DC^2)}$
	Crest Factor:	3:1 at Full Range
	Protection:	<2A, internally clamped >2A, rear panel fuse
	Ratio Accuracy:	±(Net ChA Accuracy + Net ChB Accuracy)
	Settling Time:	As ACV