Table 1-1. Summarized Specifications

PROGRAMMED OUTPUT	RANGE	ACCURACY +/- (% OF OUTPUT + % OF RANGE + FLOOR)
DC Voltage	All	.005 + .001 + 5 μV
AC Voltage	400 Hz (All ranges) 50 Hz - 1 kHz (Up to 250V) 1 kHz - 10 kHz (Up to 110V)	.05 + .005 + 50 μV
	10 kHz - 20 kHz (Up to 110V) 20 kHz - 50 kHz (Up to 19.9999V)	.08 + .008 + 50 μV
Direct Current	All	.025 + .0025 + .01 μA
Alternating Current	50 Hz - 1 kHz (All ranges)	.07 + .01 + 2 μA
Resistance	Four terminal	
	1 ohm	.02%
	10 ohm	.01%
	100 ohm, 1 kilohm, 10 kilohm	.005%
	Two terminal	
	100 kilohm	.005%
	1 Megohm	.01%
	10 Megohm	.05%

Table 1-2. DC Volts Specifications

DC Volts

Range	Resolution	Maximum Current	Ripple and Noise (10 Hz to 3 kHz) No Load to Maximum Rated Load	Accuracy (6 months) (20°C to 30°C)
±(200V to 1100V)	10 mV	6 mA/400 pF max	<0.05% of setting rms	±(0.005% of setting + 0.001% of range + 5 μV)
±(20V to 199.999V)	1 mV	10 mA/400 pF max	<0.05% of setting rms (open to 20k Ω) <0.1% of setting rms (20k Ω to max rated load)	
±(2V to 19.9999V)	100 μV	25 mA/1000 pF max	<0.02% of setting +50 μV rms	
±(0.2V to 1.99999V)	10 μV	Limited by 50Ω output resistance	<0.01% of setting +25 μV rms	
±(20 mV to 199.999 mV)	1 μV		<0.01% of setting +25 μV rms	
±(0 to 19.9999 mV)	0.1 μV		<0.01% of setting +25 μV rms	
±(0 to 1.99999V) 50Ω OVERRIDE	100 μV	25 mA/1000 pF max	<0.02% of setting +50 μV rms	

Temperature Coefficient

Above 30°C and Below 20°C add to accuracy limits ±(5 ppm of setting+1 ppm of range+1 μV)/°C. 200V to 1100V range add ±(5 ppm of setting+2 ppm of range)/°C.

Remote Sensing

Four wire remote sensing is available from 2V to 1100V and below 2V in 50Ω DIVIDER OVERRIDE mode. The three lowest ranges are normally internal sensed. Internal sense connections are made automatically inside the box.

Transient Recovery Time

2 Seconds to settle within 50 ppm of final value following any change in output voltage or current for all ranges except 20 to 199.999V, 20k Ω to 2k Ω load and switching between two highest ranges which requires 4 seconds.

Short Term Stability (10 Minutes)

At any fixed temperature from 0°C to 50°C the short term stability is ±(10 ppm of setting+2 ppm of range+5 μV) except above 500V which is ±25 ppm of setting.

Load Regulation

EXTERNAL SENSE: 2V to 1100V±10 ppm no load to full rated load. Same for 0V to 1.99999V using 50Ω DIVIDER OVERRIDE.

INTERNAL SENSE. Same as external except max full load is 400 Ω.

Overcurrent Protection

On all ranges current is limited to prevent damage due to an overload or short circuit at output terminals. The operator is alerted by a flashing "O.L." on the central display. After approximately 2 seconds the calibrator goes to standby.

Guard

The DC voltage section is guarded and a front panel terminal is provided labeled "V GUARD".

Table 1-3. AC Volts Specifications

AC Volts

Range [1]	Resolution	Maximum Current	Frequency	Amplitude Accuracy (6 months) (20°C to 30°C)	Total Harmonic Distortion and Noise
200V to 1100V	10 mV	6 mA/400 pF max	(1 mV to 1100V) 400 Hz	50 Hz to 10 kHz ±(0.05% of setting +0.005% of range +50 μV)	Bandwidth of 10 Hz to 200 kHz. Distortion, line interference + noise including random spikes
20V to 199.999V	1 mV	10 mA/400 pF max	(1 mV to 250V) [2] 50 Hz to 1 kHz		(20V and Higher) 50 Hz to 10 kHz: (0.08% of output) rms
2V to 19.9999V	100 μV	25 mA/400Ω/ 1000 pF max	(1 mV to 110V) 50 Hz to 20 kHz	10 kHz to 50 kHz ±(0.08% of setting +0.008% of range +50 μV)	(Below 20V) 50 Hz to 10 kHz: (0.05% of output +10 μV) rms
0.2V to 1.99999V	10 μV	2 kΩ/1000 pF max	(Below 20V) 50 Hz to 50 kHz		10 kHz to 50 kHz: (0.08% of output +20 μV) rms
20 mV to 199.999 mV	1 μV	25 mA from 50Ω source resistance	Accuracy: + 3% Resolution: 1 MSD		
1 mV to 19.9999 mV	0.1 μV				

(1) Can be set in dBm. 0 dBm = 1 mW across 600Ω = .7746V

(2) 10% Lower voltage available using the Edit control

(3) 5.2% Higher voltage available using the Edit control

Temperature Coefficient (Above 30°C and Below 20°C)

AMPLITUDE. Accuracy limits increase by ±(20 ppm of setting +2 ppm of range)/°C

FREQUENCY. Accuracy limits increase by ±0.1%/°C

Remote Sensing

Four wire remote sensing is available from 2V to 1100V. The three lowest ranges are internally sensed. Internal sense connections are made automatically inside the box.

Transient Recovery Time

2 Seconds to settle within 100 ppm for amplitude and within 0.3% for frequency following any change in output voltage, current or frequency. Switching between two highest ranges requires 2.2 seconds.

Short Term Stability (10 Minutes)

At any fixed temperature from 0°C to 50°C the short term stability is ±(0.01% of range +10 μV).

Load Regulation

EXTERNAL SENSE. 0.2V to 1100V: ± 200 ppm no load to full rated load.

INTERNAL SENSE. Same as external except voltages less than 0.2V have a load regulation expressed as an output impedance of 50Ω.

The above load regulations are met with reactive loads with power factors between 0.9 and 1.0.

Overcurrent Protection

On all ranges current is limited to prevent damage due to an overload or short circuit at output terminals. The operator is alerted by a flashing "O.L." on the central display. After approximately 2 seconds the calibrator goes to standby.

Guard

The AC voltage function is guarded and a front panel terminal labeled "V GUARD" is provided.

DISCRETE FREQUENCIES AVAILABLE

In Hz	50	60	70	80	90	100	200	300	400	500	600	700	800	900
250V to 1100V									●					
110V to 250V	●	●	●	●	●	●	●	●	●	●	●	●	●	●
20V to 110V	●	●	●	●	●	●	●	●	●	●	●	●	●	●
1 mV to 20V	●	●	●	●	●	●	●	●	●	●	●	●	●	●

In kHz	1	2	3	4	5	6	7	8	9	10	20	30	40	50
110V to 250V	●													
20V to 110V	●	●	●	●	●	●	●	●	●	●	●			
1 mV to 20V	●	●	●	●	●	●	●	●	●	●	●	●	●	●

Table 1-4. Current Specifications

DC Current

Range	Resolution	Compliance Voltage	Accuracy (6 months) (20°C to 30°C)	Ripple and Noise
±(0.2A to 1.99999A)	10 μA	0 to 2.1V min	±(0.025% of setting + 0.0025% of range + 0.01 μA)	(0.05% of output + 0.01 μA) rms
±(20 mA to 199.999 mA)	1 μA	0 to 10V min		
±(2 mA to 19.9999 mA)	100 nA	0 to 10V min	Compliance voltage: ≥1V add 0.002% setting/volt	Measured with a bandwidth of 10 Hz to 10 kHz including random spikes
±(0.2 mA to 1.99999 mA)	10 nA	0 to 10V min		
±(10 μA[1] to 199.999 μA)	1 nA	0 to 10V min		

(1) 10% lower current available using the Edit Control.

Temperature Coefficient (Above 30°C and Below 20°)

The accuracy limits increase by ±(10 ppm of setting + 2 ppm of range)/°C

Transient Recovery Time

1 Second to settle to within 0.01% of final value following any change in current or compliance voltage.

Short Term Stability (10 Minutes)

At any fixed temperature from 0°C to 50°C the short term stability is ±(50 ppm of setting + 5 ppm of range + 0.002 μA).

Load Regulation

±20 ppm/volt for a change in the output voltage from 1 volt to maximum rated compliance voltage.

Overvoltage Protection

On all ranges voltage is limited to not more than 2V greater than maximum rated compliance voltage due to an open circuit condition. The operator is alerted by a flashing "O.L." on the central display. After approximately 2 seconds the calibrator goes to standby.

Guard

The DC current section is guarded and a front panel terminal labeled "I GUARD" is provided.

AC Current

Range	Resolution	Compliance Voltage	Accuracy (6 months) (20°C to 30°C)	Frequency	Total Harmonic Distortion and Noise
0.2A to 1.99999A	10 μA	0 to 1.4V rms min	±(0.07% of setting + 0.01% of range + 2 μA)	50 Hz to 1 kHz	Distortion, line interference + noise including random spikes
20 mA to 199.999 mA	1 μA	0 to 7V rms min		Accuracy: ±3%	
2 mA to 19.9999 mA	100 nA	0 to 7V rms min	Compliance voltage: ≥1V rms add 0.005% of setting/volt	Resolution: 1 MSD	(0.05% of output + 2 μA) rms
0.2 mA to 1.99999 mA	10 nA	0 to 7V rms min			
10 μA[1] to 199.999 μA	1 nA	0 to 7V rms min			

(1) 10% lower current available using the Edit Control.

Temperature Coefficient (Above 30°C and Below 20°C)

CURRENT: Accuracy limits increase by ±(25 ppm of setting+10 ppm of range)/°C.
FREQUENCY: Accuracy limits increase by ±0.1%/°C.

Transient Recovery Time

4 Seconds to settle within 0.02% for current and within 0.3% for frequency following any change in output current, voltage or frequency.

Short Term Stability (10 Minutes)

At any fixed temperature from 0° C to 50° C the short term stability is ±(0.014% of setting+0.002% of range+0.4 μA).

Load Regulation

±50 ppm/volt for a change in the output voltage from 1V to maximum rated compliance voltage. Load regulation is met with reactive loads with power factors between 0.9 and 1.0.

Overvoltage Protection

On all ranges voltage is limited to not more than 2V peak greater than maximum rated compliance voltage due to an open circuit condition. The operator is alerted by a flashing "O.L." on the central display. After approximately 2 seconds the calibrator goes to standby.

Guard

The AC current section is guarded and a front panel terminal labeled "I GUARD" is provided.

Table 1-5. Resistance Specifications

Resistance

Range	Power Dissipation	Maximum Current	Peak Voltage	Accuracy (6 months) (20°C to 30°C)	Temperature Coefficient > 30°C and < 20°C Accuracy Limits Increase By	Power Coefficient
1Ω	1W	1A	1V	0.02%	10 ppm/°C	0.1 ppm/mW
10Ω	1W	300 mA	3V	0.01%	10 ppm/°C	0.3 ppm/mW
100Ω	1W	100 mA	10V	0.005%	5 ppm/°C	0.3 ppm/mW
1 kΩ	1W	30 mA	30V	0.005%	5 ppm/°C	0.3 ppm/mW
10 kΩ	1W	10 m/A	100V	0.005%	5 ppm/°C	0.3 ppm/mW
100 kΩ	1W	3 mA	300V	0.005%	5 ppm/°C	0.3 ppm/mW
1 MΩ	100 mW	0.3 mA	300V	0.01%	5 ppm/°C	0.2 ppm/mW
10 MΩ	10 mW	0.03 mA	300V	0.05%	10 ppm/°C up to 40°C 50 ppm/°C above 40°C	0.02 ppm/mW

Two or Four Terminal Ohms Below 100 kΩ

The maximum residual resistance that can be compensated for using the cal 1Ω function is 0.99999Ω

Table 1-6. Wideband Option –03 Specifications

Wideband Option —03

Range Volts	Range Approx dBm[1]	Amplitude Accuracy at 1 kHz Terminated in 50Ω (6 months 20°C to 30°C)	Frequency vs. Amplitude Flatness Terminated with 50Ω and 1 Ft of RG58/AU
1V to 3.1623V	-13 to +23	±(0.25% of setting+0.25% of range)	10 Hz to 30 Hz: ±0.3%
0.31624V to 0.99999V	-3 to +13	±(0.50% of setting+0.25% of range)	30 Hz to 1 MHz: ±0.25%
0.1V to 0.31623V	-7 to +3	±(0.75% of setting+0.25% of range)	1 MHz to 5 MHz:
31 624 mV to 99.999 mV	-17 to -7	±(1.00% of setting+0.25% of range)	±0.25% above 1 mV
10 mV to 31.623 mV	-27 to -17	±(1.25% of setting+0.25% of range)	±0.6% at 1 mV and lower
3.1624 mV to 9.9999 mV	-37 to -27	±(1.50% of setting+0.25% of range)	5 MHz to 10 MHz: ±0.6%
1 mV to 3.1623 mV	-47 to -37	±(1.75% of setting+0.25% of range)	Frequency Resolution: 1 MSD
300 μV to 0.99999 mV	-57.5 to -47	±(2.00% of setting+0.25% of range)	Frequency Accuracy: ±3%

(1) 0 dBm = mW across 50Ω = 0.22361V.

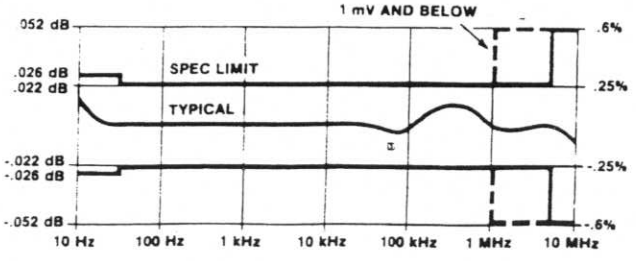
Temperature Coefficient (Above 30°C and Below 20°C)

AMPLITUDE: Accuracy limits increase by 0.1 times the accuracies listed in the amplitude accuracy column/°C.
FREQUENCY: Accuracy limits increase by 0.25%/°C.

Transient Recovery Time

2 Seconds to settle within 500 ppm for amplitude and within 0.3% for frequency following any change in voltage, current or frequency.

5100A/5101A WIDEBAND FREQUENCY RESPONSE



Harmonics

-40 dB or lower relative to fundamental for each frequency except -32 dB above 5 MHz.

Spurious Outputs

-50 dB or lower relative to fundamental for each frequency.

Overload Protection

A short circuit on the wideband output will not damage the calibrator. Normal operation is restored upon removal.

Table 1-7. General Specifications

Stability/Environmental
All specifications have been stated with the following conditions:
Time: Six months
Temp: 25°C ±5°C
R.H. : < 85%

Temperature Range
5100A/5101A: Operating 0°C to +50°C
Non Operating -20°C to +65°C
5101A w/tape: Operating +10°C to +40°C
Non Operating +4°C to +50°C

Humidity Range
0°C to 35°C: 85% RH (Non-Condensing)
35°C to 40°C: 70% RH
40°C to 50°C: 50% RH

Shock and Vibration
Meets requirements of MIL-T-28800 for class 5 style E equipment.

Operating Power
(100V to 240V ±10%: 50 - 60 Hz)
5100A: 200 VA Fully Loaded
5101A: 220 VA Fully Loaded

Warmup
30 Minutes to rated accuracy

Dimensions
22.23 cm H x 43.18 cm L x 60.33 cm W
(8.75 in H x 17.00 in L x 23.75 in W)

Weight
5100A: 24.9 kgm (55 lbs) basic
29.5 kgm (65 lbs) fully loaded
5101A: 27.3 kgm (60 lbs) basic
31.8 kgm (70 lbs) fully loaded
5102A: 30.5 kgm (67 lbs) basic
35.0 kgm (77 lbs) fully loaded