

# **5051Plus**

## **Extended Specification**

### **V1.0**

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## SPECIFICATIONS DETAILS

1. Accuracies are shown as ppm or % of output + floor.
2. Specifications apply at ambient temp of 23°C ±3°C
3. For temperatures outside the above range apply 0.2 x specification per °C
4. Calibrator warm up time at least 30 minutes.
5. All values are relative to calibration standards.
6. Accuracies quoted are for 1 year.

Due to continuous development Time Electronics reserves the right to change specifications without prior notice.

## Calibrator (Source)

### DC VOLTAGE

Range	Accuracy ppm	Output Resistance	Max Output Current	Resolution
20mV	30 + 4uV	10 Ω	-	100nV
200mV	30 + 4uV	10 Ω	-	1uV
2V	15 + 20uV	< 0.1 Ω	20mA	1uV
20V	15 + 150uV	< 0.1 Ω	20mA	10uV
200V	30 + 3mV	< 5 Ω	20mA	100uV
1050V	50 + 30mV	< 10 Ω	10mA	1mV

### AC VOLTAGE

Range	Frequency	Accuracy %	Output Resistance	Max Output Current	Resolution
20mV	10Hz to 45Hz	0.05 + 250uV	10 Ω		1uV
	45Hz to 1kHz	0.05 + 100uV	10 Ω		
	1kHz to 10kHz	0.05 + 150uV	10 Ω		
	10kHz to 20kHz	0.05 + 250uV	10 Ω		
	20kHz to 100kHz	0.05% + 0.1mV	50 Ω		
	100kHz to 300kHz	0.1% + 0.5mV	50 Ω		
200mV	10Hz to 45Hz	0.05 + 250uV	10 Ω		1uV
	45Hz to 1kHz	0.04 + 100uV	10 Ω		
	1kHz to 10kHz	0.04 + 150uV	10 Ω		
	10kHz to 20kHz	0.05 + 250uV	10 Ω		
	20kHz to 100kHz	0.1% + 0.5mV	50 Ω		
	100kHz to 300kHz	0.1% + 1mV	50 Ω		
2V	10Hz to 45Hz	0.08 + 500uV	< 0.1 Ω	20mA	10uV
	45Hz to 1kHz	0.03 + 170uV	< 0.1 Ω		
	1kHz to 10kHz	0.03 + 250uV	< 0.1 Ω		
	10kHz to 20kHz	0.08 + 500uV	< 0.1 Ω		
	20kHz to 100kHz	0.05% + 1mV	< 0.5 Ω		
	100kHz to 300kHz	0.1% + 5mV	< 0.5 Ω		
20V	300kHz to 1MHz	1% + 10mV	< 0.5 Ω	20mA	100uV
	10Hz to 45Hz	0.08 + 4mV	< 5 Ω		
	45Hz to 1kHz	0.03 + 2mV	< 5 Ω		
	1kHz to 10kHz	0.03 + 3mV	< 5 Ω		
	10kHz to 20kHz	0.08 + 4mV	< 5 Ω		
	20kHz to 100kHz	0.15% + 15mV			
200V	40Hz to 1kHz	0.06 + 20mV	< 5Ω	20mA	1mV
1050V	40Hz to 1kHz	0.08 + 90mV	< 10 Ω	10mA	10mV

The frequency accuracy for AC ranges is 0.01% and is crystal controlled. The setting resolution is 1Hz.

The output resistance on the 20mV and 200mV ranges is 10 ohms. This must be taken into account when loads of 100K ohms or less are being driven. A 100K load will result in a 0.01% error. All AC outputs exclude the DC component.

## DC CURRENT

Range	Accuracy ppm	Compliance Voltage	Resolution
200uA	150 + 15nA	11V	1 nA
2mA	100 + 40nA	11V	10 nA
20mA	80 + 200nA	11V	10 nA
200mA	80 + 3uA	11V	100 nA
2A	250 + 40uA	5V	1 uA
22A	600 + 2mA	4V	10 uA

## AC CURRENT (sine-wave)

Range	Frequency	Accuracy %	Compliance Voltage	Resolution
200uA	20Hz to 1kHz	0.07 + 300nA	8V rms	10nA
2mA	20Hz to 1kHz	0.05 + 300nA	8V	10nA
20mA	20Hz to 1kHz	0.05 + 3uA	8V	100nA
200mA	20Hz to 1kHz	0.05 + 30uA	8V	1uA
2A	20Hz to 500Hz	0.1 + 0.5mA	3.5V	10uA
22A	20Hz to 500Hz	0.2 + 5mA	3V	100uA

## THERMOCOUPLE SIMULATION

Thermocouple Type	Temperature Range °C	Accuracy °C
J	-210 to -50	0.15
	-50 to 1200	0.18
K	-270 to 1372	0.25
	-270 to -150	0.25
T	-150 to 0	0.2
	0 to 400	0.15
	-50 to 50	1.0
R	50 to 250	0.8
	250 to 1768	0.6
	-50 to 300	0.9
S	300 to 1768	0.8
	0 to 800	1.8
B	800 to 1820	1.0
	-270 to -100	0.8
N	-100 to 1300	0.3
	-270 to -100	0.3
E	-100 to 0	0.2
	0 to 1000	0.15

Cold Junction Compensation  $\pm 0.5^{\circ}\text{C}$  (applies to ambient changes of  $\pm 1^{\circ}\text{C}$ )

The accuracy of the thermocouple simulation is determined by the accuracy of the 5051's DC Voltage function and the accuracy of the standard thermocouple tables BS EN 60584-1. The 5051 uses precise digital interpretation of the tables to output voltage levels that are within the accuracies specified in the table above.

## RTD SIMULATION

	Temperature Range °C	Accuracy °C	Resolution °C
Pt100 (Alpha Coeff 0.003850)	-180 to -100	0.5	0.01
	-100 to 850	0.2	

It should be noted that the accuracy of the RTD simulation is determined by the accuracy of the PRT tables BS EN 60751. The 5051 uses precise digital interpretation of the tables to output resistance values that are within the accuracies specified in the table above.

## RESISTANCE

Range	Accuracy <sup>1</sup>	Resolution	Max Rating
1Ω – 20Ω	100ppm + 7mΩ	1Ω	0.1W
20Ω – 99.999Ω	100ppm + 7mΩ	1mΩ/5mΩ*	0.1W
100Ω – 999.999Ω	100ppm + 5mΩ	1mΩ	0.1W
1kΩ – 9.999kΩ	200ppm + 20mΩ	1Ω	0.1W
10kΩ – 99.999kΩ	100ppm + 1Ω	1Ω	0.1W
100kΩ – 999.99kΩ	100ppm + 10Ω	10Ω	0.1W
1MΩ – 9.9999MΩ	200ppm + 100Ω	100Ω	0.1W
10MΩ – 120MΩ	0.1% + 1kΩ	1kΩ	0.1W
1GΩ (Fixed Value)	10%	-	200V

1. After subtraction of lead resistance. Add end resistance variation +/- 2.5mΩ. \* Output resolution is 5mΩ below 50Ω

## CONDUCTANCE

Value	Accuracy	Max Rating
1 S	750ppm	0.1W
100m S	850ppm	0.1W
10m S	250ppm	0.1W
1m S	200ppm	0.1W
100u S	200ppm	0.1W
10u S	200ppm	0.1W
1u S	300ppm	0.1W
100n S	200ppm	0.1W
10n S	210ppm	0.1W
1n S	10%	200V

## CAPACITANCE AND INDUCTANCE

Value	Frequency	Accuracy (of displayed value)	Max Volts
1 nF	1kHz	0.5% +/-10pf	100V
10 nF	1kHz	0.5% +/-10pf	
100 nF	1kHz	0.5%	
1 uF	1kHz	0.25%	
10 uF	1kHz	0.5%	
100 uF	100Hz	0.5%	
Value	Frequency	Accuracy (of displayed value)	Max Volts
1 mH, 1.9 mH	1kHz	0.1%	10mA
5 mH, 10 mH	1kHz		
19 mH, 50 mH	1kHz		
100 mH, 190 mH	1kHz		
500 mH, 1H	1kHz		
10H	100Hz		

Specifications apply to the displayed value, after subtraction of residual capacitance / inductance.  
Specification based on 4 wire sine-wave measurement technique.

## OSCILLOSCOPE / FREQUENCY CALIBRATION

<b>FREQUENCY</b> Fixed Values 1, 2, 5 steps 0.1Hz to 10MHz accuracy 20ppm or 0.1ppm* 20, 50, 100MHz accuracy 20ppm	<b>PERIOD</b> Fixed Values 1, 2, 5 steps 100nS to 10S accuracy 20ppm or 0.1ppm* 50, 20, & 10nS accuracy 20ppm
* Fitted with Oven-Controlled Frequency Reference (Option 9783) 1.5V pk-pk - 0.1Hz to 100kHz. 1V pk-pk - 100kHz to 100MHz (sine-wave at 100MHz)	
<b>DUTY CYCLE</b> 3 frequencies, 100Hz, 1kHz, 10kHz. Duty cycle settable from 0 to 100% Setting resolution 0.01% at 100Hz, 0.1% at 1 kHz, 1% at 10 kHz Deviation function is not available.	
<b>AMPLITUDE</b>	
<b>Output per div</b>	12mV to 50V in 1, 2, 5 sequence. 1kHz square wave or DC.
<b>Graticule X</b>	1, 2, 4, 6, 8. Max output 200V pk-pk <sup>1</sup>
<b>Range</b>	<b>Accuracy</b>
6mV to 200mV 200mV to 200V 6mV to 20mV 50Ω 20mV to 2V 50Ω	0.2% +/- 4uV 0.05% 0.5% +/- 10uV 0.25%
<b>FAST RISE</b>	< 400ps. Bandwidth Checking up to 400 MHz

1. At 1mV/div 1,2,4X not available

# DMM (Measure)

## DC VOLTAGE

Range	Accuracy PPM (Reading + Range)	Input Impedance	Resolution
100 mV	50 + 40	10M $\Omega$	1uV
1 V	40 + 8	10M $\Omega$	1uV
10 V	35 + 6	10M $\Omega$	10uV
100 V	45 + 7	10M $\Omega$	100uV
1 kV	45 + 10	10M $\Omega$	1mV

## AC VOLTAGE

Range RMS	Frequency	Accuracy % (Reading + Range)	Resolution
100 mV	5 Hz – 10 Hz	0.4 + 0.04	10uV
	10 Hz – 20 kHz	0.06 + 0.04	10uV
	20 Hz – 50 kHz	0.12 + 0.05	10uV
	50 kHz – 100 kHz	0.6 + 0.1	10uV
	100 kHz – 300 kHz	5.0 + 0.5	100uV
1V – 750V	5 Hz – 10 Hz	0.4 + 0.03	0.01% of f.s.
	10 Hz – 20 kHz	0.15 + 0.05	0.01% of f.s.
	20 kHz – 50 kHz	0.6 + 0.1	0.01% of f.s.
	50 kHz – 100 kHz	5.0 + 0.5	0.01% of f.s.

## DC CURRENT

Range	Accuracy PPM (Reading + Range)	Burden Voltage	Resolution
10 mA	500 + 200	<0.1V	100nA
100 mA	500 + 50	<0.7V	1uA
1 A	1000 + 100	<1V	10uA
3 A	1200 + 200	<2V	100uA

## AC CURRENT

Range	Frequency	Accuracy % (Reading + Range)	Resolution
1 A	10Hz – 5kHz	0.15 + 0.05	100uA
3 A	10Hz – 5kHz	0.25 + 0.1	100uA

## RESISTANCE

Range	Test Current	Accuracy (Reading + Range)
100 $\Omega$	1mA	100ppm + 40ppm
1k $\Omega$	1mA	100ppm + 10ppm
10k $\Omega$	100uA	100ppm + 10ppm
100k $\Omega$	10uA	100ppm + 10ppm
1 M $\Omega$	5uA	100ppm + 10ppm
10 M $\Omega$	0.5uA	400ppm + 10ppm
100 M $\Omega$	0.1uA	1% + 10ppm

## FREQUENCY/PERIOD (100mV to 750V)

Range	Accuracy
3Hz to 10Hz	0.1% of reading
10Hz to 40Hz	0.03% of reading
40Hz to 300kHz	0.01% of reading

## THERMOCOUPLES

Thermocouple Type	Temperature Range °C	Accuracy °C
J	-210 to 1200	0.18
K	-270 to 1300	0.4
T	-200 to 380	0.4
R	-50 to 1749	1.0
S	-50 to 1749	1.2
N	-270 to 1280	0.4
E	-50 to 980	0.3

## RTD

	Range °C	Accuracy °C	Resolution
Pt100 (Alpha Coeff 0.003850)	-180 to -100	0.5	0.01
	-100 to 550	0.1	
	550 to 850	0.15	

# Calibrator Options

## 2.2GHz-LEVELLED SWEEP (9769)

Range	Amplitude Accuracy
100 MHz to 200 MHz	1%
200 MHz to 500 MHz	4%
500 MHz to 1 GHz	10%
2.2 GHz to 2.2 GHz	20%

<sup>1</sup>Vpk-pk Sine-Wave, 50Ω Output.

# General Specifications

## PC SPECIFICATION

Processor	1.8GHz (or higher)
RAM	512MB (or higher)
Hard Drive	60 GB Solid State (or higher)
Ports	4 x USB, 1 x Fast Ethernet.
Display	10.5in Touch Screen LCD
Operating System / Software	Windows XP Embedded. EasyCal Calibration Software.

## POWER SUPPLY

Mains Voltage	100 to 230V AC 50/60 Hz.
Fuse Ratings	3.15A anti-surge
Connector	IEC Plug
Power Consumption	125W typical, 220W Max.

## MAXIMUM ALLOWABLE VOLTAGE BETWEEN TERMINALS

Source	
Between V+ and V- terminals	< 1500V Peak
Between V- and Earth	< 75V Peak
Between Main, Aux and Earth	< 75V Peak
Measure	
Between V+ and V- terminals	<1000V Peak
Between V- and Earth < 75V Peak	<75V Peak

## ENVIRONMENTAL

Operating Temperature	5 to 45°C, Full Spec: 23°C ± 3°C.
Storage Temperature	-10°C to 50°C
Humidity	Operating < 80%
Altitude	0 to 3km. Non Operating 3km to 12km
Warm Up Time	30 Minutes to full accuracy

## MECHANICAL

Dimensions	Width 430mm, Height 202, Depth 538mm
Weight	23kg