

7051

Extended Specification

V1.7

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SPECIFICATIONS DETAILS

1. Accuracies are shown as \pm (ppm or % of output + floor).
2. Specifications apply for settings between 10% and 100% of range.
3. Specifications apply at ambient temp of $23^{\circ}\text{C} \pm 5^{\circ}\text{C}$
4. For temperatures outside the above range apply $0.2 \times$ specification per $^{\circ}\text{C}$
5. Calibrator warm up time at least 30 minutes.
6. All values are relative to calibration standards.
7. 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 ¹	100 + 4uV	10 Ω ³	-	100nV
200mV ¹	30 + 6uV	10 Ω ³	-	1uV
2V ¹	15 + 20uV	< 0.1 Ω	20mA	1uV
20V ¹	15 + 150uV	< 0.1 Ω	20mA	10uV
<i>With 9782 High Voltage/Current option fitted</i>				
200V ¹	30 + 6mV	< 5 Ω	20mA	100uV
1050V	50 + 30mV	< 10 Ω	10mA	1mV

1. Over-Range 10%. Specifications are between 0.1Hz and 10Hz bandwidth. Maximum capacitance 1000pF.

AC VOLTAGE 10Hz to 20kHz (sine wave)					
Range RMS	Frequency ²	Accuracy %	Output Resistance	Max Output Current	Resolution
20mV ¹	10Hz to 45Hz	0.05 + 250uV	10 Ω ³	-	1uV
	45Hz to 1kHz	0.05 + 100uV	10 Ω ³		1uV
	1kHz to 10kHz	0.05 + 150uV	10 Ω ³		1uV
	10kHz to 20kHz	0.05 + 250uV	10 Ω ³		1uV
200mV ¹	10Hz to 45Hz	0.05 + 250uV	10 Ω	-	1uV
	45Hz to 1kHz	0.04 + 100uV	10 Ω		1uV
	1kHz to 10kHz	0.04 + 150uV	10 Ω		1uV
	10kHz to 20kHz	0.05 + 250uV	10 Ω		1uV
2V ¹	10Hz to 45Hz	0.08 + 500uV	< 0.1 Ω	20mA	10uV
	45Hz to 1kHz	0.03 + 170uV	< 0.1 Ω	20mA	10uV
	1kHz to 10kHz	0.03 + 250uV	< 0.1 Ω	20mA	10uV
	10kHz-20kHz	0.08 + 500uV	< 0.1 Ω	20mA	10uV
20V ¹	10Hz to 45Hz	0.08 + 4mV	< 5 Ω	20mA	100uV
	45Hz to 1kHz	0.03 + 2mV	< 5 Ω	20mA	100uV
	1kHz to 10kHz	0.03 + 3mV	< 5 Ω	20mA	100uV
	10kHz to 20kHz	0.08 + 4mV	< 5 Ω	20mA	100uV
<i>With 9782 High Voltage/Current option fitted</i>					
200V ¹	40Hz to 1kHz	0.06 + 20mV	< 5 Ω	20mA	1mV
1050V	40Hz to 1kHz	0.08 + 90mV	< 10 Ω	10mA	10mV

1. Over-Range 10%

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

3. The output resistance on the 20mV and 200mV ranges is 10 Ω . This must be taken into account when loads of 100k Ω or less are being driven. A 100k Ω load will result in a 0.01% error.

All AC outputs exclude the DC component.

DC CURRENT			
Range	Accuracy ppm	Compliance Voltage	Resolution
200uA ¹	150 + 15nA	11V	1nA
2mA ¹	100 + 40nA	11V	10nA
20mA ¹	80 + 200nA	11V	10nA
200mA ¹	80 + 3uA	11V	100nA
<i>With 9782 High Voltage/Current option fitted</i>			
2A ¹	250 + 40uA	5V	1uA
20A ¹	600 + 2mA	4V	10 uA

1. Over-Range 10%.

AC CURRENT (sine-wave)				
Range	Frequency	Accuracy %	Compliance Voltage rms	Resolution
200uA ¹	20Hz to 1kHz	0.07 + 300nA	8V	10nA
2mA ¹	20Hz to 1kHz	0.05 + 300nA	8V	10nA
20mA ¹	20Hz to 1kHz	0.05 + 3uA	8V	100nA
200mA ¹	20Hz to 1kHz	0.05 + 30uA	8V	1uA
<i>With 9782 High Voltage/Current option fitted</i>				
2A ¹	20Hz to 500Hz	0.1 + 0.5mA	3.5V	10uA
20A ¹	20Hz to 500Hz	0.2 + 5mA	3V	100uA

1. Over-Range 10%.

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
T	-270 to -150	0.25
	-150 to 0	0.2
	0 to 400	0.15
R	-50 to 50	1.0
	50 to 250	0.8
	250 to 1768	0.6
S	-50 to 300	0.9
	300 to 1768	0.8
B	0 to 800	1.8
	800 to 1820	1.0
N	-270 to -100	0.8
	260-100 to 1300	0.3
E	-270 to -100	0.3
	-100 to 0	0.2
	0 to 1000	0.15

Resolution 0.1°C. Switchable automatic internal cold junction reference, accuracy ±0.5°C (applies to ambient changes of ±1°C)

The accuracy of the thermocouple simulation is determined by the accuracy of the 7051's DC Voltage function and the accuracy of the standard thermocouple tables (BS EN 60584-1) published by the British Standards Institute.

The 7051 uses precise digital interpretation of the tables to output voltage levels that are within the accuracies specified in the table above. Additional errors apply for temperatures below -200°C.

DECADE RESISTANCE ¹		
Value	Accuracy	Max Rating
1 Ω	800 ppm	0.1W
10 Ω	70 ppm	0.1W
100 Ω	30 ppm	0.1W
1 kΩ	20 ppm	0.1W
10 kΩ	20 ppm	0.1W
100 kΩ	30 ppm	0.1W
1 MΩ	150 ppm	200V
10 MΩ	0.1%	200V
100 MΩ	1%	200V
1 GΩ	10%	200V

1. Resistance specifications are ±5mΩ.

SIMULATED RESISTANCE	
RANGE	ACCURACY
10 to 40Ω	0.15% of setting + 20mΩ
400Ω	0.05% of setting + 0.05% of range
4kΩ	0.02% of setting + 0.05% of range
40kΩ	0.02% of setting + 0.05% of range
400kΩ	0.02% of setting + 0.05% of range
4MΩ	0.05% of setting + 0.05% of range
40MΩ	0.2% of setting + 0.05% of range

1. After subtraction of lead resistance.

Maximum measure current allowed in simulated resistance mode is 20mA. Simulated resistance mode is suitable for DC only, i.e. only DC current may be passed through the active resistance.

Simulated resistance limitations

It should be noted that the 7051's simulated resistance circuitry has a 2V voltage compliance. This means that the simulation is only valid if the measure current multiplied by required resistance is less than 2V. For example, if the measure current is 1mA, the maximum simulated resistance will be 2K ohms. The user should be aware of the measure currents being used by the instrument being calibrated in order to prevent incorrect simulated resistance being output by the 7051.

It should also be noted that some DMMs use measuring currents which are outside the 7051 simulated resistance limits. If in doubt over the validity of the 7051's output it is recommended that the voltage across the output terminals is checked – it should be less than 2V for correct operation.

PRT SIMULATION (Uses Simulated Resistance option)			
Pt100 DIN	Alpha 0.00385	Range -180 to 850°C	Accuracy ±0.1°C

CONDUCTANCE		
Value	Accuracy	Max Rating
1 S	800 ppm	0.1W
100m S	70 ppm	0.1W
10m S	30 ppm	0.1W
1m S	20 ppm	0.1W
100u S	20 ppm	0.1W
10u S	30 ppm	0.1W
1u S	150 ppm	200V
100n S	0.1%	200V
10n S	1%	200V
1n S	10%	200V

1. Conductance specifications are +/- 5mΩ

10MHz DIGITAL FREQUENCY
Variable Values 0.1Hz to 10MHz, ~2V pk-pk square wave. Accuracy 20ppm

PERIOD
Variable Values 100nS to 10S, ~2V pk-pk square wave. Accuracy 20ppm

DMM (Measure)

DC VOLTAGE			
Range	Accuracy PPM (Reading + Range)	Input Impedance	Resolution
100 mV	50 + 40	10MΩ	1uV
1 V	40 + 8	10MΩ	1uV
10 V	35 + 6	10MΩ	10uV
100 V	45 + 7	10MΩ	100uV
1 kV	45 + 10	10MΩ	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 to 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 RMS	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)
100Ω	1mA	100ppm + 40ppm
1kΩ	1mA	100ppm + 10ppm
10kΩ	100uA	100ppm + 10ppm
100kΩ	10uA	100ppm + 10ppm
1 MΩ	5uA	100ppm + 10ppm
10 MΩ	0.5uA	400ppm + 10ppm
100 MΩ	0.1uA	1% + 10ppm

FREQUENCY/PERIOD (100mV – 750V)	
Range	Accuracy (Reading)
3Hz to 10Hz	0.1%
10Hz to 40Hz	0.03%
40Hz to 300kHz	0.01%

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

Resolution 0.001°C. Switchable automatic internal cold junction compensation, accuracy ±0.5°C (applies to ambient changes of ±1°C). Additional errors apply for temperatures below -200°C.

RTD			
	Range °C	Accuracy °C	Resolution
Pt100 (Alpha 0.00385)	-180 to -100	0.5	0.01
	-100 to 550	0.1	
	550 to 850	0.15	

Calibrator Options

(Option code shown in brackets)

CAPACITANCE AND INDUCTANCE (9798)			
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 (9770)	
FREQUENCY Fixed Values 1, 2, 5 steps 0.1Hz to 10MHz accuracy 0.1ppm* 20, 50, 100MHz accuracy 20ppm	PERIOD Fixed Values 1, 2, 5 steps 100nS to 10S accuracy 0.1ppm* 50, 20, & 10nS accuracy 20ppm
* Fitted with Oven-Controlled Frequency Reference. Otherwise - 20ppm. 1.5V pk-pk - 0.1Hz to 100kHz. 1V pk-pk - 100kHz to 100MHz (sine-wave at 100MHz)	
DUTY CYCLE 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.	
AMPLITUDE	
Output per div	1mV to 50V in 1, 2, 5 sequence. 1kHz square wave or DC.
Graticule X	1, 2, 4, 6, 8. Max output 200V pk-pk ¹
Range	Accuracy
6mV to 200mV	0.2% + 4uV
200mV to 200V	0.05%
6mV to 20mV 50Ω	0.5% + 10uV
20mV to 2V 50Ω	0.25%
FAST RISE	400ps ±150ps (Into 50Ω Load)

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

2.2GHz-LEVELLED SWEEP (9769) 1V pk-pk Sine-Wave, 50Ω Output.	
Range	Amplitude Accuracy
100 MHz to 200 MHz	1%
200 MHz to 500 MHz	2%
500 MHz to 1 GHz	4%
1 GHz to 2.2 GHz	6%

From 100 to 500 MHz an additional floor of 5mVpk-pk applies.

Calibrator Options (continued)

FULL RANGE RESISTANCE (9787)			
Range	Accuracy ¹	Resolution	Max Rating
1Ω to 20Ω	0.01% + 7mΩ	1Ω	0.1W
20Ω to 99.999Ω	0.01% + 7mΩ	1mΩ/5mΩ*	0.1W
100Ω to 999.999Ω	0.01% + 5mΩ	1mΩ	0.1W
1kΩ to 9.999kΩ	0.02% + 20mΩ	1Ω	0.1W
10kΩ to 99.999kΩ	0.01% + 1Ω	1Ω	0.1W
100kΩ to 999.99kΩ	0.01% + 10Ω	10Ω	0.1W
1MΩ to 9.9999MΩ	0.02% + 100Ω	100Ω	0.1W
10MΩ to 120MΩ	0.1% + 1kΩ	1kΩ	0.1W

1. After subtraction of lead resistance. Add end resistance variation $\pm 2.5\text{m}\Omega$

* Output resolution is 5mΩ below 50Ω.

RTD SIMULATION			
	Range °C	Accuracy °C	Resolution °C
Pt100 (Alpha 0.00385)	-180 to 200	± 0.07	0.01
	200 to 850	± 0.15	

It should be noted that the accuracy of the RTD simulation is determined by the accuracy of the PRT tables BS EN 60751.

The 7051 uses precise digital interpretation of the tables to output resistance values that are within the accuracies specified in the table above.

AC VOLTAGE HI FREQUENCY (9771)			
Range	20 kHz to 100 kHz	100 kHz to 300 kHz	300kHz to 1MHz
20mV	0.05% + 0.1mV	0.1% + 0.5mV	-
200mV	0.05% + 0.1mV	0.1% + 0.5mV	-
2V	0.05% + 1mV	0.1% + 5mV	1% + 10mV
20V	0.1% + 10mV	-	-

Frequency Accuracy 0.01%

PC SPECIFICATION

Processor	64 bit quad Core (or equivalent)
RAM	4 GB (or higher)
Hard Drive	60 GB Solid State (or higher)
Ports	4 x USB, 1 x Fast Ethernet.
Display	10.4 inch Touch Screen
Operating System	Windows 8.1

GENERAL

POWER SUPPLY	
Mains Voltage	100 to 260V AC 50/60 Hz.
Power Consumption	125W typical, 220W Max.
MAXIMUM ALLOWABLE VOLTAGE BETWEEN TERMINALS	
Source	
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	15 to 35 °C.
Storage Temperature	-10 °C to 50 °C
Humidity	Operating < 80%
Altitude	0 to 3km. Non Operating 3km to 12km

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