



# Certificate of Calibration

1000194446

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## Customer Information

Accurate Calibration & Repair  
1924 Pinnacle Drive  
Aurora, IL 60504

PO #: 2017013  
Reference #: 1741904Rg17025  
Account #: 00317  
SO #: 41904

## Instrument Identification

Instrument Id: **R051089 / 02.41.002791**

Location: **R051089**

Noun: Handheld Calibrator

Model: Memocal 2000

Mfr: ERO Electronic

Serial #: 02.41.002791

Accuracy: See manufacturer's specifications

## Certification Information

Reason For Service: Calibration with Data  
Type Of Calibration: Accredited 17025  
As Found Condition: In Tolerance  
As Left Condition: Left As Found  
Procedure: MFR Manual :

Technician: Appealle Bullock  
Cal Date: 24 JAN 17  
Cal Due: 24 APR 17  
Temperature: 22.9 °C  
Humidity: 46.0 %

Technician Remarks: Datasheet reflects customer specified calibration points. Calibrated per AMS 2750 E.

- No sampling plan or other procedure was used for this calibration. Measurements and information on this certificate are valid at time of calibration only and any number of factors may cause calibration to drift out of tolerance prior to calibration due date.
- The calibration results published in this certificate were obtained using equipment capable of producing results that are traceable through NIST to the International System of Units (SI).
- The expanded uncertainty of the measurement process has not exceeded 25% of the tolerance allowed for the individual characteristics measured, unless otherwise stated. The uncertainties are based on a 95% confidence level, K=2.
- (!) Designates that the expanded uncertainty of measurement does not meet the 95% confidence level.
- J.H. Metrology Co., Inc's Calibration Control System complies with applicable requirements of ANSI Z540-1-1994, ISO 9001, and ISO/IEC 17025-2005.
- The results contained herein relate only to the item calibrated. This certificate shall not be reproduced except in full, without the written approval of J.H. Metrology Co., Inc.

Approved By:

President

Date: Jan 24, 2017

## Calibration Data

✓ In Tolerance    ✗ Out of Tolerance

Range	Nominal	As Found	As Left	Min	Max	Uncertainty
mV Output						
-4 mV to 20 mV	-4.000	-3.99901	✓ As Found	-4.004	-3.996	0.00060 mV
	0.000	0.00041	✓ As Found	-0.004	0.004	0.00059 mV



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✓ In Tolerance    ✗ Out of Tolerance

## Calibration Data

Range	Nominal	As Found		As Left		Min	Max	Uncertainty
<b>mV Output</b>								
	5.000	5.00104	✓	As Found		4.996	5.004	0.00060 mV
	10.000	10.00089	✓	As Found		9.996	10.004	0.00061 mV
	15.000	15.00161	✓	As Found		14.996	15.004	0.00062 mV
	20.000	20.00164	✓	As Found		19.996	20.004	0.00063 mV
-40 mV to 200 mV	-40.00	-40.00318	✓	As Found		-40.04	-39.96	0.0058 mV
	0.00	-0.000567	✓	As Found		-0.04	0.04	0.0058 mV
	50.00	50.00087	✓	As Found		49.96	50.04	0.0058 mV
	100.00	100.00497	✓	As Found		99.96	100.04	0.0059 mV
	150.00	150.00482	✓	As Found		149.96	150.04	0.0059 mV
	200.00	200.0108	✓	As Found		199.96	200.04	0.0060 mV
-400 mV to 2000 mV	-400.0	-400.0436	✓	As Found		-400.4	-399.4	0.058 mV
	0.0	-0.05643	✓	As Found		-0.4	0.4	0.058 mV
	500.0	499.9749	✓	As Found		499.6	500.4	0.058 mV
	1000.0	999.9854	✓	As Found		999.6	1000.4	0.058 mV
	1500.0	1500.0017	✓	As Found		1499.6	1500.4	0.059 mV
	2000.0	2000.147	✓	As Found		1999.6	2000.4	0.060 mV
-4000 mV to 20000 mV	-4000	-4000.436	✓	As Found		-4005	-3995	0.58 mV
	0	-0.50149	✓	As Found		-5	5	0.58 mV
	5000	5000.207	✓	As Found		4995	5005	0.58 mV
	10000	9999.951	✓	As Found		9995	10005	0.58 mV
	15000	15000.422	✓	As Found		14995	15005	0.59 mV
	20000	20000.98	✓	As Found		19995	20005	0.61 mV
<b>mV Measurement</b>								
-20 mV to 20 mV	-20.000	-19.996	✓	As Found		-20.006	-19.994	0.00090 mV
	0.000	0.000	✓	As Found		-0.006	0.006	0.00077 mV
	5.000	5.000	✓	As Found		4.994	5.006	0.00080 mV
	10.000	10.000	✓	As Found		9.994	10.006	0.00083 mV
	15.000	14.999	✓	As Found		14.994	15.006	0.00086 mV
	20.000	19.999	✓	As Found		19.994	20.006	0.00090 mV
-200 mV to 200 mV	-200.00	-199.96	✓	As Found		-200.06	-199.94	0.0063 mV
	0.00	0.00	✓	As Found		-0.06	0.06	0.0058 mV
	50.00	49.99	✓	As Found		49.94	50.06	0.0059 mV
	100.00	99.99	✓	As Found		99.94	100.06	0.0060 mV
	150.00	149.99	✓	As Found		149.94	150.06	0.0061 mV



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## Calibration Data

Range	Nominal	As Found		As Left		Min	Max	Uncertainty
<b>mV Measurement</b>								
	200.00	199.99	✓	As Found		199.94	200.06	0.0063 mV
-2000 mV to 2000 mV	-2000.0	-1999.7	✓	As Found		-2000.6	-1999.4	0.060 mV
	0.0	0.0	✓	As Found		-0.6	0.6	0.058 mV
	500.0	500.0	✓	As Found		499.4	500.6	0.058 mV
	1000.0	999.9	✓	As Found		999.4	1000.6	0.059 mV
	1500.0	1500.0	✓	As Found		1499.4	1500.6	0.059 mV
	2000.0	2000.0	✓	As Found		1999.4	2000.6	0.060 mV
-20000 mV to 20000 mV	-20000	-19996	✓	As Found		-20008	-19992	0.59 mV
	0	0	✓	As Found		-8	8	0.58 mV
	5000	4999	✓	As Found		4992	5008	0.58 mV
	10000	9999	✓	As Found		9992	10008	0.58 mV
	15000	14999	✓	As Found		14992	15008	0.59 mV
	20000	19999	✓	As Found		19992	20008	0.59 mV
<b>mA Output</b>								
0 mA to 21 mA	0.000	-0.00008024	✓	As Found		-0.003	0.003	0.00058 mA
	1.000	0.9995586	✓	As Found		0.997	1.003	0.00058 mA
	5.000	4.999405	✓	As Found		4.997	5.003	0.00060 mA
	10.000	9.999623	✓	As Found		9.997	10.003	0.00062 mA
	15.000	14.999147	✓	As Found		14.997	15.003	0.00066 mA
	21.000	20.99888	✓	As Found		20.997	21.003	0.00072 mA
<b>mA Measurement</b>								
-20 mA to 20 mA	-20.000	-19.997	✓	As Found		-20.006	-19.994	0.0011 mA
	0.000	0.000	✓	As Found		-0.006	0.006	0.00058 mA
	5.000	5.000	✓	As Found		4.994	5.006	0.00063 mA
	10.000	9.999	✓	As Found		9.994	10.006	0.00074 mA
	15.000	15.000	✓	As Found		14.994	15.006	0.00087 mA
	20.000	20.000	✓	As Found		19.994	20.006	0.0011 mA
-130 mA to 130 mA	-130.00	-130.01	✓	As Found		-130.05	-129.95	0.0094 mA
	0.00	0.00	✓	As Found		-0.05	0.05	0.0058 mA
	10.00	10.00	✓	As Found		9.95	10.05	0.0058 mA
	50.00	50.00	✓	As Found		49.95	50.05	0.0067 mA
	100.00	100.00	✓	As Found		99.95	100.05	0.0082 mA
	130.00	130.01	✓	As Found		129.95	130.05	0.0094 mA

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## Calibration Data

Range	Nominal	As Found		As Left	Min	Max	Uncertainty
<b>RTD Pt. 100 Ohm Measurement (-200° to 850°C)</b>							
20.68 Ohms	-195.0	-195.0	✓	As Found	-195.6	-194.4	0.058 °C
60.26 Ohms	-100.0	-100.0	✓	As Found	-100.6	-99.4	0.058 °C
100.00 Ohms	0.0	-0.1	✓	As Found	-0.6	0.6	0.058 °C
138.51 Ohms	100.0	99.9	✓	As Found	99.4	100.6	0.058 °C
280.98 Ohms	500.0	500.0	✓	As Found	499.4	500.6	0.059 °C
389.02 Ohms	845.0	845.1	✓	As Found	844.1	845.9	0.060 °C
<b>Ohms Measurement</b>							
0 to 800 Ohms	0.0	0.0	✓	As Found	-0.2	0.2	0.058 Ohms
	10.0	10.0	✓	As Found	9.8	10.2	0.058 Ohms
	100.0	100.0	✓	As Found	99.8	100.2	0.058 Ohms
	300.0	300.0	✓	As Found	299.8	300.2	0.058 Ohms
	500.0	500.0	✓	As Found	499.8	500.2	0.058 Ohms
	790.0	790.0	✓	As Found	789.8	790.2	0.059 Ohms
<b>Thermocouple Measurement</b>							
Type E -328° to 1832°F	-328.0	-327.8	✓	As Found	-329.0	-327.0	0.061 °F
	-200.0	-200.0	✓	As Found	-201.0	-199.0	0.058 °F
	0.0	0.0	✓	As Found	-1.0	1.0	0.058 °F
	32.0	32.0	✓	As Found	31.0	33.0	0.058 °F
	200.0	199.9	✓	As Found	199.0	201.0	0.058 °F
	400.0	399.9	✓	As Found	399.0	401.0	0.058 °F
	600.0	600.1	✓	As Found	599.0	601.0	0.058 °F
	800.0	800.1	✓	As Found	799.0	801.0	0.058 °F
	1000.0	1000.0	✓	As Found	999.0	1001.0	0.058 °F
	1200.0	1200.0	✓	As Found	1198.8	1201.2	0.058 °F
	1400.0	1399.8	✓	As Found	1398.6	1401.4	0.059 °F
	1600.0	1599.8	✓	As Found	1598.4	1601.6	0.059 °F
	1832.0	1832.0	✓	As Found	1830.2	1833.8	0.059 °F
Type J -328° to 2192°F	-328.0	-327.8	✓	As Found	-329.0	-327.0	0.058 °F
	-200.0	-199.8	✓	As Found	-201.0	-199.0	0.058 °F
	0.0	0.0	✓	As Found	-1.0	1.0	0.058 °F
	32.0	32.0	✓	As Found	31.0	33.0	0.058 °F
	200.0	199.8	✓	As Found	199.0	201.0	0.058 °F
	400.0	399.9	✓	As Found	399.0	401.0	0.058 °F
	600.0	600.1	✓	As Found	599.0	601.0	0.058 °F



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## Calibration Data

Range	Nominal	As Found	As Left	Min	Max	Uncertainty	
<b>Thermocouple Measurement</b>							
	800.0	800.1	✓	As Found	799.0	801.0	0.058 °F
	1000.0	1000.0	✓	As Found	999.0	1001.0	0.059 °F
	1200.0	1199.8	✓	As Found	1198.8	1201.2	0.059 °F
	1600.0	1600.0	✓	As Found	1598.4	1601.6	0.059 °F
	1800.0	1800.0	✓	As Found	1798.2	1801.8	0.059 °F
	2192.0	2191.8	✓	As Found	2189.8	2194.2	0.060 °F
Type K -328° to 2498°F	-328.0	-327.8	✓	As Found	-329.0	-327.0	0.079 °F
	-200.0	-200.0	✓	As Found	-201.0	-199.0	0.058 °F
	0.0	0.0	✓	As Found	-1.0	1.0	0.058 °F
	32.0	32.0	✓	As Found	31.0	33.0	0.058 °F
	200.0	199.9	✓	As Found	199.0	201.0	0.058 °F
	400.0	399.8	✓	As Found	399.0	401.0	0.058 °F
	600.0	599.9	✓	As Found	599.0	601.0	0.058 °F
	800.0	799.9	✓	As Found	799.0	801.0	0.058 °F
	1000.0	999.9	✓	As Found	999.0	1001.0	0.059 °F
	1200.0	1200.0	✓	As Found	1198.8	1201.2	0.059 °F
	1400.0	1400.0	✓	As Found	1398.6	1401.4	0.059 °F
	1600.0	1600.0	✓	As Found	1598.4	1601.6	0.059 °F
	1800.0	1800.0	✓	As Found	1798.2	1801.8	0.059 °F
	2000.0	1999.8	✓	As Found	1998.0	2002.0	0.059 °F
	2200.0	2199.7	✓	As Found	2197.8	2202.2	0.062 °F
	2498.0	2497.8	✓	As Found	2495.5	2500.5	0.062 °F
Type T -328° to 752°F	-328.0	-327.8	✓	As Found	-329.0	-327.0	0.066 °F
	-200.0	-200.0	✓	As Found	-201.0	-199.0	0.059 °F
	0.0	0.0	✓	As Found	-1.0	1.0	0.058 °F
	32.0	32.0	✓	As Found	31.0	33.0	0.058 °F
	200.0	199.9	✓	As Found	199.0	201.0	0.058 °F
	400.0	399.9	✓	As Found	399.0	401.0	0.058 °F
	600.0	600.1	✓	As Found	599.0	601.0	0.058 °F
	752.0	752.0	✓	As Found	751.0	753.0	0.058 °F
Type R -58° to 3214°F	-50.0	-50.3	✓	As Found	-52.6	-47.4	0.065 °F
	0.0	-0.2	✓	As Found	-2.6	2.6	0.065 °F
	32.0	32.0	✓	As Found	29.4	34.6	0.065 °F
	200.0	200.1	✓	As Found	198.4	201.6	0.061 °F
	400.0	399.9	✓	As Found	398.8	401.2	0.060 °F



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## Calibration Data

Range	Nominal	As Found		As Left	Min	Max	Uncertainty
<b>Thermocouple Measurement</b>							
	600.0	600.1	✓	As Found	599.0	601.0	0.060 °F
	800.0	800.1	✓	As Found	799.0	801.0	0.060 °F
	1000.0	1000.0	✓	As Found	999.0	1001.0	0.060 °F
	1200.0	1200.0	✓	As Found	1198.8	1201.2	0.060 °F
	1400.0	1400.0	✓	As Found	1398.6	1401.4	0.060 °F
	1600.0	1600.0	✓	As Found	1598.4	1601.6	0.060 °F
	1800.0	1799.8	✓	As Found	1798.2	1801.8	0.060 °F
	2000.0	1999.6	✓	As Found	1998.0	2002.0	0.060 °F
	2200.0	2199.7	✓	As Found	2197.8	2202.2	0.060 °F
	2800.0	2799.9	✓	As Found	2797.2	2802.8	0.063 °F
	3200.0	3199.7	✓	As Found	3196.8	3203.2	0.063 °F
Type S -58° to 3214°F	-50.0	-49.7	✓	As Found	-52.0	-48.0	0.065 °F
	0.0	0.3	✓	As Found	-2.0	2.0	0.065 °F
	32.0	32.0	✓	As Found	30.0	34.0	0.065 °F
	200.0	199.8	✓	As Found	198.8	201.2	0.061 °F
	400.0	400.1	✓	As Found	398.8	401.2	0.060 °F
	600.0	599.9	✓	As Found	599.0	601.0	0.060 °F
	800.0	799.9	✓	As Found	799.0	801.0	0.060 °F
	1000.0	1000.0	✓	As Found	999.0	1001.0	0.061 °F
	1200.0	1200.0	✓	As Found	1198.8	1201.2	0.061 °F
	1400.0	1400.0	✓	As Found	1398.6	1401.4	0.061 °F
	1600.0	1599.8	✓	As Found	1598.4	1601.6	0.061 °F
	1800.0	1799.8	✓	As Found	1798.2	1801.8	0.061 °F
	2000.0	1999.8	✓	As Found	1998.0	2002.0	0.061 °F
	2200.0	2199.7	✓	As Found	2197.8	2202.2	0.061 °F
	2800.0	2800.0	✓	As Found	2797.2	2802.8	0.064 °F
	3200.0	3199.8	✓	As Found	3196.8	3203.2	0.064 °F
Type N 32° to 2570°F	32.0	32.0	✓	As Found	31.0	33.0	0.058 °F
	200.0	199.9	✓	As Found	199.0	201.0	0.058 °F
	400.0	399.9	✓	As Found	399.0	401.0	0.058 °F
	600.0	599.9	✓	As Found	599.0	601.0	0.058 °F
	800.0	799.9	✓	As Found	799.0	801.0	0.058 °F
	1000.0	999.9	✓	As Found	999.0	1001.0	0.059 °F
	1200.0	1199.8	✓	As Found	1198.8	1201.2	0.059 °F
	1400.0	1399.8	✓	As Found	1398.6	1401.4	0.059 °F



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## Calibration Data

Range	Nominal	As Found		As Left	Min	Max	Uncertainty
<b>Thermocouple Measurement</b>							
	1600.0	1599.8	✓	As Found	1598.4	1601.6	0.059 °F
	1800.0	1800.0	✓	As Found	1798.2	1801.8	0.059 °F
	2000.0	1999.9	✓	As Found	1998.0	2002.0	0.059 °F
	2200.0	2199.9	✓	As Found	2197.8	2202.2	0.060 °F
	2370.0	2369.8	✓	As Found	2367.6	2372.4	0.060 °F
Type B 122° to 3276°F	150.0	153.7	✓	As Found	126.3	173.7	0.15 °F
	200.0	200.1	✓	As Found	176.3	223.7	0.15 °F
	400.0	400.8	✓	As Found	396.2	403.8	0.074 °F
	600.0	600.1	✓	As Found	596.2	603.8	0.064 °F
	800.0	799.9	✓	As Found	798.0	802.0	0.064 °F
	1000.0	999.7	✓	As Found	998.0	1002.0	0.062 °F
	1200.0	1200.0	✓	As Found	1198.0	1202.0	0.062 °F
	1400.0	1399.8	✓	As Found	1398.6	1401.4	0.060 °F
	1600.0	1600.0	✓	As Found	1598.4	1601.6	0.060 °F
	1800.0	1799.8	✓	As Found	1798.2	1801.8	0.060 °F
	2000.0	1999.8	✓	As Found	1998.0	2002.0	0.060 °F
	2200.0	2200.1	✓	As Found	2197.8	2202.2	0.060 °F
	2600.0	2599.9	✓	As Found	2597.4	2602.6	0.060 °F
	3000.0	2999.9	✓	As Found	2997.0	3003.0	0.061 °F
	3272.0	3271.8	✓	As Found	3268.7	3275.3	0.061 °F
<b>Thermocouple Output</b>							
Type E -328° to 1832°F	-328.0	-327.95	✓	As Found	-329.0	-327.0	0.061 °F
	-200.0	-199.86	✓	As Found	-201.0	-199.0	0.058 °F
	32.0	32.02	✓	As Found	31.0	33.0	0.058 °F
	600.0	600.03	✓	As Found	599.0	601.0	0.058 °F
	1000.0	1000.06	✓	As Found	999.0	1001.0	0.058 °F
	1832.0	1831.89	✓	As Found	1830.2	1833.8	0.059 °F
Type J -328° to 2192°F	-328.0	-327.80	✓	As Found	-329.0	-327.0	0.058 °F
	-200.0	-200.04	✓	As Found	-201.0	-199.0	0.058 °F
	32.0	32.00	✓	As Found	31.0	33.0	0.058 °F
	800.0	800.02	✓	As Found	799.0	801.0	0.058 °F
	1600.0	1599.93	✓	As Found	1598.4	1601.6	0.059 °F
	2192.0	2192.07	✓	As Found	2189.8	2194.2	0.060 °F
Type K -328° to 2498°F	-328.0	-327.64	✓	As Found	-329.0	-327.0	0.079 °F



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## Calibration Data

Range	Nominal	As Found		As Left	Min	Max	Uncertainty
<b>Thermocouple Output</b>							
	-200.0	-199.98	✓	As Found	-201.0	-199.0	0.058 °F
	32.0	32.00	✓	As Found	31.0	33.0	0.058 °F
	600.0	600.13	✓	As Found	599.0	601.0	0.058 °F
	1600.0	1599.91	✓	As Found	1598.4	1601.6	0.059 °F
	2498.0	2497.95	✓	As Found	2495.5	2500.5	0.062 °F
Type T -328° to 752°F	-328.0	-327.77	✓	As Found	-329.0	-327.0	0.066 °F
	-200.0	-200.02	✓	As Found	-201.0	-199.0	0.059 °F
	32.0	32.02	✓	As Found	31.0	33.0	0.058 °F
	200.0	199.92	✓	As Found	199.0	201.0	0.058 °F
	400.0	399.92	✓	As Found	399.0	401.0	0.058 °F
	752.0	751.91	✓	As Found	751.0	753.0	0.058 °F
Type R -58° to 3214°F	-50.0	-49.37	✓	As Found	-52.6	-47.4	0.065 °F
	32.0	32.07	✓	As Found	29.4	34.6	0.065 °F
	600.0	600.04	✓	As Found	599.0	601.0	0.060 °F
	1600.0	1600.03	✓	As Found	1598.4	1601.6	0.060 °F
	2200.0	2199.96	✓	As Found	2197.8	2202.2	0.060 °F
	3200.0	3199.59	✓	As Found	3196.8	3203.2	0.063 °F
Type S -58° to 3214°F	-50.0	-49.56	✓	As Found	-52.0	-48.0	0.065 °F
	32.0	32.04	✓	As Found	30.0	34.0	0.065 °F
	600.0	600.09	✓	As Found	599.0	601.0	0.060 °F
	1600.0	1599.93	✓	As Found	1598.4	1601.6	0.061 °F
	2200.0	2199.87	✓	As Found	2197.8	2202.2	0.061 °F
	3200.0	3199.93	✓	As Found	3196.8	3203.2	0.064 °F
Type N 32° to 2570°F	32.0	32.04	✓	As Found	31.0	33.0	0.058 °F
	600.0	600.19	✓	As Found	599.0	601.0	0.058 °F
	1400.0	1399.89	✓	As Found	1398.6	1401.4	0.059 °F
	1600.0	1599.96	✓	As Found	1598.4	1601.6	0.059 °F
	2000.0	1999.83	✓	As Found	1998.0	2002.0	0.059 °F
	2370.0	2370.02	✓	As Found	2367.6	2372.4	0.060 °F
Type B 122° to 3276°F	150.0	149.2	✓	As Found	126.3	173.7	0.15 °F
	1200.0	1199.88	✓	As Found	1198.0	1202.0	0.062 °F
	1600.0	1600.11	✓	As Found	1598.4	1601.6	0.060 °F
	2000.0	2000.12	✓	As Found	1998.0	2002.0	0.060 °F
	2600.0	2600.08	✓	As Found	2597.4	2602.6	0.060 °F





# Certificate of Calibration

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✓ In Tolerance    ✗ Out of Tolerance

## Calibration Data

Range	Nominal	As Found	As Left	Min	Max	Uncertainty	
<b>Thermocouple Output</b>							
	3272.0	3271.93	✓	As Found	3268.7	3275.3	0.061 °F

End of Datasheet

## Calibration Standards

<u>NIST Traceable #</u>	<u>Instrument ID#</u>	<u>Description</u>	<u>Model</u>	<u>Calibration Date</u>	<u>Date Due</u>
1000189221	02007	Calibrator	5520A/SC1.1GHz	18 MAY 2016	31 MAY 2017
1000189671	00522	Resistance Standard	RS925A	21 APR 2016	30 APR 2017
1000190278	02037	Humidity/Temperature Chart Recorder	RH520	01 JUN 2016	31 MAY 2017
1000190766	00266	High Impedance Voltmeter-Null Detector	845AR	14 JUN 2016	30 APR 2017
1000193574	00888	Calibrator	5720A	19 DEC 2016	31 DEC 2017
1000193575	00890	Reference Multimeter	8508A-01	04 JAN 2017	31 JAN 2018