



Certificate of Calibration

1000185973

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Customer Information

Accurate Calibration & Repair
1924 Pinnacle Drive
Aurora, IL 60504

PO #: 344943
Reference #: 1539168Rg
Account #: 00317
SO #: 39168

Instrument Identification

Instrument Id: **R051276**

Location: **R051276**

Noun: Handheld Calibrator

Model: Memocal 2000

Mfr: Barber-Colman Company

Serial #: 98.24.1614

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: 04 SEP 15
Cal Due: 04 DEC 15
Temperature: 23.4 °C
Humidity: 38.0 %

Technician Remarks: Datasheet reflects customer specified calibration points. Unit 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.
- This instrument has been calibrated using standards with accuracies traceable to the National Institute of Standards and Technology, derived from natural physical constants, from ratio measurements, or compared to consensus standards.
- 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.
- Measurement uncertainties are not used in the determination of In or Out of Tolerance of the Unit under test.
- 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: Sep 04, 2015

Printed: 9/8/2015 08:01:44

JH Metrology Co, Inc. • 1801 Hicks Road, Unit E • Rolling Meadows, Illinois 60008 • Phone: (847) 991-0290 • Fax: (847) 991-0348

✓ In Tolerance ✗ Out of Tolerance

Calibration Data

Range	Nominal	As Found	As Left	Min	Max	Uncertainty
mV Output						
-4 mV to 20 mV	-4.000	-3.99967	✓ As Found	-4.004	-3.996	0.00065 mV
	0.000	0.00051	✓ As Found	-0.004	0.004	0.00062 mV

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Range	Nominal	As Found		As Left	Min	Max	Uncertainty
mV Output							
	5.000	5.00137	✓	As Found	4.996	5.004	0.00065 mV
	10.000	10.00154	✓	As Found	9.996	10.004	0.00069 mV
	15.000	15.00081	✓	As Found	14.996	15.004	0.00072 mV
	20.000	20.00072	✓	As Found	19.996	20.004	0.00075 mV
-40 mV to 200 mV	-40.00	-40.00022	✓	As Found	-40.04	-39.96	0.0054 mV
	0.00	0.00293	✓	As Found	-0.04	0.04	0.0051 mV
	50.00	50.01184	✓	As Found	49.96	50.04	0.0054 mV
	100.00	100.01441	✓	As Found	99.96	100.04	0.0058 mV
	150.00	150.00565	✓	As Found	149.96	150.04	0.0061 mV
	200.00	200.0089	✓	As Found	199.96	200.04	0.0064 mV
-400 mV to 2000 mV	-400.0	-400.0122	✓	As Found	-400.4	-399.4	0.052 mV
	0.0	-0.00995	✓	As Found	-0.4	0.4	0.050 mV
	500.0	500.0865	✓	As Found	499.6	500.4	0.053 mV
	1000.0	1000.0977	✓	As Found	999.6	1000.4	0.055 mV
	1500.0	1500.0327	✓	As Found	1499.6	1500.4	0.057 mV
	2000.0	2000.048	✓	As Found	1999.6	2000.4	0.064 mV
-4000 mV to 20000 mV	-4000	-4000.227	✓	As Found	-4005	-3995	0.52 mV
	0	-0.01121	✓	As Found	-5	5	0.50 mV
	5000	5000.698	✓	As Found	4995	5005	0.53 mV
	10000	10000.019	✓	As Found	9995	10005	0.55 mV
	15000	15001.002	✓	As Found	14995	15005	0.57 mV
	20000	20000.36	✓	As Found	19995	20005	0.69 mV
mV Measurement							
-20 mV to 20 mV	-20.000	-19.998	✓	As Found	-20.006	-19.994	0.0012 mV
	0.000	0.000	✓	As Found	-0.006	0.006	0.00050 mV
	5.000	5.001	✓	As Found	4.994	5.006	0.0011 mV
	10.000	10.000	✓	As Found	9.994	10.006	0.0011 mV
	15.000	15.000	✓	As Found	14.994	15.006	0.0011 mV
	20.000	20.000	✓	As Found	19.994	20.006	0.0012 mV
-200 mV to 200 mV	-200.00	-199.95	✓	As Found	-200.06	-199.94	0.0070 mV
	0.00	0.00	✓	As Found	-0.06	0.06	0.0050 mV
	50.00	50.00	✓	As Found	49.94	50.06	0.0060 mV
	100.00	99.99	✓	As Found	99.94	100.06	0.0060 mV
	150.00	149.98	✓	As Found	149.94	150.06	0.0070 mV



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Range	Nominal	As Found		As Left		Min	Max	Uncertainty
mV Measurement								
	200.00	199.98	✓	As Found		199.94	200.06	0.0070 mV
-2000 mV to 2000 mV	-2000.0	-1999.6	✓	As Found		-2000.6	-1999.4	0.060 mV
	0.0	0.0	✓	As Found		-0.6	0.6	0.050 mV
	500.0	500.0	✓	As Found		499.4	500.6	0.050 mV
	1000.0	999.9	✓	As Found		999.4	1000.6	0.060 mV
	1500.0	1499.9	✓	As Found		1499.4	1500.6	0.060 mV
	2000.0	1999.8	✓	As Found		1999.4	2000.6	0.060 mV
-20000 mV to 20000 mV	-20000	-19995	✓	As Found		-20008	-19992	0.60 mV
	0	0	✓	As Found		-8	8	0.50 mV
	5000	4999	✓	As Found		4992	5008	0.50 mV
	10000	9998	✓	As Found		9992	10008	0.50 mV
	15000	14997	✓	As Found		14992	15008	0.60 mV
	20000	19997	✓	As Found		19992	20008	0.60 mV
mA Output								
0 mA to 21 mA	0.000	0.00005848	✓	As Found		-0.003	0.003	0.00050 mA
	1.000	0.9999716	✓	As Found		0.997	1.003	0.00052 mA
	5.000	5.000988	✓	As Found		4.997	5.003	0.00063 mA
	10.000	10.002045	✓	As Found		9.997	10.003	0.00072 mA
	15.000	15.002392	✓	As Found		14.997	15.003	0.00081 mA
	21.000	21.00213	✓	As Found		20.997	21.003	0.00092 mA
mA Measurement								
-20 mA to 20 mA	-20.000	-19.996	✓	As Found		-20.006	-19.994	0.0014 mA
	0.000	0.000	✓	As Found		-0.006	0.006	0.00050 mA
	5.000	4.999	✓	As Found		4.994	5.006	0.00080 mA
	10.000	9.998	✓	As Found		9.994	10.006	0.0010 mA
	15.000	14.998	✓	As Found		14.994	15.006	0.0012 mA
	20.000	19.996	✓	As Found		19.994	20.006	0.0014 mA
-130 mA to 130 mA	-130.00	-129.98	✓	As Found		-130.05	-129.95	0.012 mA
	0.00	0.00	✓	As Found		-0.05	0.05	0.0050 mA
	10.00	10.00	✓	As Found		9.95	10.05	0.0050 mA
	50.00	50.00	✓	As Found		49.95	50.05	0.0080 mA
	100.00	99.99	✓	As Found		99.95	100.05	0.011 mA
	130.00	129.99	✓	As Found		129.95	130.05	0.012 mA

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Range	Nominal	As Found		As Left	Min	Max	Uncertainty
RTD Pt. 100 Ohm Measurement (-200° to 850°C)							
20.68 Ohms	-195.0	-195.3	✓	As Found	-195.3	-194.7	0.050 °C
60.26 Ohms	-100.0	-100.3	✓	As Found	-100.3	-99.7	0.050 °C
100.00 Ohms	0.0	-0.3	✓	As Found	-0.3	0.3	0.050 °C
138.51 Ohms	100.0	99.7	✓	As Found	99.7	100.3	0.060 °C
280.98 Ohms	500.0	499.7	✓	As Found	499.7	500.3	0.060 °C
389.02 Ohms	845.0	844.7	✓	As Found	844.7	845.3	0.060 °C
Ohms Measurement							
0 to 800 Ohms	0.0	0.0	✓	As Found	-0.2	0.2	0.050 Ohms
	10.0	9.9	✓	As Found	9.8	10.2	0.050 Ohms
	100.0	99.9	✓	As Found	99.8	100.2	0.050 Ohms
	300.0	299.8	✓	As Found	299.8	300.2	0.060 Ohms
	500.0	499.8	✓	As Found	499.8	500.2	0.060 Ohms
	790.0	789.8	✓	As Found	789.8	790.2	0.060 Ohms
Thermocouple Measurement							
Type E -328° to 1832°F	-328.0	-328.0	✓	As Found	-328.4	-327.6	0.090 °F
	-200.0	-200.0	✓	As Found	-200.4	-199.6	0.11 °F
	0.0	0.0	✓	As Found	-0.4	0.4	0.11 °F
	32.0	32.0	✓	As Found	31.6	32.4	0.11 °F
	200.0	199.9	✓	As Found	199.6	200.4	0.11 °F
	400.0	399.9	✓	As Found	399.6	400.4	0.11 °F
	600.0	599.9	✓	As Found	599.6	600.4	0.11 °F
	800.0	799.9	✓	As Found	799.6	800.4	0.11 °F
	1000.0	999.9	✓	As Found	999.6	1000.4	0.11 °F
	1200.0	1200.0	✓	As Found	1199.6	1200.4	0.11 °F
	1400.0	1399.9	✓	As Found	1399.6	1400.4	0.11 °F
	1600.0	1599.8	✓	As Found	1599.6	1600.4	0.11 °F
	1832.0	1832.0	✓	As Found	1831.6	1832.4	0.11 °F
Type J -328° to 2192°F	-328.0	-328.0	✓	As Found	-328.5	-327.5	0.11 °F
	-200.0	-200.0	✓	As Found	-200.5	-199.5	0.11 °F
	0.0	0.0	✓	As Found	-0.5	0.5	0.11 °F
	32.0	32.0	✓	As Found	31.5	32.5	0.11 °F
	200.0	199.9	✓	As Found	199.5	200.5	0.11 °F
	400.0	399.9	✓	As Found	399.5	400.5	0.11 °F
	600.0	600.1	✓	As Found	599.5	600.5	0.11 °F



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Range	Nominal	As Found		As Left	Min	Max	Uncertainty
Thermocouple Measurement							
	800.0	799.9	✓	As Found	799.5	800.5	0.11 °F
	1000.0	999.9	✓	As Found	999.5	1000.5	0.11 °F
	1200.0	1199.8	✓	As Found	1199.5	1200.5	0.11 °F
	1600.0	1600.0	✓	As Found	1599.5	1600.5	0.080 °F
	1800.0	1800.0	✓	As Found	1799.5	1800.5	0.080 °F
	2192.0	2191.8	✓	As Found	2191.5	2192.5	0.090 °F
Type K -328° to 2498°F	-328.0	-328.0	✓	As Found	-328.5	-327.5	0.12 °F
	-200.0	-200.0	✓	As Found	-200.5	-199.5	0.11 °F
	0.0	0.0	✓	As Found	-0.5	0.5	0.11 °F
	32.0	32.0	✓	As Found	31.5	32.5	0.11 °F
	200.0	200.1	✓	As Found	199.6	200.4	0.11 °F
	400.0	399.9	✓	As Found	399.6	400.4	0.11 °F
	600.0	599.9	✓	As Found	599.6	600.4	0.11 °F
	800.0	800.1	✓	As Found	799.6	800.4	0.11 °F
	1000.0	999.9	✓	As Found	999.6	1000.4	0.11 °F
	1200.0	1199.8	✓	As Found	1199.6	1200.4	0.11 °F
	1400.0	1399.8	✓	As Found	1399.6	1400.4	0.11 °F
	1600.0	1599.8	✓	As Found	1599.6	1600.4	0.11 °F
	1800.0	1799.8	✓	As Found	1799.3	1800.7	0.11 °F
	2000.0	1999.8	✓	As Found	1999.3	2000.7	0.11 °F
	2200.0	2199.7	✓	As Found	2199.3	2200.7	0.12 °F
	2498.0	2497.8	✓	As Found	2497.1	2498.9	0.11 °F
Type T -328° to 752°F	-328.0	-328.2	✓	As Found	-328.5	-327.5	0.11 °F
	-200.0	-200.0	✓	As Found	-200.5	-199.5	0.11 °F
	0.0	0.0	✓	As Found	-0.5	0.5	0.11 °F
	32.0	32.0	✓	As Found	31.5	32.5	0.11 °F
	200.0	199.9	✓	As Found	199.7	200.3	0.11 °F
	400.0	399.9	✓	As Found	399.7	400.3	0.11 °F
	600.0	599.9	✓	As Found	599.7	600.3	0.11 °F
	752.0	752.0	✓	As Found	751.7	752.3	0.070 °F
Type R -58° to 3214°F	-50.0	-50.3	✓	As Found	-52.6	-47.4	0.30 °F
	0.0	-0.8	✓	As Found	-2.6	2.6	0.20 °F
	32.0	31.6	✓	As Found	29.4	34.6	0.20 °F
	200.0	199.8	✓	As Found	198.4	201.6	0.17 °F
	400.0	399.7	✓	As Found	398.8	401.2	0.15 °F



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Range	Nominal	As Found		As Left	Min	Max	Uncertainty
Thermocouple Measurement							
	600.0	599.7	✓	As Found	599.2	600.8	0.15 °F
	800.0	799.9	✓	As Found	799.2	800.8	0.14 °F
	1000.0	1000.0	✓	As Found	999.2	1000.8	0.14 °F
	1200.0	1200.0	✓	As Found	1199.2	1200.8	0.13 °F
	1400.0	1399.8	✓	As Found	1399.2	1400.8	0.13 °F
	1600.0	1599.8	✓	As Found	1599.2	1600.8	0.13 °F
	1800.0	1799.8	✓	As Found	1799.2	1800.8	0.13 °F
	2000.0	1999.8	✓	As Found	1999.2	2000.8	0.14 °F
	2200.0	2199.9	✓	As Found	2199.2	2200.8	0.13 °F
	2800.0	2800.0	✓	As Found	2799.2	2800.8	0.13 °F
	3200.0	3199.6	✓	As Found	3198.8	3201.2	0.15 °F
Type S -58° to 3214°F	-50.0	-50.6	✓	As Found	-52.0	-48.0	0.22 °F
	0.0	0.0	✓	As Found	-2.0	2.0	0.20 °F
	32.0	31.8	✓	As Found	30.0	34.0	0.20 °F
	200.0	199.8	✓	As Found	198.8	201.2	0.17 °F
	400.0	399.7	✓	As Found	398.8	401.2	0.15 °F
	600.0	599.8	✓	As Found	599.2	600.8	0.15 °F
	800.0	799.7	✓	As Found	799.2	800.8	0.15 °F
	1000.0	999.9	✓	As Found	999.2	1000.8	0.15 °F
	1200.0	1200.0	✓	As Found	1199.2	1200.8	0.14 °F
	1400.0	1399.8	✓	As Found	1399.2	1400.8	0.14 °F
	1600.0	1599.8	✓	As Found	1599.2	1600.8	0.14 °F
	1800.0	1799.8	✓	As Found	1799.2	1800.8	0.13 °F
	2000.0	1999.9	✓	As Found	1999.2	2000.8	0.14 °F
	2200.0	2199.7	✓	As Found	2199.2	2200.8	0.14 °F
	2800.0	2799.9	✓	As Found	2799.2	2800.8	0.14 °F
	3200.0	3199.8	✓	As Found	3199.2	3200.8	0.16 °F
Type N 32° to 2570°F	32.0	32.0	✓	As Found	31.6	32.4	0.11 °F
	200.0	199.9	✓	As Found	199.6	200.4	0.11 °F
	400.0	399.9	✓	As Found	399.6	400.4	0.11 °F
	600.0	599.9	✓	As Found	599.6	600.4	0.11 °F
	800.0	799.9	✓	As Found	799.6	800.4	0.11 °F
	1000.0	999.9	✓	As Found	999.6	1000.4	0.11 °F
	1200.0	1199.8	✓	As Found	1199.3	1200.7	0.11 °F
	1400.0	1399.8	✓	As Found	1399.3	1400.7	0.11 °F



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Range	Nominal	As Found		As Left	Min	Max	Uncertainty
Thermocouple Measurement							
	1600.0	1599.8	✓	As Found	1599.3	1600.7	0.11 °F
	1800.0	1800.0	✓	As Found	1799.3	1800.7	0.11 °F
	2000.0	1999.9	✓	As Found	1999.3	2000.7	0.11 °F
	2200.0	2199.7	✓	As Found	2199.2	2200.8	0.12 °F
	2370.0	2369.6	✓	As Found	2369.2	2370.8	0.10 °F
Type B 122° to 3276°F	150.0	150.6	✓	As Found	126.3	173.7	0.56 °F
	200.0	198.1	✓	As Found	176.3	223.7	0.51 °F
	400.0	399.0	✓	As Found	396.2	403.8	0.51 °F
	600.0	599.5	✓	As Found	596.2	603.8	0.27 °F
	800.0	799.5	✓	As Found	798.0	802.0	0.20 °F
	1000.0	999.3	✓	As Found	998.0	1002.0	0.20 °F
	1200.0	1199.8	✓	As Found	1198.0	1202.0	0.20 °F
	1400.0	1399.8	✓	As Found	1398.7	1401.3	0.15 °F
	1600.0	1599.6	✓	As Found	1598.7	1601.3	0.15 °F
	1800.0	1799.8	✓	As Found	1799.2	1800.8	0.15 °F
	2000.0	1999.8	✓	As Found	1999.2	2000.8	0.15 °F
	2200.0	2199.9	✓	As Found	2199.2	2200.8	0.15 °F
	2600.0	2599.9	✓	As Found	2599.2	2600.8	0.15 °F
	3000.0	2999.8	✓	As Found	2999.2	3000.8	0.14 °F
	3276.0	3275.8	✓	As Found	3275.2	3276.8	0.16 °F
Thermocouple Output							
Type E -328° to 1832°F	-328.0	-327.93	✓	As Found	-328.4	-327.6	0.060 °F
	-200.0	-199.82	✓	As Found	-200.4	-199.6	0.11 °F
	32.0	32.02	✓	As Found	31.6	32.4	0.050 °F
	600.0	600.10	✓	As Found	599.6	600.4	0.060 °F
	1000.0	1000.13	✓	As Found	999.6	1000.4	0.11 °F
	1829.0	1831.87	✓	As Found	1831.6	1832.4	0.11 °F
Type J -328° to 2192°F	-328.0	-327.96	✓	As Found	-328.5	-327.5	0.060 °F
	-200.0	-199.97	✓	As Found	-200.5	-199.5	0.11 °F
	32.0	31.93	✓	As Found	31.5	32.5	0.050 °F
	800.0	800.11	✓	As Found	799.5	800.5	0.11 °F
	1600.0	1600.17	✓	As Found	1599.5	1600.5	0.060 °F
	2192.0	2192.09	✓	As Found	2191.5	2192.5	0.070 °F
Type K -328° to 2498°F	-328.0	-327.74	✓	As Found	-328.5	-327.5	0.070 °F



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Range	Nominal	As Found		As Left	Min	Max	Uncertainty
Thermocouple Output							
	-200.0	-199.88	✓	As Found	-200.5	-199.5	0.11 °F
	32.0	32.01	✓	As Found	31.5	32.5	0.060 °F
	600.0	600.22	✓	As Found	599.6	600.4	0.060 °F
	1600.0	1600.03	✓	As Found	1599.6	1600.4	0.070 °F
	2498.0	2498.31	✓	As Found	2497.1	2498.9	0.080 °F
Type T -328° to 752°F	-328.0	-327.63	✓	As Found	-328.5	-327.5	0.070 °F
	-200.0	-199.89	✓	As Found	-200.5	-199.5	0.060 °F
	32.0	32.02	✓	As Found	31.5	32.5	0.060 °F
	200.0	199.96	✓	As Found	199.7	200.3	0.060 °F
	400.0	399.92	✓	As Found	399.7	400.3	0.060 °F
	752.0	751.95	✓	As Found	751.7	752.3	0.060 °F
Type R -58° to 3214°F	-50.0	-49.7	✓	As Found	-52.6	-47.4	0.11 °F
	32.0	31.86	✓	As Found	29.4	34.6	0.090 °F
	600.0	600.08	✓	As Found	599.2	600.8	0.080 °F
	1600.0	1600.02	✓	As Found	1599.2	1600.8	0.080 °F
	2200.0	2200.32	✓	As Found	2199.2	2200.8	0.080 °F
	3200.0	3200.07	✓	As Found	3198.8	3201.2	0.090 °F
Type S -58° to 3214°F	-50.0	-49.7	✓	As Found	-52.0	-48.0	0.090 °F
	32.0	31.91	✓	As Found	30.0	34.0	0.090 °F
	600.0	600.22	✓	As Found	599.2	600.8	0.080 °F
	1600.0	1600.03	✓	As Found	1599.2	1600.8	0.080 °F
	2200.0	2200.19	✓	As Found	2199.2	2200.8	0.080 °F
	3200.0	3199.82	✓	As Found	3199.2	3200.8	0.090 °F
Type N 32° to 2570°F	32.0	32.04	✓	As Found	31.6	32.4	0.060 °F
	600.0	600.24	✓	As Found	599.6	600.4	0.060 °F
	1400.0	1400.05	✓	As Found	1399.3	1400.7	0.060 °F
	1600.0	1600.09	✓	As Found	1599.3	1600.7	0.070 °F
	2000.0	2000.07	✓	As Found	1999.3	2000.7	0.070 °F
	2370.0	2370.24	✓	As Found	2369.2	2370.8	0.070 °F
Type B 122° to 3276°F	150.0	149.2	✓	As Found	126.3	173.7	0.18 °F
	1200.0	1199.98	✓	As Found	1198.0	1202.0	0.10 °F
	1600.0	1600.12	✓	As Found	1598.7	1601.3	0.080 °F
	2000.0	2000.21	✓	As Found	1999.2	2000.8	0.080 °F
	2600.0	2600.11	✓	As Found	2599.2	2600.8	0.080 °F



Certificate of Calibration

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✓ In Tolerance ✗ Out of Tolerance

Calibration Data

Range	Nominal	As Found	As Left	Min	Max	Uncertainty	
Thermocouple Output							
	3276.0	3276.19	✓	As Found	3275.2	3276.8	0.090 °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>
1000179677	02022	Calibrator	5520A/SC1.1GHz	09 JAN 2015	31 JAN 2016
1000180945	00890	Reference Multimeter	8508A-01	29 DEC 2014	31 DEC 2015
1000180960	00888	Calibrator	5720A	06 JAN 2015	31 JAN 2016
1000183402	00522	Resistance Standard	RS925A	23 APR 2015	30 APR 2016
1000183643	00266	High Impedance Voltmeter-Null Detector	845AR	23 APR 2015	30 APR 2016
1000184046	02037	Humidity/Temperature Chart Recorder	RH520	15 MAY 2015	31 MAY 2016