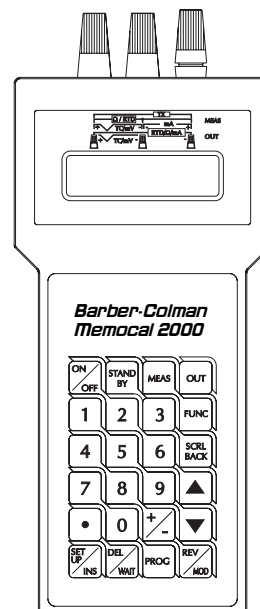


MEMOCAL 2000

MEMOCAL 2000 Hand Held Calibrator

- **Two-line 16 Character Back-lit LCD Display**
- **Calibration for T/C, RTD, mAdc, mVdc, Vdc & Ohms**
- **Reference Accuracy to 0.015% of Range**
- **Temperature Drift of 0.1 μ V/ $^{\circ}$ C**
- **Battery or AC Adapter Operated**
- **Built-in Auxiliary Power Supply**
- **High & Low Peak Reading Memory**
- **50 Step Ramp, Soak & Step Function**



The MEMOCAL 2000 is a versatile portable calibrator ideal for both field and laboratory. Calibrates to IPTS-68 or ITS 90 linearization standards. This calibrator sets a new standard for affordable, easy to use instrumentation.

Optional Features

- RS-232 Digital Communications
- Desk Stand with RS-232/RS-485 Converter and battery charger
- Leather Carrying Case
- Calibration Certificate

Introduction

The Barber-Colman MEMOCAL 2000 is a lightweight, versatile, hand-held calibrator for use both in the field and laboratory. The small size, simple programming, friendly interface, high noise immunity and long battery life make the MEMOCAL ideal for field maintenance calibration. The optional leather carrying case features an over the shoulder strap and allows for viewing of both the display and the keypad. The high accuracy, large range of I/O capabilities and digital interface make the MEMOCAL ideal for laboratory use. A standard 120/240 Vac adapter saves battery capacity when working at the bench.

The MEMOCAL 2000 simulates and measures 15 different thermocouple, 2 RTD, mAdc, mVdc, Vdc and Ohms signals. A built-in auxiliary power supply allows excitation and measurement of 2-wire and 4-wire transmitters. Standard features also include configurable internal or external cold junction compensation, square root extraction and quadratic signal generation.

Up to 50 program steps can be created in one or more programs, providing pre-configured ramp, soak and step functions for calibration zero, span and midpoints. Two dry contact inputs allow program advance and hold.

MEMOCAL 2000

Ordering Information

Schedule: S8

0MEM-20900-00E-R-00	Hand Held Calibrator with AC Adapter, 120/240 Vac
0MEM-2090R-01E-R-00	Hand Held Calibrator with AC Adapter, RS-232, 120/240 Vac
0MEM-08M04-030-0-00	Leather Carrying Bag for Hand Held Calibrator
0MEM-2000D-T0E-R-00	Desk Stand with RS-232/485, battery charger
0MEM-2000B-ATT-0-00	Kit – Four Long Life Ni-H Rechargeable Batteries

Schedule: A1

1262-IN-021-0-XX	Instruction Manual
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For calibration re-certification price, see 0001-SP-009-0-XX, Factory Repairs

Specifications

Case:	ABS gray. Self-extinguishing degree V-0 according to UL, VDE and CSA.
Input Protection:	All ranges are protected against a fault connection up to 30 Vac/Vdc.
Terminals:	3 external screw terminals, 4 mm diameter.
Weight:	600 grams (21 ounces) maximum.
Power Supply:	- 4 AA batteries (Alkaline, Ni-Cd or Ni-MH). - Switching Type AC adapter (100 to 240 Vac).
Battery Life:	About 24 hours (with Ni-MH batteries).
Recharging Time:	12 Hours (or two hours with MEM-2000D-T00-0-00)
Insulation Resistance:	Greater than 100 M Ω according to IEC 348.
Dielectric Strength:	1500 Vac rms according to IEC 348.
D/A Conversion:	Dual slope integration.
Noise Immunity:	Electrical fast transient/burst requirements: Severity Level 3 (according to IEC 801-4). Electric discharge requirements: Severity Level 8 (according to IEC 801-2).
Sampling Time:	500 ms typical.
Display Update Time:	500 ms.
Accuracy:	See Tables.
Common Mode	
Rejection Ratio:	120 dB @ 50/60 Hz.
Normal Mode	
Rejection Ratio:	60 dB @ 50/60 Hz.
Temperature Drift:	Less than 28 ppm/ $^{\circ}$ C
Operating Temperature:	From 0 to 40 $^{\circ}$ C.
Storage Temperature:	From -10 to 60 $^{\circ}$ C.
Humidity:	From 20% to 85% RH non-condensing.

MEMOCAL 2000

Specifications (continued)

Inputs All inputs are factory calibrated and selectable from the keyboard.

Type: Thermocouple (J, K, T, E, R, S, B, U, L, N, W, W3, W5, Ni/Ni-Mo and Platinel II), keyboard configurable (and programmable choice of IPTS-68 or ITS 90).
Engineering Units: °C and °F keyboard configurable.
Cold Junction: Automatic compensation for an ambient temperature between 0 and 45 °C.
Cold Junction Compensation Error: ±0.3 °C, ±0.05 °C/°C.
External Cold Junction Compensation: Programmable from -20 to 80 °C.
Input Impedance: Greater than 10 MΩ.
Sensor Break: Open circuit detection.

Type: RTD, Pt 100 Ω and Ni 100 Ω, 3-wire connection.
Engineering Units: °C and °F keyboard configurable.
Line Resistance: Automatic compensation up to 20 Ω/wire with no measurable error.
Measuring Current: 100 μAmps.
Sensor Break: Open circuit detection (one or more wires); short circuit detection.
Calibration: According to DIN 43760.

Type: Linear Inputs (mAdc, mVdc, Vdc), keyboard programmable.
Input Impedance: 10 Ω for mAdc inputs.
Greater than 10 MΩ for mVdc inputs.
Greater than 500 KΩ for Volt inputs.

Range Selection: Automatic or manual.
Square Root Extraction: Programmable.
Readout: -20,000 to 20,000 keyboard programmable.
Decimal Point: Programmable to any position.

Type: Ohms.
Range: 0 to 200; 200 to 400; 400 to 800.
Resolution: 0.1 Ω.

Outputs

Type: Thermocouple (J, K, T, E, R, S, B, U, L, N, W, W3, W5, Ni/Ni-Mo and Platinel II), keyboard configurable (and programmable choice of IPTS-68 or ITS 90).
Engineering Units: °C and °F keyboard configurable.
Output Impedance: 50 Ω.

Type: RTD, Pt 100 Ω and Ni 100 Ω, 3-wire connection.
Engineering Units: °C and °F keyboard configurable.
Calibration: According to DIN 43760.

Type: Linear (mAdc, mVdc, Vdc), keyboard programmable.
Output Impedance: 50 Ω for mVdc outputs.
0.5 Ω for Vdc outputs.

Maximum Load for Current Output: 500 Ω.
Range Selection: Automatic or manual.
Quadratic Signal Generation: Programmable.
Readout: -20,000 to 20,000 keyboard programmable.
Decimal Point: Programmable to any position.

Type: Ohms.
Range: 15 to 80; 80 to 500.
Resolution: 0.1 Ω.

MEMOCAL 2000

Special Functions

Peak High/Peak Low

Detection: The instrument memorizes (and displays) the high and lowest detected reading.

Backlight: The backlight on the LED display automatically turns off after 30 seconds.

Program Routine: Up to 50 steps which can be programmed to one or more separate routines.

Battery Check: The instrument operates at 3 different battery levels:

Level 1 The instrument is fully operational.

Level 2 The instrument is still fully operational, but "BATTERY LOW" appears on the upper display.

Level 3 The instrument turns OFF automatically and utilizes the remaining power for memory back-up only.

Logic Inputs: (Not available with digital communications)

Logic Input 1 sequences to the next program step.

Logic Input 2 starts/stops program operation.

Digital Communications (optional)

Type: Built-in RS-232C. External RS-232 to RS-485 converter available in desk-top stand.

Protocol: MODBUS, JBUS.

Baud Rate: 600, 1200, 2400, 4800, 9600 and 19,200 baud.

Byte Format: 8 bits.

Parity: Even, odd, or none.

Stop Bit: One.

Address: From 1 to 255.

Input Tables

RTD Type	Range	Resolution	Reference Accuracy
Pt 100	-200 °C to 850 °C	0.1 °C	± 0.028%
	-328 °F to 512 °F	0.1 °F	± 0.012%
	513 °F to 1562 °F	< 0.2 °F	± 0.029%

RTD Type	Range	Resolution	Reference Accuracy
Ni 100*	-60 °C to 350 °C	0.1 °C	± 0.029%
	-76 °F to 662 °F	0.1 °F	± 0.029%

* Available only when IPTS-68 is selected.

Input Type	Range	Resolution	Reference Accuracy
mV	-20 mV to 20 mV	1 µVdc	± 0.015%
	-200 mV to 200 mV	10 µVdc	± 0.015%
Volts	-2 V to 2 V	100 µVdc	± 0.015%
	-20 V to 20 V	1 mVdc	± 0.020%
mA	-20 mA to 20 mA	1 µAdc	± 0.015%
	-130 mA to 130 mA	10 µAdc	± 0.020%

Input Type	Range	Resolution	Reference Accuracy
Ohms	0 to 200 Ω	0.1 Ω	± 0.025%
	200 to 400 Ω	0.1 Ω	± 0.025%
	400 to 800 Ω	0.1 Ω	± 0.025%

Note: All reference accuracies are % of range.

MEMOCAL 2000

Input Tables (continued)

TC Type	Range in °C	Resolution	Reference Accuracy
J	-200°C to 1200 °C	0.1 °C	± 0.021%
K	-200°C to 967 °C	0.1 °C	± 0.018%
	968°C to 1370 °C	< 0.2 °C	± 0.032%
T	-200°C to 0 °C	0.1 °C	± 0.045%
	1°C to 400 °C	0.1 °C	± 0.023%
E	-200°C to 1000 °C	0.1 °C	± 0.019%
R	-50°C to 0 °C	< 0.3 °C	± 0.080%
	1°C to 350 °C	< 0.2 °C	± 0.048%
	351°C to 1684 °C	0.1 °C	± 0.024%
	1685°C to 1760 °C	< 0.2 °C	± 0.037%
S	-50°C to 0 °C	< 0.3 °C	± 0.060%
	1°C to 600 °C	< 0.2 °C	± 0.048%
	601°C to 1760 °C	0.1 °C	± 0.024%
B	50°C to 100 °C	< 3 °C	± 0.700%
	101°C to 200 °C	< 1 °C	± 0.230%
	201°C to 600 °C	< 0.5 °C	± 0.110%
	601°C to 1150 °C	0.2 °C	± 0.039%
	1151°C to 1820 °C	0.1 °C	± 0.023%
U*	-200°C to 600 °C	0.1 °C	± 0.027%
L*	-200°C to 900 °C	0.1 °C	± 0.026%
N	0°C to 1410 °C	< 0.2 °C	± 0.034%
Ni/Ni-Mo	0°C to 1300 °C	0.1 °C	± 0.024%
PLII	-100°C to 961 °C	0.1 °C	± 0.014%
W (G)	962°C to 1400 °C	< 0.2 °C	± 0.039%
	0°C to 50 °C	< 1 °C	± 0.126%
	51°C to 100 °C	< 0.3 °C	± 0.048%
	101°C to 250 °C	< 0.2 °C	± 0.035%
	251°C to 1530 °C	0.1 °C	± 0.019%
W3 (D)	1531°C to 2300 °C	< 0.2 °C	± 0.030%
	0°C to 100 °C	0.1 °C	± 0.019%
	101°C to 1090 °C	0.1 °C	± 0.014%
W5	1091°C to 2310 °C	< 0.3 °C	± 0.042%
	0°C to 1096 °C	0.1 °C	± 0.014%
W5	1097°C to 2250 °C	0.2 °C	± 0.037%
	2251°C to 2315 °C	< 0.3 °C	± 0.042%

* Available only when IPTS-68 is selected.

TC Type	Range in °F	Resolution	Reference Accuracy
J	-328 °F to 1382 °F	0.1 °F	± 0.021%
K	-328 °F to 32 °F	< 0.2 °F	± 0.018%
	33 °F to 1772 °F	0.1 °F	± 0.014%
	1773 °F to 2264 °F	0.1 °F	± 0.023%
	2265 °F to 2498 °F	< 0.3 °F	± 0.032%
T	-328 °F to 32 °F	< 0.2 °F	± 0.045%
	33 °F to 752 °F	0.1 °F	± 0.023%
E	-328 °F to 1832 °F	0.1 °F	± 0.019%
R	-58 °F to 32 °F	< 0.5 °F	± 0.080%
	33 °F to 350 °F	< 0.4 °F	± 0.048%
	351 °F to 500 °F	< 0.3 °F	± 0.036%
	501 °F to 3062 °F	< 0.2 °F	± 0.025%
	3063 °F to 3214 °F	< 0.3 °F	± 0.037%
S	-58 °F to 32 °F	< 0.5 °F	± 0.060%
	33 °F to 140 °F	< 0.4 °F	± 0.048%
	141 °F to 470 °F	< 0.3 °F	± 0.036%
	471 °F to 3214 °F	< 0.2 °F	± 0.024%
B	122 °F to 212 °F	< 4 °F	± 0.750%
	213 °F to 320 °F	< 2 °F	± 0.250%
	321 °F to 600 °F	< 1 °F	± 0.120%
	601 °F to 1250 °F	< 0.5 °F	± 0.063%
	1251 °F to 1770 °F	< 0.3 °F	± 0.041%
U*	1771 °F to 3276 °F	< 0.2 °F	± 0.025%
	-328 °F to 1112 °F	0.1 °F	± 0.027%
L*	-328 °F to 1299 °F	0.1 °F	± 0.016%
	1300 °F to 1652 °F	< 0.2 °F	± 0.026%
N	32 °F to 1083 °F	< 0.2 °F	± 0.014%
	1084 °F to 2006 °F	0.1 °F	± 0.028%
	2007 °F to 2570 °F	< 0.2 °F	± 0.031%
Ni/Ni-Mo	32 °F to 1529 °F	0.1 °F	± 0.016%
	1530 °F to 2372 °F	< 0.2 °F	± 0.024%
PLII	-148 °F to 924 °F	0.1 °F	± 0.013%
	925 °F to 1761 °F	< 0.2 °F	± 0.015%
	1762 °F to 2552 °F	< 0.3 °F	± 0.039%
W (G)	32 °F to 392 °F	< 1.2 °F	± 0.160%
	393 °F to 1292 °F	< 0.2 °F	± 0.045%
	1293 °F to 2309 °F	0.1 °F	± 0.023%
	2310 °F to 2786 °F	0.2 °F	± 0.025%
	2787 °F to 3276 °F	< 0.3 °F	± 0.038%
W3 (D)	32 °F to 572 °F	< 0.2 °F	± 0.024%
	573 °F to 1832 °F	0.1 °F	± 0.017%
	1833 °F to 1994 °F	< 0.2 °F	± 0.019%
	1995 °F to 3276 °F	< 0.3 °F	± 0.053%
W5	32 °F to 572 °F	< 0.2 °F	± 0.018%
	573 °F to 1958 °F	< 0.3 °F	± 0.048%
	1959 °F to 3276 °F	< 0.4 °F	± 0.054%

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Output Tables

RTD Type	Range	Resolution	Reference Accuracy
Pt 100	-200 °C to 850 °C	0.1 °C	± 0.029%
	-328 °F to 512 °F	0.1 °F	± 0.022%
	513 °F to 1562 °F	< 0.2 °F	± 0.025%

RTD Type	Range	Resolution	Reference Accuracy
Ni 100	-60 °C to 350 °C	0.1 °C	± 0.036%
	-76 °F to 680 °F	0.1 °F	± 0.036%

Output Type	Range	Resolution	Reference Accuracy
mV	-4 mV to 20 mV	1 μV	± 0.015%
	-40mV to 200 mV	10 μV	± 0.015%
	-400 mV to 2000 mV	100 μV	± 0.015%
Volts	-4 V to 20 V	1 mV	± 0.020%
mA	0 mA to 21 mA	1 μA	± 0.015%

Output Type	Range	Resolution	Reference Accuracy
Ohms	15 to 800 Ω	0.1 Ω	± 0.031%

Operator Interface

Terminals

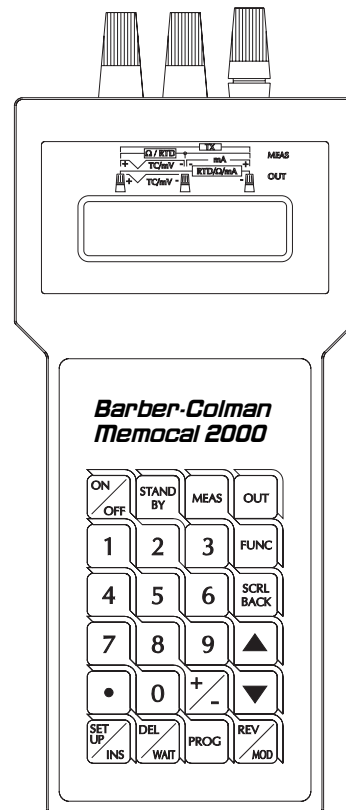
Three high quality 4mm diameter external screw terminals.

Display

Two rows of 16 back-lit alphanumeric LCD characters.

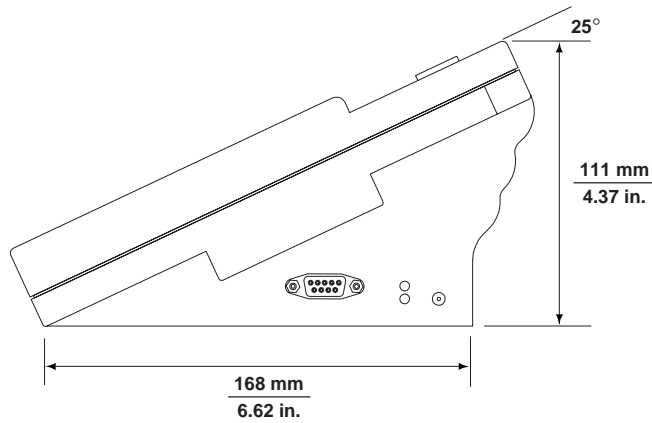
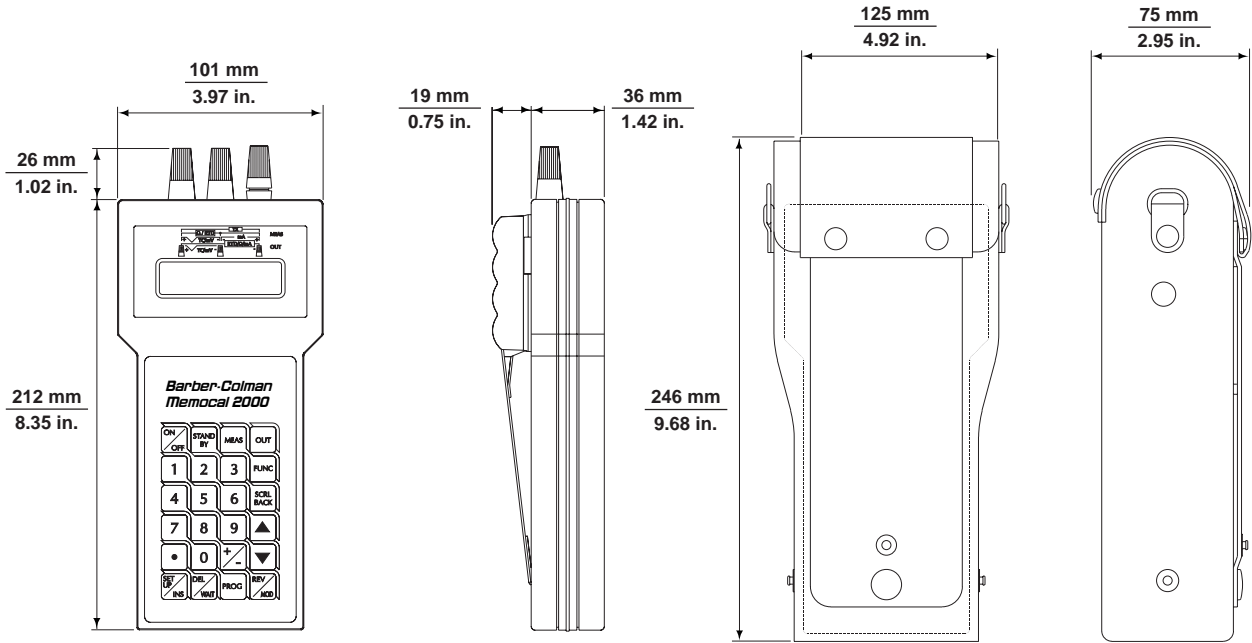
Keypad

Multi-function, tactile feedback numeric keypad.



MEMOCAL 2000

Dimensions



MEMOCAL 2000

