

**FLUKE®**

**725**

Multifunction Process Calibrator

**Product Overview**

English

January 2000 Rev.1, 8/03

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# Multifunction Process Calibrator

## Introduction

Your Fluke 725 Multifunction Process Calibrator (referred to as “the calibrator”) is a handheld, battery-operated instrument that measures and sources electrical and physical parameters.

The calibrator has the following features and functions:

- A split-screen display. The upper display allows you to measure volts, current, and pressure only. The lower display allows you to measure and source volts, current, pressure, resistance temperature detectors, thermocouples, frequency, and ohms.
- Calibrates a transmitter using the split-screen.
- A thermocouple (TC) input/output terminal and internal isothermal block with automatic reference-junction temperature compensation.
- Stores and recalls setups.
- Manual stepping and automatic stepping and ramping.

- Controls the calibrator remotely from a PC running a terminal emulator program.

## Accessing the Users Manual

The *725 Users Manual* is available on the 725 CD included with your calibrator.

## Contacting Fluke

To order accessories, receive operating assistance, or get the location of the nearest Fluke distributor or Service Center, call:

USA: 1-888-99-FLUKE (1-888-993-5853)

Canada: 1-800-36-FLUKE (1-800-363-5853)

Europe: +31 402-675-200

Japan: +81-3-3434-0181

Singapore: +65-738-5655

Anywhere in the world: +1-425-446-5500

Or, visit Fluke's Web site at [www.fluke.com](http://www.fluke.com).

## Standard Equipment

The items listed below are included with your calibrator. If the calibrator is damaged or something is missing, contact the place of purchase immediately. To order replacement parts or spares, see the user-replaceable parts list in Table 4.

- TL75 test leads (one set)
- AC72 alligator clips (one set)
- Stackable alligator clip test leads (one set)
- *725 Product Overview Manual*
- *725 CD-ROM* (contains Users Manual)
- Spare fuse

## Safety Information

The calibrator is designed in accordance with IEC1010-1, ANSI/ISA S82.01-1994 and CAN/CSA C22.2 No. 1010.1-92. Use the calibrator only as specified in this manual, otherwise the protection provided by the calibrator may be impaired.


A **Warning** identifies conditions and actions that pose hazard(s) to the user; a **Caution** identifies conditions and actions that may damage the calibrator or the equipment under test.

International symbols used on the calibrator and in this manual are explained in Table 1.

### Warning

To avoid possible electric shock or personal injury:

- Do not apply more than the rated voltage, as marked on the calibrator, between the terminals, or between any terminal and earth ground (30 V 24 mA max all terminals).
- Before each use, verify the calibrator's operation by measuring a known voltage.
- Follow all equipment safety procedures.
- Never touch the probe to a voltage source when the test leads are plugged into the current terminals.
- Do not use the calibrator if it is damaged. Before you use the calibrator, inspect the case. Look for cracks or missing plastic. Pay particular attention to the insulation surrounding the connectors.
- Select the proper function and range for your measurement.
- Make sure the battery door is closed and latched before you operate the calibrator.
- Remove test leads from the calibrator before you open the battery door.











- Inspect the test leads for damaged insulation or exposed metal. Check test leads continuity. Replace damaged test leads before you use the calibrator.
- When using the probes, keep your fingers away from the probe contacts. Keep your fingers behind the finger guards on the probes.
- Connect the common test lead before you connect the live test lead. When you disconnect test leads, disconnect the live test lead first.
- Do not use the calibrator if it operates abnormally. Protection may be impaired. When in doubt, have the calibrator serviced.
- Do not operate the calibrator around explosive gas, vapor, or dust.
- When using a pressure module, make sure the process pressure line is shut off and depressurized before you connect it or disconnect it from the pressure module.
- Use only 4 AA batteries, properly installed in the calibrator case, to power the calibrator.
- Disconnect test leads before changing to another measure or source function.
- When servicing the calibrator, use only specified replacement parts.
- To avoid false readings, which could lead to possible electric shock or personal injury, replace the battery as soon as the battery indicator (  ) appears.

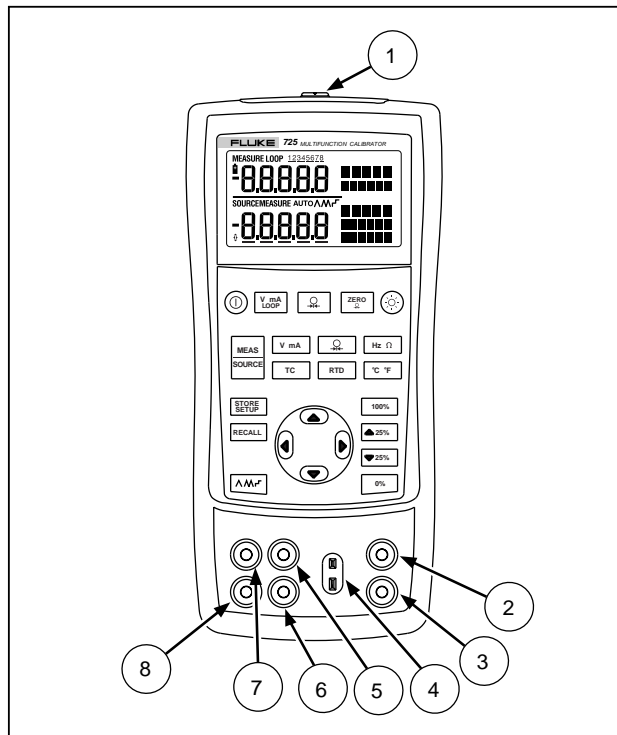
**Caution**

To avoid possible damage to calibrator or to equipment under test:

- Disconnect the power and discharge all high-voltage capacitors before testing resistance or continuity.
- Use the proper jacks, function, and range for your measurement or sourcing application.

**Table 1. International Symbols**

	AC - Alternating current		Double insulated
	DC - Direct current		Battery
	Earth ground		Refer to the manual for information about this feature.
	Pressure		ON/OFF
	Conforms to Canadian Standards Association directives		Conforms to European Union directives



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Figure 1. Input/Output Terminals and Connectors

Table 2. Input/Output Terminals and Connectors

No	Name	Description
①	Pressure module connector	Connects the calibrator to a pressure module or the calibrator to a PC for a remote control connection.
②, ③	MEASURE V, mA terminals	Input terminals for measuring voltage, current, and supplying loop power.
④	TC input/output	Terminal for measuring or simulating thermocouples. This terminal accepts a miniature polarized thermocouple plug with flat, in-line blades spaced 7.9 mm (0.312 in) center to center.
⑤, ⑥	SOURCE/ MEASURE V, RTD, Hz, $\Omega$ terminals	Terminals for sourcing or measuring voltage, resistance, frequency, and RTDs.
⑦, ⑧	SOURCE/ MEASURE mA terminals, 3W, 4W	Terminals for sourcing and measuring current, and performing 3W and 4W RTD measurements.

Keys

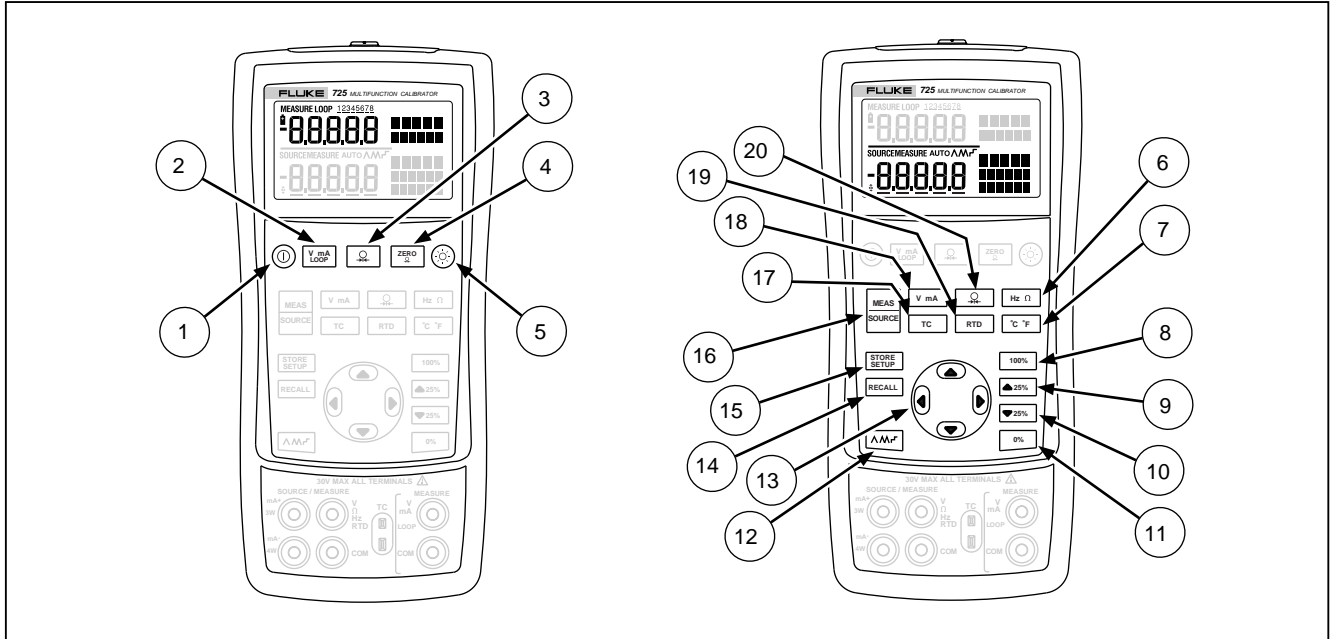














Figure 2. Keys













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Table 3. Key Functions

No	Name	Description
①		Turns the power on or off.
②		Selects voltage, mA or Loop Power measurement function in the upper display.
③		Selects the pressure measurement function in the upper display. Repeated pushes cycle through the different pressure units.
④		Zeros the pressure module reading. This applies to both upper and lower displays.
⑤		Turns backlight on or off. Turns Contrast Adjust mode on when powering up.
⑥		Toggles frequency and ohms measurement and sourcing functions.
⑦		Toggles between Centigrade or Fahrenheit when in TC or RTD functions.
⑧		Recalls from memory a source value corresponding to 100 % of span and sets it as the source value. Press and hold to store the source value as the 100 % value.
⑨		Increments output by 25 % of span.
⑩		Decrements output by 25 % of span.
⑪		Recalls from memory a source value corresponding to 0 % of span and sets it as the source value. Press and hold to store the source value as the 0 % value. Identifies Firmware version. Press and hold  when powering up.



**Table 3 . Key Functions (cont.)**

No	Name	Description
⑫		Cycles through : ^ Slow repeating 0 % - 100 % - 0 % ramp / Fast repeating 0 % - 100 % - 0 % ramp □ Repeating 0 % - 100 % - 0 % ramp in 25 % steps
① ⑬		Disables Shut Down Mode
① ⑬		Enables Shut Down Mode
⑬	 	Increases or decreases the source level. Cycles through the 2-, 3-, and 4-wire selections. Moves through the memory locations of calibrator setups. In Contrast Adjustment mode; up-darkens contrast, down-lightens contrast.
⑭		Retrieves a previous calibrator setup from a memory location.
⑮		Saves the calibrator setup. Saves Contrast Adjust setup.
⑯		Cycles the calibrator through MEASURE and SOURCE modes in the lower display.
⑰		Selects TC (thermocouple) measurement and sourcing function in the lower display. Repeated pushes cycle through the thermocouple types.
⑱		Toggles between voltage, mA sourcing, or mA simulate functions in the lower display.
⑲		Selects RTD (resistance temperature detector) measurement and sourcing function in lower display. Repeated pushes cycle through the RTD types.
⑳		Selects the pressure measurement and sourcing function. Repeated pushes cycle through the different pressure units.

## Display

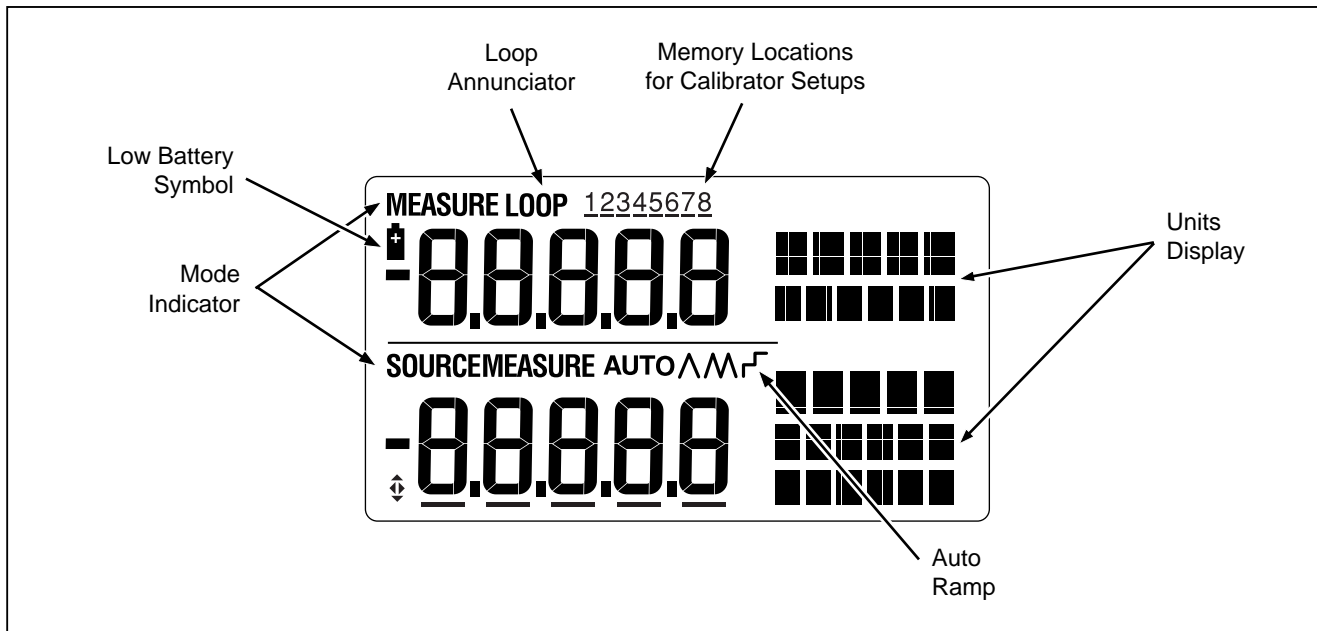


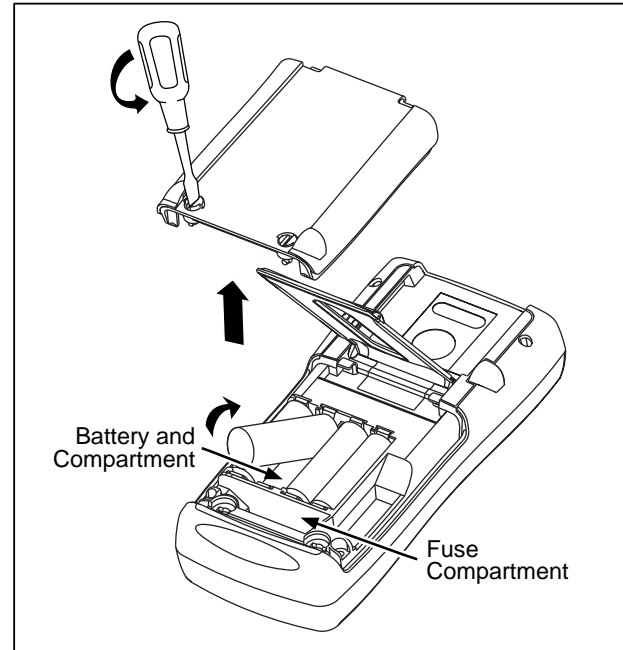
Figure 3. Elements of a Typical Display

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## Replacing the Batteries

### **⚠ Warning**

To avoid false readings, which could lead to possible electric shock or personal injury, replace the batteries as soon as the battery indicator (🔋) appears.



**Figure 4. Replacing the Batteries**

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## Replacing the Fuses

The calibrator comes equipped with two 0.05A, 250V, socketed fuses to protect the calibrator.

### Warning

**To avoid electrical shock, remove the test leads from the calibrator before opening the battery door. Close and latch the battery door before using the calibrator.**

The fuses can be removed and checked for resistance. A value of  $< 10 \Omega$  is good. Problems while measuring using the right jacks indicate that F3 may have opened. If you can't measure or source current with the left jacks, F4 may have opened. To replace the fuses, refer to Figure 4 and perform the following steps:

1. Turn the calibrator off, remove the test leads from the terminals, and hold the calibrator face down.
2. Using a flat-blade screwdriver, turn the battery door screws 1/4-turn counterclockwise and remove the battery door.
3. Remove and replace the damaged fuse.
4. Replace the battery door and secure it by turning the screws 1/4-turn clockwise.

## Replacement Parts

Table 4 lists the part number of each replaceable part. Refer to Figure 5.

**Table 4. Replacement Parts**

Item	Description	PN	Qty.
1	Case top	664232	1
2	LCD mask	664273	1
3	Elastomeric strips	802063	2
4	Input/output bracket	691391	1
5	LCD bracket	667287	1
6	Mounting screws	494641	11
7	Backlight	690336	1
8	LCD	690963	1
9	Keypad	690955	1
10	Case bottom	664235	1
11	AA alkaline batteries	376756	4
12	Case screws	832246	4
13	Battery door	664250	1
14	Accessory mount	658424	1
15	Tilt stand	659026	1
16	Battery door 1/4-turn fasteners	948609	2
17	TL75 series test leads	855742	1
18	Test lead, red	688051	1
	Test lead, black	688066	1
19	<i>725 Product Overview Manual</i>	1549644	1
20	AC72 alligator clip, red	1670641	1
	AC72 alligator clip, black	1670652	1
21	CD ROM, contains User Manual	1549615	1
22	Input Decal	690948	1
23	Fuse 0.05A/250V	2002234	2

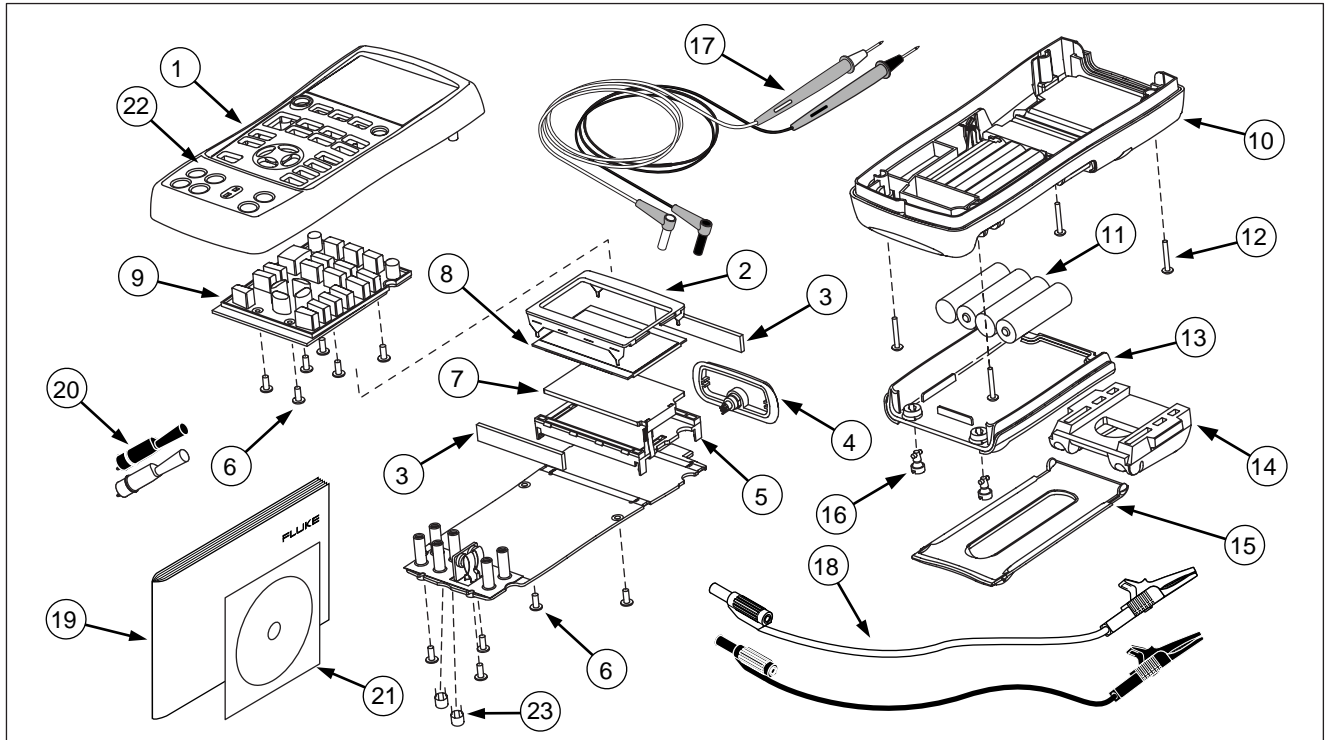


Figure 5. Replacement Parts

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## Specifications

Specifications are based on a one year calibration cycle and apply from +18 °C to +28 °C unless stated otherwise. All specifications assume a 5 minute warmup period.

### DC Voltage Measurement

Range	Resolution	Accuracy, (% of Reading + Counts)
30 V (upper display)	0.001 V	0.02 % + 2
20 V (lower display)	0.001 V	0.02 % + 2
90 mV	0.01 mV	0.02 % + 2
<b>Temperature coefficient -10 °C to 18 °C, +28 °C to 55 °C: ±0.005 % of range per °C</b>		

### DC Voltage Source

Range	Resolution	Accuracy, (% of Reading + Counts)
100 mV	0.01 mV	0.02 % + 2
10 V	0.001 V	0.02 % + 2
<b>Temperature coefficient -10 °C to 18 °C, +28 °C to 55 °C: ±0.005 % of range per °C</b>		
<b>Maximum load: 1 mA</b>		

### DC mA Measurement and Source

Range	Resolution	Accuracy, (% of Reading + Counts)
24 mA	0.001 mA	0.02 % + 2
<b>Temperature coefficient -10 °C to 18 °C, +28 °C to 55 °C: ±0.005 % of range per °C</b>		
<b>Drive capability: 1000 Ω at 20 mA</b>		

### Millivolt Measurement and Source\*

Range	Resolution	Accuracy
-10 mV to 75 mV	0.01 mV	±(0.025 % + 1 count)
<b>Maximum input voltage: 30 V</b>		
<b>Temperature coefficient -10 °C to 18 °C, +28 °C to 55 °C: ±0.005 % of range per °C</b>		
*Select this function by pressing <input type="checkbox"/> . The signal is available at the thermocouple miniplug connector.		

**Ohms Measurement**

Ohms Range	Accuracy $\pm \Omega^*$	
	4-Wire	2- and 3-Wire
0 to 400 $\Omega$	0.1	0.15
400 to 1.5 k $\Omega$	0.5	1.0
1.5 to 3.2 k $\Omega$	1	1.5
<b>Temperature coefficient -10 °C to 18 °C, +28 °C to 55 °C: <math>\pm 0.005</math> % of range per °C</b> <b>Excitation Current: 0.2 mA</b> <b>Maximum input voltage: 30 V</b> * 2-wire: Does not include lead resistance. 3-wire: Assumes matched leads with a total resistance not exceeding 100 $\Omega$ .		

**Ohms Source**

Ohms Range	Excitation Current from Measurement Device	Accuracy $\pm \Omega$
15 to 400 $\Omega$	0.15 to 0.5 mA	0.15
15 to 400 $\Omega$	0.5 to 2 mA	0.1
400 to 1.5 k $\Omega$	0.05 to 0.8 mA	0.5
1.5 to 3.2 k $\Omega$	0.05 to 0.4 mA	1
<b>Temperature coefficient -10 °C to 18 °C, +28 °C to 55 °C: <math>\pm 0.005</math> % of resistance range per °C</b>		
Resolution		
15 to 400 $\Omega$	0.1 $\Omega$	
400 to 3.2 k $\Omega$	1 $\Omega$	

**Frequency Measurement**

Range	Resolution	Accuracy
2.0 to 1000.0 CPM	0.1 CPM	$\pm (0.05 \% + 1 \text{ count})$
1 to 1000	0.1 Hz	$\pm (0.05 \% + 1 \text{ count})$
1.0 to 10.0 kHz	0.01 kHz	$\pm (0.05 \% + 1 \text{ count})$
<b>Sensitivity: 1 V peak-to-peak minimum</b> <b>Waveform: squarewave</b>		

**Frequency Source**

Range	Resolution	Accuracy (% of output frequency)
2.0 to 1000.0 CPM	0.1 CPM	$\pm 0.05 \%$
1 to 1000 Hz	1 Hz	$\pm 0.05 \%$
1.0 to 10.0 kHz	0.1 kHz	$\pm 0.25 \%$
<b>Waveform: 5 V p-p squarewave, -0.1 V offset</b>		

**Temperature, Thermocouples**

Type	Range	Measure and Source Accuracies (ITS-90)
J	-200 to 0 °C 0 to 1200 °C	1.0 °C 0.7 °C
K	-200 to 0 °C 0 to 1370 °C	1.2 °C 0.8 °C
T	-200 to 0 °C 0 to 400 °C	1.2 °C 0.8 °C
E	-200 to 0 °C 0 to 950 °C	0.9 °C 0.7 °C
R	-20 to 0 °C 0 to 500 °C 500 to 1750 °C	2.5 °C 1.8 °C 1.4 °C
S	-20 to 0 °C 0 to 500 °C 500 to 1750 °C	2.5 °C 1.8 °C 1.5 °C
B	600 to 800 °C 800 to 1000 °C 1000 to 1800 °C	2.2 °C 1.8 °C 1.4 °C
L	-200 to 0 °C 0 to 900 °C	0.85 °C 0.7 °C
U	-200 to 0 °C 0 to 400 °C	1.1 °C 0.75 °C
N	-200 to 0 °C 0 to 1300 °C	1.5 °C 0.9 °C
<b>Resolution:</b>		
J, K, T, E, L, N, U:	0.1 °C, 0.1 °F	
B, R, S:	1 °C, 1 °F	

**Loop Power Supply**

Voltage: 24 V

Maximum current: 22 mA

Short circuit protected

**RTD Excitation (simulation)**

Allowable Excitation by RTD type	
Ni 120	0.15 to 3.0 mA
Pt 100-385	0.15 to 3.0 mA
Pt 100-392	0.15 to 3.0 mA
Pt 100-JIS	0.15 to 3.0 mA
Pt 200-385	0.15 to 3.0 mA
Pt 500-385	0.05 to 0.80 mA
Pt 1000-385	0.05 to 0.40 mA

**Pressure Measurement**

Range	Resolution	Accuracy	Units
Determined by pressure module	5 digits	Determined by pressure module	psi, inH <sub>2</sub> O@4 °C, inH <sub>2</sub> O@20 °C, kPa, cmH <sub>2</sub> O@4 °C, cmH <sub>2</sub> O@20 °C, bar, mbar, kg/cm <sup>2</sup> , mmHg, inHg



**Temperature, RTD Ranges, and Accuracies (ITS-90)**

Type	Range °C	Accuracy		
		Measure 4-Wire °C	Measure 2- and 3-Wire* °C	Source °C
Ni120	-80 to 260	0.2	0.3	0.2
Pt100-385	- 200 to 800	0.33	0.5	0.33
Pt100-392	-200 to 630	0.3	0.5	0.3
Pt100-JIS	-200 to 630	0.3	0.5	0.3
Pt200-385	-200 to 250	0.2	0.3	0.2
	250 to 630	0.8	1.6	0.8
Pt500-385	-200 to 500	0.3	0.6	0.3
	500 to 630	0.4	0.9	0.4
Pt1000-385	-200 to 100	0.2	0.4	0.2
	100 to 630	0.2	0.5	0.2

**Resolution:** 0.1 °C, 0.1 °F  
**Allowable excitation current (source):** Ni120, Pt100-385, Pt100-392, Pt100-JIS, Pt200-385: 0.15 to 3.0 mA  
Pt500-385: 0.05 to 0.80 mA; Pt1000-385: 0.05 to 0.40 mA  
**RTD Source:** Addresses pulsed transmitters and PLCs with pulses as short as 5 ms.  
\* 2-wire: Does not include lead resistance.  
3-wire: Assumes matched leads with a total resistance not exceeding 100 Ω.

**General Specifications**

Operating temperature	-10 °C to 55 °C
Storage temperature	- 20 °C to 71 °C
Operating altitude	3000 meters above mean sea level
Relative Humidity (% RH operating without condensation)	90 % (10 to 30 °C) 75 % (30 to 40 °C) 45 % (40 to 50 °C) 35 % (50 to 55 °C) uncontrolled < 10 °C
Vibration	Random, 2 g, 5 to 500 Hz
Safety	EN 61010-1:1993, ANSI/ISA S82.01-1994; CAN/CSA C22.2 No 1010.1:1992
Power requirements	4 AA alkaline batteries
Size	96 x 200 x 47 mm. (3.75 x 7.9 x 1.86 in)
Weight	650 gm (1 lb, 7 oz)

