1071-8031-410

MONARCH INSTRUMENT

Instruction Manual

Monarch 309

Datalogging Four Channel Thermometer

15 Columbia Drive
Amherst, NH 03031-2334 USA
Phone: (603) 883-3390
Fax: (603) 886-3300
E-mail: support@monarchinstrument.com
Website: www.monarchinstrument.com

Safeguards and Precautions

1. **Read and follow all instructions in this manual carefully, and retain this manual for future reference.**

2. **Do not use this instrument in any manner inconsistent with these operating instructions or under any conditions that exceed the environmental specifications stated.**

3. **Making measurements of high or low temperature can be dangerous. Keep the hand holding the temperature probe well away from the object being measured.**

4. **This instrument is not user serviceable. For technical assistance, contact the sales organization from which you purchased the product or Monarch Instrument directly.**

LIMITED WARRANTY

SELLER warrants hardware products to be free from any defect in materials or workmanship for a period of one (1) year from date of shipment to BUYER. SELLER's entire liability and BUYER's sole and exclusive remedy resulting from any defect in workmanship or material in the hardware product covered by this limited warranty shall be limited to and fully discharged by the SELLER's option of replacement or repair of such item without charge. The limited warranty provided in this clause is in lieu of all other warranties, expressed or implied, arising by law or otherwise. ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE EXCLUDED. This limited warranty shall not be modified except by an arrangement signed by both parties specifically referencing this clause.

SELLER warrants that any software supplied will operate in accordance with the documentation or manual supplied therewith in all material respects when used in strict compliance with such documentation or manual. Notwithstanding the foregoing, BUYER acknowledges that, since software is complex and therefore may have defects, BUYER's sole and exclusive remedy for any such defects or breach of this warranty shall be to require SELLER, within a reasonable period of time, to provide all reasonable programming services to correct programming errors in the software. Except as provided above SELLER MAKES AND BUYER RECEIVES FROM SELLER NO EXPRESS OR IMPLIED WARRANTIES OF ANY KIND WITH RESPECT TO ALL OR ANY PORTION OF SOFTWARE AND BUYER HEREBY AGREES AND ACKNOWLEDGES THAT IT ACCEPTS THE SOFTWARE IN 'AS IS' CONDITION. SELLER HEREBY EXPRESSLY EXCLUDES ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE SOFTWARE. BUYER agrees that any specific right or remedy granted to BUYER hereunder with respect to any breach or default by SELLER shall be in lieu of all other rights and remedies otherwise available to BUYER at law or in equity as the result of such breach or default, regardless of whether based on contract, tort, strict liability, or other theory of liability.

IN NO EVENT SHALL SELLER BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL, CONSEQUENTIAL, OR PUNITIVE LOSSES OR DAMAGES (INCLUDING, BUT NOT LIMITED TO, LOSSES OR DAMAGES FOR ANY LOST PROFITS OR LOST DATA) AS THE RESULT OF ANY BREACH OR DEFAULT BY SELLER WITH RESPECT TO THE HARDWARE OR SOFTWARE, EVEN IF SELLER HAS BEEN ADVISED OR MADE AWARE OF THE POSSIBILITY OF ANY SUCH LOSSES OR DAMAGES AND REGARDLESS OF WHETHER THE CLAIM IS BASED ON CONTRACT, TORT, STRICT LIABILITY, OR OTHER THEORY OF LIABILITY.

This limited warranty does not extend or apply to consumables (including, but not limited to, lamps and batteries, if applicable) or equipment, instruments or accessories which are warranted separately by the original manufacturer of these items.

DECLARATION OF CONFORMITY

Monarch Instrument
Division of Monarch International Inc.
15 Columbia Drive, Amherst NH 03031 USA

declares that the product:

Name: **Thermometer, Four Channel, Type K**
Model: **Monarch 309**

to which this declaration relates is in conformity with the following standards:

EMC: **EN55022/1998, CISPR 22, Class B**
EN50082-1/1997 / EN61000-4

and therefore conforms in accordance with 89/336/EEC-EMC Directive. The testing of this product was performed by GesTek EMC Lab. in April of 2001. (Ref. No. 0103105E).

3rd May 2001
Importer (Amherst, NH)

Alan Woolfson, VP Engineering (Authorized Signature)

Table of Contents

Section **Page**

1.0 Introduction 1

2.0 Specifications 1

3.0 Symbol Definitions and Feature Locations 2

4.0 Operating Instructions 3

4.1 Preparation for Measurement 3
4.2 Power and Backlight 3
4.3 Selecting the Temperature Scale 3
4.4 Data-Hold Operation 3
4.5 T1-T2 Operation 3
4.6 Clock Setup 3
4.7 Recording Interval Setup 3
4.8 Recording Data 4
4.9 MAX/MIN Operation 4
4.10 Auto Power Off 4
4.11 Low Battery Condition 4
4.12 Calibration 4
4.13 Digital Output 4

Appendix: Thermocouple Probe Specifications 5

5.0 Setup TestLink - RS232 Interface Software 5

1.0 Introduction:

This instrument is a four channel, recording digital thermometer for use with any Type K thermocouple as temperature sensor. Temperature indication complies with the NIST and IEC584 temperature/voltage tables for Type K thermocouples. Its internal memory can store up to 16312 records per channel in any number of recording intervals. It is equipped with a RS232 interface for bi-directional communication with a PC.

2.0 Specifications:

Measurement Range: -200°C - 1370°C -328°F - 2498°F

Accuracy: (At ambient of 23 ± 5°C)

Range	Accuracy
-200°C - 200°C	±(0.2% reading + 1°C)
200°C - 400°C	±(0.5% reading + 1°C)
400°C - 1370°C	±(0.2% reading + 1°C)
-328°F - -200°F	±(0.5% reading + 2°F)
-200°F - 200°F	±(0.2% reading + 2°F)
200°F - 2498°F	±(0.3% reading + 2°F)

Temperature Coefficient:

For ambient temperatures from 0°C - 18°C and 28°C - 50°C, for each °C ambient below 18°C or above 28°C, add the following tolerance into the accuracy spec.

0.01% of reading + 0.03°C
(0.01% of reading + 0.06°F)

⚠ Note:

The basic accuracy specification does not include the error of the probe. Please refer to the probe accuracy specification for additional details.

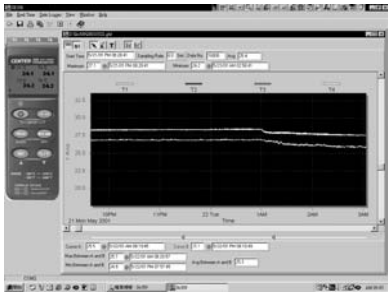
Resolution: -200°C - 200°C: 0.1°C; 200°C -1370°C: 1°C
-200°F - 200°F: 0.1°F; outside this range: 1°F
Number of Sensor Inputs: Four Type K Thermocouples
Input Protection at Thermocouple Input: 60V DC or 24Vrms AC
Display: Four 4 Digit Temperature Displays plus Indicators, see Section 3.0
Switchable backlight
Sample Rate: 3 seconds per period
Time Function: Real time clock, see Section 4.6
Datalogging Capacity: 16,312 records per channel
Recording Interval: User adjustable, see Section 4.7
Digital Output: Bi-directional RS232. Software and Cable included
Power requirement: 9 Volt Battery, NEDA 1604 or JIS 006P or IEC6F22
Battery Life: Approx. 100 hours with alkaline battery; Low battery indication
Operating Conditions:

- Operating Temperature and Humidity: 0°C - 50°C (32°F - 122°F); 0 - 80% RH
- Storage Temperature and Humidity: -10°C - 60°C (14°F - 140°F); 0 - 80% RH
- Altitude: Up to 2000 meters (6500 feet).

Dimensions: 184×64×30 mm (5.4×2.5×1.2 in)
Weight: Approx. 250g (8.7 oz)
Accessories: Two Type K Wire Thermocouple Probes, Battery, Carrying Case, Instruction Manual, Software, RS232 Cable
Option: AC Adapter: 9VDC ±15%; 100mA: Plug Diameter: 3.5mm×1.35mm

Notes

5.0 Setup TestLink SE-309 - RS232 Interface Software:



The TestLink package contains:

1. One 80 mm CD
2. Custom designed RS232 cable for TestLink

System Requirements:

Windows 95, Windows 98 or Windows NT 4.0

Minimum Hardware Required:

- Pentium 90MHz PC, 32 MB RAM.
- At least 5 MB byte hard disk space available to install TestLink
- Recommended display resolution is 800X600.

Install TestLink:

1. Close all other application before installing TestLink.
2. Insert setup CD disk in CD disk drive.
3. Choose the Start button on the Taskbar and select Run.
4. Type E:\SETUP and choose OK to copy SE309.exe (executable file) and Help file to your hard disk (default is C:\program files\TestLink\SE309).

For other operating instructions, please refer to the online help while executing TestLink.

3.0 Symbol Definitions and Feature Locations:

: Indicates 'Auto Power Off' is enabled

T1 T3
T2 T4 : Indicates the value below is theT1, T2, T3 or T4 temperature sensor

°C°F : Centigrade or Fahrenheit indication

– : Negative temperature indication

: Low battery indication. Battery voltage is not sufficient for proper operation.

K : Thermocouple type indication

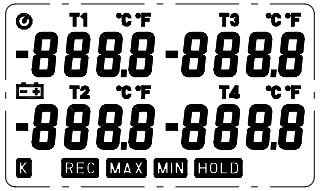
REC : Indicates that the instrument is recording. When flashing, the memory is full.

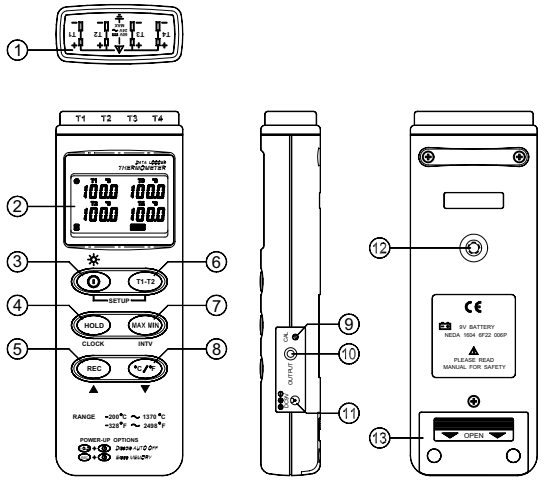
MAX : The Maximum value is now being displayed

MIN : The Minimum value is now being displayed

HOLD : Indicates that the display data is being held

: Indicates the value below is T1-T2





Feature Locations:

1) T1 through T4 Type K temperature sensor input connectors
2) LCD display
3) ON/OFF & Backlight button
4) Hold button
5) Record button
6) T1-T2 button
7) MAX MIN function control button
8) °C, °F control button
9) Offset calibration screw
10) Digital output connector (RS232)
11) AC power adapter connector
12) Tripod connector
13) Battery cabinet cover

4.0 Operating Instructions:

4.1 Preparation for Measurement

Plug as many thermocouples as are to be monitored into the sockets marked **T1** through **T4**, taking care to observe the polarity of the thermocouple pins. If a differential measurement is required, this is available only between **T1** and **T2**, which determines which thermocouples should be connected to these locations.

4.2 Power and Backlight

The ⏻ button turns both the thermometer and the display backlight ON or OFF. Press it once to turn the thermometer ON. Every subsequent momentary press toggles the backlight ON or OFF. Press and hold this button for 3 seconds to turn the power OFF.

When first powered on, the display will show how much memory space is available for use, as shown to the right.

4.3 Selecting the Temperature Scale

When first turned on, the instrument defaults to reading in Celsius (°C). The instrument toggles between Celsius (°C) and Fahrenheit (°F) each time the **°C/°F** button is pressed. The instrument remembers the scale setting when last turned off and powers on in that setting the next time.

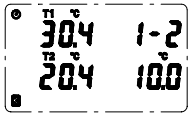
4.4 Data-Hold Operation

The present reading is held on the display by pressing the **HOLD** button. Pressing the **HOLD** button again releases the hold function and returns the instrument to continuous reading.

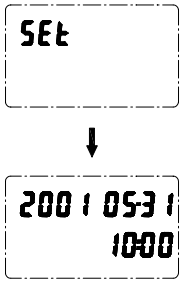
In the **HOLD** mode, the **T1-T2**, **MAX MIN** and **°C/°F** buttons are disabled, as indicated by two continuous beeps when pressed.

4.5 T1-T2 Operation

When the **T1-T2** button is pressed, the display will indicate *1-2* indicating the instrument is in the differential mode of **T1** minus **T2**. The display then indicates **T1** value on the top left, **T2** value on the bottom left, and the difference **T1-T2** on the bottom right.



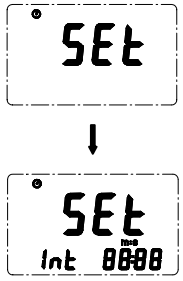
4.6 Clock Setup



To set the real time clock:

1. Press and hold the **T1-T2** button and then power on the meter.
2. Press **HOLD** (clock).
3. Press **REC** (↑) or **°C/°F** (↓) to increase or decrease the number; press **HOLD** to advance to the next item. The adjusting order is: year; month; day; hour; minute. Press **HOLD** again after the last setting to complete the process.
   To abort during a setup process, press the ⏻ button.

4.7 Recording Interval Setup



To set the recording interval:

1. Press and hold the **T1-T2** button and then power on the meter.
2. Press **MAX MIN** (interval).
3. Press **REC** (↑) or **°C/°F** (↓) to increase or decrease the number; press **MAX MIN** to advance to the next item. Press **MAX MIN** again after the last setting to complete the process.
   To abort during a setup process, press the ⏻ button.

4.8 Recording Data

Each momentary press of the **REC** button will alternately start and stop recording. To clear the memory, power off the meter, press and hold the **REC** button followed by the ⏻ button, holding both on simultaneously for at least 5 seconds. The display will show 'CLR' 'SURE 5', and releasing all buttons then clears the memory.

4.9 MAX/MIN Operation

Press the **MAX MIN** button to enter the MAX/MIN mode. In this mode, both the maximum and minimum values are simultaneously retained in memory and updated with every new data sample. The instrument first enters the MAX mode, and the MAX symbol and value are both displayed. Pressing **MAX MIN** again advances the display to the MIN symbol and value. The next press of the **MAX MIN** button will cause both the MAX and MIN symbols to flash. This indicates that the maximum and minimum values have been updated in memory and the displayed reading is the present temperature. Each successive press of the **MAX MIN** button circulates the display mode among these options. To exit the MAX/MIN mode, press and hold the **MAX MIN** button for two seconds.

In the MAX/MIN mode, the **°C/°F** button is disabled, as indicated by two consecutive beeps if pressed.

4.10 Auto Power Off

By default, the instrument powers on in the 'Auto Power Off' mode and will automatically shut off 30 minutes after the last key operation or RS232 communication.

To disable this feature, press and hold the **HOLD** button and then power on the meter. Two successive beeps will indicate that 'Auto Power Off' is disabled, and the ⏲ will not be displayed.

4.11 Low Battery Condition

When the battery voltage is at or below the minimum for proper operation, the 🔋 symbol will show on the display indicating that the battery must be replaced.

4.12 Calibration

Calibration is conducted by adjusting the following potentiometers to within the tolerances shown.

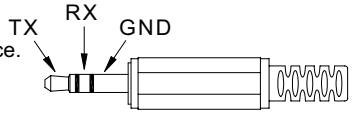
(Ambient Temperature: 23 ± 3°C)

Input	Adjust VR	Tolerance
0 °C	VR1	± 0.1 °C
190 °C	VR2	± 0.1 °C
1000 °C	VR3	± 1 °C
1900 °F	VR4	± 1 °F

A simple single point calibration may be performed by adjusting VR1 to 0 °C with thermally stabilized ice water.

4.13 Digital Output

The Digital Output is a 9600 bps N 81 serial interface.
RX is a 5V normally high input port.
TX is a 5V normally high output port.



Appendix: Thermocouple Probe Specifications

Model	Range	Tolerances	Description
TP-K01 Wire probe	-50°C to 200°C -58°F to 392°F	±2.2°C or ±0.75% ±3.6°F or ±0.75%	Teflon insulation. Maximum insulation temperature: 260°C (500°F)

TP-K01:
Probe for general condition measurements, especially for complex and hard to reach places.