Model 410
Operator's Manual
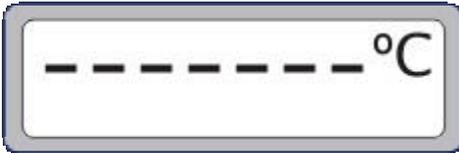
Table of Contents

Secton 1	Setup

The Data Page is displayed each time the Model 410 is powered on. To display the Setup Pages, press the Setup key.

General Setup Navigation

- To change Setup pages or highlight a different parameter, press either the "single" Up or "single" Down arrow key.

- To change the value of a scrollable parameter (e.g., Units), press either the "single" Up or "single" Down arrow key.

- To change the value of an editable parameter (e.g., Rtp), position the cursor with the Left or Right arrow key

and scroll the digit (or character) with either the "double" Up or "doublee" Down arrow key.

⬆⬇

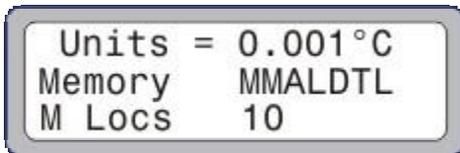• To return to the Data Page, press the Setup key.

Backlight

To toggle the backlight on or off, press the backlight key.

Note: When the backlight is on, the Model 410 battery will drain faster.

Setup Page #1

```
Units = 0.001°C
Memory   MMALDTL
M Locs   10
```

Units

The Units parameter specifies the measurement units. The options are: 0.01 °C, 0.001 °C, 0.01 °F, 0.001 °F, 0.01 K, 0.001 K, and □. Temperatures are displayed with either two or three digits of resolution. Resistance is displayed with three digits of resolution.

Memory

The Memory parameter specifies which Memory Data Items are displayable on the bottom of the Data Page. There are seven possible Memory Data Items: Maximum, Minimum, Average, Last, Date, Time, and Label. To specify whether a Memory Data Item is enabled or not, toggle the associated character in the parameter string: MMALDTL. If the character is displayed, the associated Memory Data Item is enabled. If '-' is displayed, the associated Memory Data Item is disabled. For example, if MMA---- is displayed, Maximum, Minimum, and Average will be the only Memory Data Items displayable on the bottom of the Data Page.

.
Memory Locations

The M Locs parameter specifies the number of Memory Locations available for memory storage. M Locs can be set between 1 and 100.

Note: The only purpose of the Memory and M Locs parameters is to reduce the amount of information to scroll through when viewing Memory data on the Data Page.

Revision Page
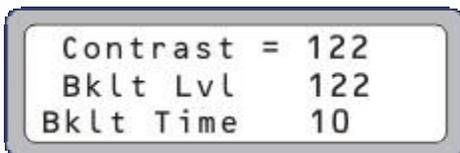
```
Model 410
Rev. A
26-Mar-07
```

To display the revision page, press the Right arrow key when Units is the highlighted parameter.

To return to Setup Page #1, press the Left arrow key.

Setup Page #2

```
Contrast = 122
 Bklt Lvl    122
Bklt Time    10
```

Contrast

The Contrast parameter allows for adjustment of the contrast of the LCD display.

Backlight Level

The Bklt Lvl parameter allows for adjustment of the intensity of the backlight on the LCD display.

Backlight Time

The Bklt Time parameter specifies the amount of time (in minutes) the backlight on the LCD display will automatically shut off after the backlight has been turned on.

Setup Page #3

```
 Time =  08:19:25
 Date    03-24-07
Unlock   000000
```
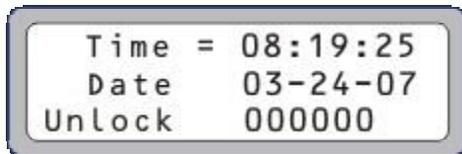
Time

The Time parameter allows for entry of the current time of day in 24 hour format.

Date

The Date parameter allows for entry of the current date (mm-dd-yy).

Unlock

Enter the Unlock Code and select using thee General Setup Navigation procedures
The Universal Pass code is 410000

to display the RTD setup and calibration pages use the "single" down arrow

Setup Page #4

```
Rtp = 100.0040
  a8    -2.0091e-02
  b8    +3.2200e-05
```

Rtp

Specifies the Rtp for the connected sensor.

a8

Specifies coefficient a8 or a7 for the connected sensor.

b8

Specifies coefficient b8 or b7 for the connected sensor.

Setup Page #5

```
c7 = +0.0000e-00
a4    -1.9633e-02
b4    -1.4000e-04
```

C7
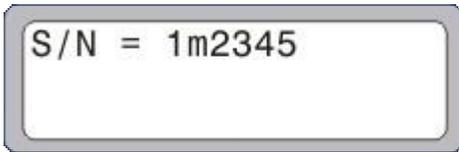
Specifies coefficient c7for the connected sensor.

a4

Specifies coefficient a4 for the connected sensor.

b4

Specifies coefficient b4 for the connected sensor.

Setup Page #6

Serial Number

```
S/N = 1m2345
```

The S/N parameter specifies the serial number for the connected sensor.

Setup Page #7

```
  Code = 920123
Do Cal    Rt Arrow
CalDue    03-24-08
```
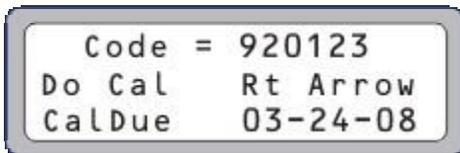
Code

Specifies the Unlock Code needed on Setup Page #3 to access the RTD setup and calibration pages.

Do Cal

When the Do Cal parameter is selected, press the Right arrow key to display The Model 410 Calibration Page #1.

CalDue

Indicates the date the next calibration is due. This is automatically set at the completion of a calibration.

Section 2   Model 410 Calibration

The Model 410 is calibrated at the factory before shipment. It is recommended that it be recalibrated every year.

Calibration Points #0 and #1

```
Cal1 = 100.0012
   Ok    Rt Arrow
```

The current calibration point and suggested calibration value (0 ohms for cal point #0 or 300 ohms for cal point #1) are displayed. The actual calibration resistance value should be within 1 or 2 percent of the suggested value and known to within 0.0010% (10 ppm).

To calibrate, connect the calibration resistor, enter the actual resistance value, highlight Ok, and press the Right arrow key to calibrate at each point. While the Model 410 is calibrating at each point, "Pls Wait…….." is displayed.

Section 3   Data Page

```
   101.02 ºC
Max 05: 105.08 ºC
```

The Data Page is displayed each time the Model 410 is powered or when the Setup key is pressed from any Setup page.

Measurement Data

The continuously updated measurement value and units are displayed in large font at the top of the screen. Temperatures are displayed with two digits of resolution. Resistance is displayed with three digits of resolution.

If an over range condition has occurred, one of the following messages will be displayed in place of the measurement value:

Condition	Display
No Sensor Attached	OPEN
> 330 Ω Measured	OVER
> 661 ºC Calculated	OVER

< -200 ºC Calculated   UNDER

Notes: Temperature calculation errors are typically due to invalid coefficients.

Upon power up or when returning from the Setup level, "-------" is temporarily displayed until the first measurement has been completed.

When battery power gets low, the units display will alternate with a low battery symbol. When the low battery symbol first appears, there will be approximately *20 minutes* of battery life left.

Memory Data Items are displayed in small font at the bottom of the screen. A label indicating the currently displayed Memory Data Item is displayed first and is followed by a number from 0 to 99 indicating the currently selected Memory Location. The value of the Memory Data Item and any applicable units are displayed to the right of the colon.

Data Page Operation

- To clear existing data and start collecting new data for the selected Memory Location, press the "double" Down arrow key.

- To stop collecting data for the selected Memory Location, press the "double" Up arrow key.

- To change the currently displayed Memory Data Item, press either the Left or Right arrow key.
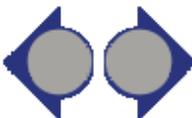
Note: Only Memory Data Items selected as displayable by the Memory parameter are available for display.

- To change the selected Memory Location, press either the "single" Up or "single" Down arrow key.

Notes: The number of displayable Memory Locations is restricted by the M Locs parameter.

When the selected Memory Location is changed, data will automatically stop being collected for the previously selected location.

Section 4	Remote Operation

Serial communication with the Model 410 is performed via the DB9 connector on the top of the unit. The Model 410 can be remotely operated from a host PC. Using PC generated serial commands, it is possible to: 1. Query all the displayed real-time and saved data, 2. Query and configure all setup parameters, and 3. Perform all front panel memory operations.

The Model 410 will attempt to process an incoming serial command each time it receives an ASCII carriage return. When it finishes processing the command, it will send a response indicating if the command was properly executed.

Command Process Responses:
0   Ok
1   Invalid Command
2   Invalid Memory Location
3   Invalid Value

The response will contain the Command Process Response followed by an ASCII carriage return and an ASCII line feed.

<command process response><cr><lf>.

If the received command is a Query command, the Model 410 will send the Command Process Response followed by <cr><lf> , the requested information, and another <cr><lf>.

<command process response><cr><lf>*<information>*<cr><lf>.

The command structure consists of nodes that group related functionality. Each node is separated by a decimal point.

When setting a value, the command must be followed by a space, the value, and then the ASCII carriage return. When querying a value, the command must be followed by a space, a question mark, and then the ASCII carriage return.

The RS232 commands are not programmable and are fixed at the following command structure. Baud rate 9600, 8 bits , 1 stop , no parity

1 - Data Commands

Data commands are query only. Therefore, the space and question mark sequence are optional.

Real-time Measurement Data

1.1	Real-time Measurement Data

Memory Data

The commands to access memory data are essentially the same for each memory location (0 to 99). To specify a data command for a memory location, append .x (where x is the number of the memory location) to the end of the command. For example, the command to query Memory Location 0 Maximum is 1.2.0 and the command to query Memory Location 57 Maximum is 1.2.57.

Note: If no location is specified, it is assumed to be location 0.

1.2	Maximum
1.3	Minimum
1.4	Average
1.5	Last
1.6	Units
1.7	Date
1.8	Time
1.9	Label (Set or Query)

2 - Setup Commands

2.1	Model Number (Query only)		
2.2	Software Revision (Query only)		
2.3	Revision Date (Query only)		
2.4	Units	0 1 2 3	ºC ºF K Ω

2.5.1	Display Memory Maximum	0 1	No Yes
2.5.2	Display Memory Minimum	0 1	No Yes
2.5.3	Display Memory Average	0 1	No Yes
2.5.4	Display Memory Last	0 1	No Yes
2.5.5	Display Memory Date	0 1	No Yes
2.5.6	Display Memory Time	0 1	No Yes
2.5.7	Display Memory Label	0 1	No Yes
2.6	Memory Locations (1 – 100)		
2.7	Contrast (0 – 255)		
2.8	Backlight Level (0 – 255)		
2.9	Backlight Time (0 – 60)		
2.10	Time (hh:mm:ss)		
2.11	Date (mm-dd-yy)		
2.12	Unlock Code (xxxxxxx)		

3 – RTD Sensor Commands

3.1	Rtp
3.2	a8
3.3	b8
3.4	a4
3.5	b4
3.6	Serial Number
3.7	c7

5 – Action Commands

All Action Commands with the exception of 5.3 are "trigger" only and cannot be queried. The <cr> must follow the command with no other characters in between.

5.1	Dump Memory
5.2	Clear All Memory
5.3	Set or Query Active Memory Location
5.4	Clear and Start Collecting Memory for Active Location
5.5	Stop Collecting Memory for Active Location

Section 5   Secifications

Section 5 Specifications

Instrument Range -196 to 660º C -320 to 1220º F   ITS-90 Coefficients
Instrument Uncertainty ±0.020º C ± 0.036º F ± 0.008 ohms (18 to 28º C)
Calibration Check 1 Year interval **Resolution** 0.01 or 0.001º C or º F selectable -
196 to –100 has 0.01º resolution only
Excitation Current Nominal 1 ma
Sensor Type 100 ohm platinum RTD any alpha 0.00385 to 0.003926
Sensor Coefficients Rtp plus required sensor coefficients dependent on the sub-range
Operating Ambient 5º to 45º C
Humidity Less than 80% non-condensing
Warm Up Time Within specifications upon turn on, optimum after 15 minutes **Temperature Coefficient** ± 2 ppm per Degree C from ambient
Display LCD with back light
Weight About 1 lb or 0.5 kg by itself
Power Battery operation up to 7 hours Use 4 NiMH batteries
        Charger Adapter 115 VAC input 6 VDC @ 300 ma output

Section 6   Features

Section 6 Features

Timed backlight display with contrast adjustment
Multifunctional stand with lanyard hook and wall hanging slide
Thermal offset correction
RS232 port standard
Password protection capability
5 Pin DIN connector as standard RTD connection
Easy 2 step resistance calibration
User friendly programming
Battery symbol to alert operator that a charge is needed

Section 7Select and Use Feature

The select and use feature is for the user that wants to use multiple RTD sensors on his Model
410 Hand Held unit. It is set up to be able to select 4 different RTD sensors
Unless the user requests this feature the standard one input RTD sensor will be furnished when
the 410 is initially shipped.
The select and use feature can be initiated by the user using the RS232 port The
commands are as follows.

   3.10 1 (3.10space1) activates the select and use feature for 4 RTD sensors
   3.10 0 (3.10space0) returns the Model 410 to one input only

Once the select and use feature is activated then coefficients for the different RTD sensors must
be programmed into the Model 410.
The model number and serial number must also be programmed into the memory thus identifying
that particular RTD sensor with its particular coefficients.

When the Model 410 is powered up it will display the probe number and the serial that has been selected. The user can change the probe(RTD) at any time, by going into the menu and making the proper selection.