

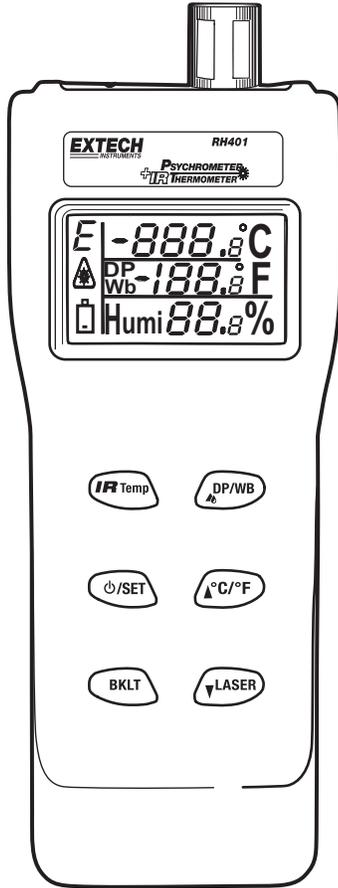
User's Guide

**EXTECH**<sup>®</sup>  
INSTRUMENTS

A FLIR COMPANY

## Digital Psychrometer + IR Thermometer

Models RH401 and RH405 (kit)

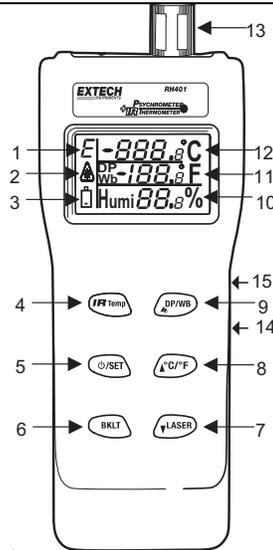


## Introduction

Congratulations on your purchase of the Extech RH401 Digital Psychrometer + InfraRed Thermometer. This device measures Humidity, Air Temperature, Dew Point and Wet Bulb. Advanced features include Infrared Non-Contact Surface Temperature Measurement, Data Hold and programmable Auto Power Off, and an RS-232 interface for capturing readings to a PC using optional 407752 software. The retractable probe protects the sensors when the meter is not in use. Careful use of this meter will provide years of reliable service.

## Meter Description

1. Emissivity adjust indicator
2. Laser pointer on indicator
3. Low Battery indicator
4. IR Surface Temperature button
5. ON/OFF/Setup button
6. Back Light button
7. Laser/Down button
8. °F/°C/Up button
9. Dew Point/Wet Bulb button
10. % Humidity display
11. Air Temperature, Dew Point or Wet Bulb display
12. IR Surface Temperature display
13. Extended probe with Humidity & Air Temperature Sensors
14. PC interface port
15. AC adaptor jack



Note: The battery compartment is located on the rear of the instrument

## Warranty

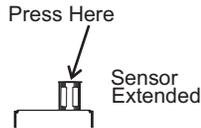
**EXTECH INSTRUMENTS CORPORATION** (A FLIR COMPANY) warrants this instrument to be free of defects in parts and workmanship for one year from date of shipment (a six month limited warranty applies to sensors and cables). If it should become necessary to return the instrument for service during or beyond the warranty period, contact the Customer Service Department at (781) 890-7440 ext. 210 for authorization or visit our website [www.extech.com](http://www.extech.com) for contact information. A Return Authorization (RA) number must be issued before any product is returned to Extech. The sender is responsible for shipping charges, freight, insurance and proper packaging to prevent damage in transit. This warranty does not apply to defects resulting from action of the user such as misuse, improper wiring, operation outside of specification, improper maintenance or repair, or unauthorized modification. Extech specifically disclaims any implied warranties or merchantability or fitness for a specific purpose and will not be liable for any direct, indirect, incidental or consequential damages. Extech's total liability is limited to repair or replacement of the product. The warranty set forth above is inclusive and no other warranty, whether written or oral, is expressed or implied.

## Operation

### Retractable Humidity and Air Temperature Sensor

Press down on the sensor, located at the top of the meter, to release it. Humidity and air temperature will not be displayed if the sensor is not extended.

After use, press the sensor into the stored (protected) position.



### Power ON/OFF

Press the  $\odot$ /SET (or the **IR**Temp button) to turn power on. The meter will perform a short self-test when turned on.

Press and hold the  $\odot$ /SET button for three seconds to turn power off.



### Humidity and Air Temperature measurements

1. Hold the meter in the area to be tested.
2. Allow adequate time for readings to stabilize.
3. View the Relative Humidity measurement in the lower display.
4. View the Air (probe)Temperature measurement in the middle display

### Wet Bulb and Dew Point measurements

1. To display the Dew Point measurement, press and hold the  $\blacktriangle$ DP/WB button until the symbol **DP** appears in the middle display.
2. Dew Point temperature is now displayed.
3. To display the Wet Bulb measurement, press and hold the  $\blacktriangle$ DP/WB button until the symbol **Wb** appears in the middle display .
4. Wet Bulb temperature is now displayed.
5. To display IR temp –DP temp (IR surface temperature-Dew Point), press and hold the  $\blacktriangle$ DP/WB button for more than 2 seconds then press the IR Temp button. The reading can now be viewed in the top display.
6. Press and hold the  $\blacktriangle$ DP/WB button for more than 2 seconds to toggle the display back to IR temperature.

### Non-Contact InfraRed Surface Temperature measurements

1. Point the meter toward the surface to be measured.
2. Press and hold the **IR**Temp button.
3. View the temperature measurement in the upper display
4. Release the **IR**Temp and the reading will be held on the display until a new reading is taken.
5. While holding down the **IR**Temp button, press the  $\blacktriangledown$ LASER button to toggle the laser targeting pointer on/off. The  $\blacktriangle$  symbol will appear in the middle left of the display indicating that surface temperature measurement is active and the laser pointer is on.

**WARNING!** The Laser button  $\blacktriangledown$ LASER enables/disables the Laser pointer. When enabled, each press of the **IR**Temp button turns on the Laser beam. Avoid looking directly into the path of the Laser or pointing the Laser toward anyone's eyes. Mirrored surfaces near a measurement object can redirect the Laser, use extreme caution. Do not allow the Laser beam to be directed toward explosive gases.



## IR Emissivity Adjustment

Emissivity is adjustable from 0.3 to 0.99. The default value is 0.95 which is the typical emissivity value of many non-metallic surfaces. If the surface to be measured is highly reflective and the emissivity is not known, cover the surface with paint or tape to improve measurement accuracy. If the emissivity of the surface is known, follow this procedure to set the value.

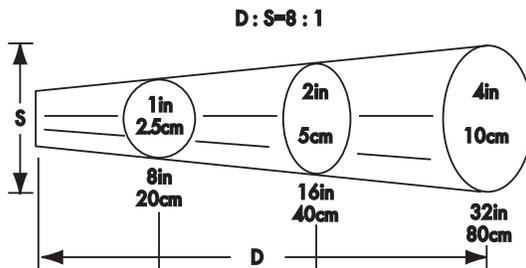
1. With the meter on, Press the  $\phi$ /SET key twice to enter the Emissivity setting procedure.  $\bar{E}$  will flash on the top left side of the display.
2. Use the  $\blacktriangle$ <sup>°C/°F</sup> up key and the  $\blacktriangledown$ LASER down key to adjust the value.
3. When the desired setting appears in the display, press  $\phi$ /SET again to save and return back to normal operation.

**Emissivity Factors for Common Materials**

| Material under test | Emissivity   | Material under test | Emissivity   |
|---------------------|--------------|---------------------|--------------|
| Asphalt             | 0.90 to 0.98 | Cloth (black)       | 0.98         |
| Concrete            | 0.94         | Skin (human)        | 0.98         |
| Cement              | 0.96         | Lather              | 0.75 to 0.80 |
| Sand                | 0.90         | Charcoal (powder)   | 0.96         |
| Soil                | 0.92 to 0.96 | Lacquer             | 0.80 to 0.95 |
| Water               | 0.92 to 0.96 | Lacquer (matt)      | 0.97         |
| Ice                 | 0.96 to 0.98 | Rubber (black)      | 0.94         |
| Snow                | 0.83         | Plastic             | 0.85 to 0.95 |
| Glass               | 0.90 to 0.95 | Timber              | 0.90         |
| Ceramic             | 0.90 to 0.94 | Paper               | 0.70 to 0.94 |
| Marble              | 0.94         | Chromium Oxides     | 0.81         |
| Plaster             | 0.80 to 0.90 | Copper Oxides       | 0.78         |
| Mortar              | 0.89 to 0.91 | Iron Oxides         | 0.78 to 0.82 |
| Brick               | 0.93 to 0.96 | Textiles            | 0.90         |

## Spot to Distance Ratio

The 8:1 spot to distance ratio determines the size of the measured surface area with respect to the distance the meter is held away from the surface.



### Selecting temperature units of measure (C/F)

Press and hold the °C/°F button momentarily to toggle the temperature units.

### Automatic Power OFF

The meter automatically shuts off after a programmed period of time.

To disable auto power off, with the meter off, press  $\phi$ /SET and  $\blacktriangle$ °C/°F. When "n" appears, release the keys and the meter is now in Non-Sleep Mode.

The power off time is adjustable from 5 to 600 seconds. To change the auto power off setting, press the  $\phi$ /SET key to enter the setting procedure. Use the  $\blacktriangle$ °C/°F up key and the  $\blacktriangledown$ LASER down key to set the value. When the desired power-off time appears in the display, press the  $\phi$ /SET key again to save the parameters.

### Backlight

Press the BKLT button to turn the display backlight on. The backlight will remain on until the BKLT button is pressed again or the meter is turned off.

### Error Messages

An error message will appear on the display if the meter fails an internal diagnostic test.

1. **E1** (Top display): IR temperature failure. Repair/replacement is necessary.
2. **E2** (Top display): IR temperature >932°F (500°C).
3. **E3** (Top display): IR temperature <-40°F (-40°C).
4. **E9** (Top display): Calibration error.
5. **E1** (Middle display): Temperature failure. Repair/replacement is necessary.
6. **E2** (Middle display): Dew Point is out of range or Repair/replacement is necessary.
7. **E3** (Middle display): Air temperature is out of range or Repair/replacement is necessary.
8. **E1** (Bottom display): RH circuit error. Repair/replacement is necessary.
9. **E5** (Bottom display): RH circuit error. Repair/replacement is necessary.

### Setup memory

The selected display, emissivity value, auto power off time, backlight status and the laser pointer status are stored in memory and will remain in memory as the user default setting until reprogrammed by the user.

## Calibration

The following verification and calibration procedures requires a humidity chamber or the 33% and 75% RH reference bottles which are supplied with the Model RH405 kit.

### RH Accuracy Verification

Checking the 33% or 75% RH Calibration

1. Insert meter's sensor into the 33% or 75% salt reference bottle.  
Rotating the bottle will assist in placing it over the sensor.
2. Check the reading after 10 minutes
3. Verify that the reading is within the accuracy specification.

### RH Calibration (33% and 75%)

This two point calibration takes approximately one hour to complete.

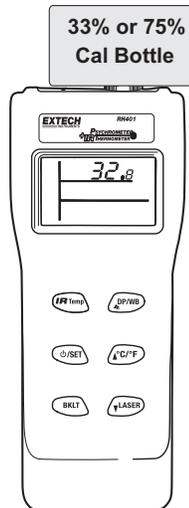
#### 33% Calibration

1. Turn off the meter and insert the meter sensor into the 33% salt reference bottle. Rotating the bottle will assist in placing it over the sensor.
2. Hold down the  $\nabla$ LASER and  $\blacktriangle$  $^{\circ}\text{C}/^{\circ}\text{F}$  keys and then press the  $\odot$ /SET key to turn the unit on.
3. "32.8" (reading may vary depending on temperature) will flash on the display. After 30 minutes, the flashing will stop to indicate that the 33% calibration is complete.

#### 75% Calibration

4. Insert the meter sensor into the 75% salt reference bottle. From a steady "32.8" display press the  $\odot$ /SET button to enter the 75% calibration.
5. "75.2" (reading may vary depending on temperature) will flash on the display. After 30 minutes, the flashing will stop to indicate that the 75% calibration is complete and the calibration data has been saved to memory.
6. The screen will return to the normal display. Calibration is now complete.

**Note:** If the salt at the bottom of the calibration bottles appears dry, the bottles should be replaced.



## RS-232 PC Communications Interface

The meter is equipped with an RS-232 PC interface jack (3.5mm phono) for connection to a PC. The cable to connect the meter to the PC is included in the optional 407752 data acquisition kit. The kit includes Windows™ compatible software that allows the user to store readings in a text file and display real-time measurements in a series of selectable formats. For more information or specific operating instructions, refer to the User Guide included with the 407752 kit or contact Extech Instruments.

## Specifications

| Function                               | Range and Resolution          | Accuracy  |
|--|-------------------------------|---|
| Humidity                               | 0.0 to 100.0% RH              | ±3% RH (10 to 90%)                              |
| Temperature (Air)                      | -4.0 to 122.0°F (-20 to 50°C) | ±1.8°F (±1°C)                                   |
| Temperature (InfraRed)<br>(@25°C ±5°C) | -4 to 842°F (-20 to 450°C)    | ±3% reading or ±3°C/6°F<br>whichever is greater |
|  | -40 to -4 °F, 842 to 932°F    | ±4% reading or ±4°C/8°F<br>whichever is greater |
|  | -40 to -20 °C, 450 to 500 °C  |   |

|                               |   |
|-------------------------------|---|
| <b>Display</b>                | Triple LCD with backlight   |
| <b>Sensor Type</b>            | Humidity: Capacitance sensor; Temperature (air): Thermistor                             |
| <b>Dew Point</b>              | -90.4 to 122.0°F (-68 to 50°C) (calculated from humidity and temperature measurements)  |
| <b>Wet Bulb</b>               | -6.9 to 122.0°F (-21.6 to 50°C) (calculated from humidity and temperature measurements) |
| <b>IR Emissivity</b>          | Adjustable from 0.3 to 0.99   |
| <b>IR Spot/Distance Ratio</b> | 8:1   |
| <b>IR Response Time</b>       | 0.5 seconds   |
| <b>Operating Conditions</b>   | -4 to 122°F (-20 to 50°C); < 99% RH non-condensing                                      |
| <b>Storage Conditions</b>     | -40 to 185°F (-40 to 85°C); <99% RH non-condensing                                      |
| <b>Power Supply</b>           | 4 x 1.5V 'AAA' batteries or AC adaptor  |
| <b>Battery Life</b>           | approx. 150 hours (laser inactive); 30 hours (laser active)                             |
| <b>Dimensions / Weight</b>    | 6.8x2.7x1.9" (175x70x50mm); 4.9 oz. (140g)  |

## **Maintenance**

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### **Cleaning and storage**

1. The meter should be cleaned with a damp cloth and mild detergent when necessary. Do not use solvents or abrasives.
2. Store the meter in an area with moderate temperature and humidity (refer to the operating and storage range in the specifications chart earlier in this manual).

### **Battery Replacement**

When the battery power falls low, the  symbol will appear on the lower left of the LCD. Replace the four (4) 1.5 'AAA' batteries by removing the rear battery compartment cover and accessing the battery compartment. Observe polarity when placing the batteries in the compartment. Ensure that the compartment cover is securely fastened when finished.

### **Calibration and Repair Services**

Extech offers repair and calibration services for the products we sell. Extech also provides NIST certification for most products. Call the Customer Service Department for information on calibration services available for this product. Extech recommends that annual calibrations be performed to verify meter performance and accuracy.



#### **Support line (781) 890-7440**

Technical support: Extension 200; E-mail: [support@extech.com](mailto:support@extech.com)

Repair & Returns: Extension 210; E-mail: [repair@extech.com](mailto:repair@extech.com)

#### **Product specifications subject to change without notice**

For the latest version of this User's Guide, Software updates, and other up-to-the-minute product information, visit our website: [www.extech.com](http://www.extech.com)

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