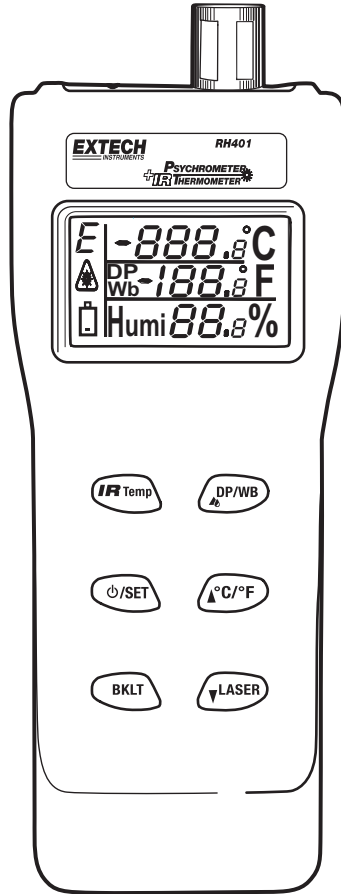




Digital Psychrometer + IR Thermometer

Model RH401



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. The retractable probe protects the sensors when the meter is not in use. Careful use of this meter will provide years of reliable service.

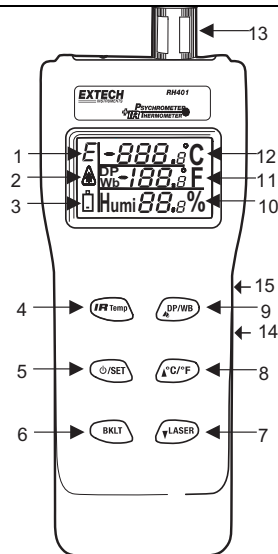
Specifications

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) (@25°C ±5°C)	-4 to 842°F (-20 to 450°C)	±3% reading or ±3°C/6°F whichever is greater
	-40 to -4 °F, 842 to 932°F	±4% reading or ±4°C/8°F whichever is greater
	-40 to -20 °C, 450 to 500 °C	

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

Meter Description

- Emissivity adjust indicator
- Laser pointer on indicator
- Low Battery indicator
- IR Surface Temperature button
- ON/OFF/Setup button
- Back Light button
- Laser/Down button
- °F/°C/Up button
- Dew Point/Wet Bulb button
- % Humidity display
- Air Temperature, Dew Point or Wet Bulb display
- IR Surface Temperature display
- Extended probe with Humidity & Air Temperature Sensors
- PC interface port
- AC adaptor jack



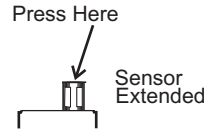
Note: The battery compartment is located on the rear of the instrument

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 **☺/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 **☺/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 Wet Bulb measurement, press and hold the **▲DP/WB** button until the symbol **DP** appears in the middle display.
2. Wet Bulb temperature is now displayed.
3. To display the Dew Point measurement, press and hold the **▲DP/WB** button until the symbol **Wb** appears in the middle display .
4. Dew Point temperature is now displayed.
5. To display IR temp -DP temp (IR surface temperature-Dew Point), press and hold the **▲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 **▲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 **▼LASER** button to toggle the laser targeting pointer on/off. The **☼** 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 **▼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.

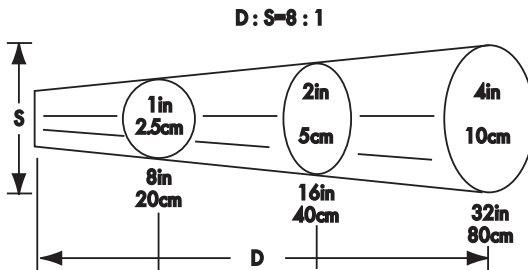
1. With the meter on, Press the \odot /SET key twice to enter the Emissivity setting procedure. E will flash on the top left side of the display.
2. Use the \blacktriangle °C/°F up key and the \blacktriangledown LASERdown key to adjust the value.
3. When the desired setting appears in the display, press \odot /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 $\text{⏻}/\text{SET}$ and $\text{▲}^{\circ}\text{C}/^{\circ}\text{F}$. 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 $\text{⏻}/\text{SET}$ key to enter the setting procedure. Use the $\text{▲}^{\circ}\text{C}/^{\circ}\text{F}$ up key and the $\text{▼}\text{LASER}$ down key to set the value. When the desired power-off time appears in the display, press the $\text{⏻}/\text{SET}$ 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 require a humidity chamber.

RH Accuracy Verification

Checking the 33% or 75% RH Calibration

1. Insert the meter into a chamber set to 33% or 75%.
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 three hours to complete.

33% Calibration

1. Turn off the meter and insert it into a chamber set to 33%.
2. Allow the meter one hour to stabilize.
3. Hold down the ▼LASER and ▲°C/°F keys and then press the ⏻/SET key to turn the unit on.
4. "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

1. Insert the meter into a chamber set to 75%.
2. Allow the meter one hour to stabilize.
3. From a steady "32.8" display press the ⏻/SET button to enter the 75% calibration mode.
4. "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.
5. The screen will return to the normal display. Calibration is now complete.

RS-232 PC Communications Interface

RS-232 data format

Baud rate	9600
Parity	none
Data bits	8
Stop bits	1
Flow control	none

RS-232 Connection

Connect the optional interface cable from the meter to the communications port of the PC.

Using Windows® Terminal or HyperTerminal program for PC Communication

The Terminal or the HyperTerminal program is included in all Windows® operating systems. Typically it is located using the following path:

START Menu > Programs > Accessories > Communications > Terminal or HyperTerminal

When in the Terminal or HyperTerminal program, configure as follows:

1. In the **Connection Description** window, enter a name, select an icon and click OK.
2. In the **Connect To** window, select COM1 or COM2 (depending on which port is being used) and click OK.
3. In the **Port Settings** window, select the following data format: Baud rate 9600, no parity, 8 data bits, 1 stop bit, and no flow control. Click OK to enter the main HyperTerminal window.
4. In the **File Menu**, select **Properties > Settings > ASCII SETUP**, select "echo typed characters" and "Send line ends with line feeds". Click OK twice to return to the main HyperTerminal window.

Format

Txxx.xC:Txx.xC:Hxx.x%:Txx.xC:Txx.xCCLRCCRLF

Where: The 1st value is IR Temperature, the 2nd value is Air Temperature, the 3rd value is Humidity, the 4th value is Wet Bulb, and the 5th value is Dew Point.

Format for error value: E01 no value; E02 Overflow; E03 Underflow

Unit for error code is n


For example: if IR is disabled: TE01n:T23.5C:H45.3%:T14.9C:T12.3CCLRCCRLF

Maintenance

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.