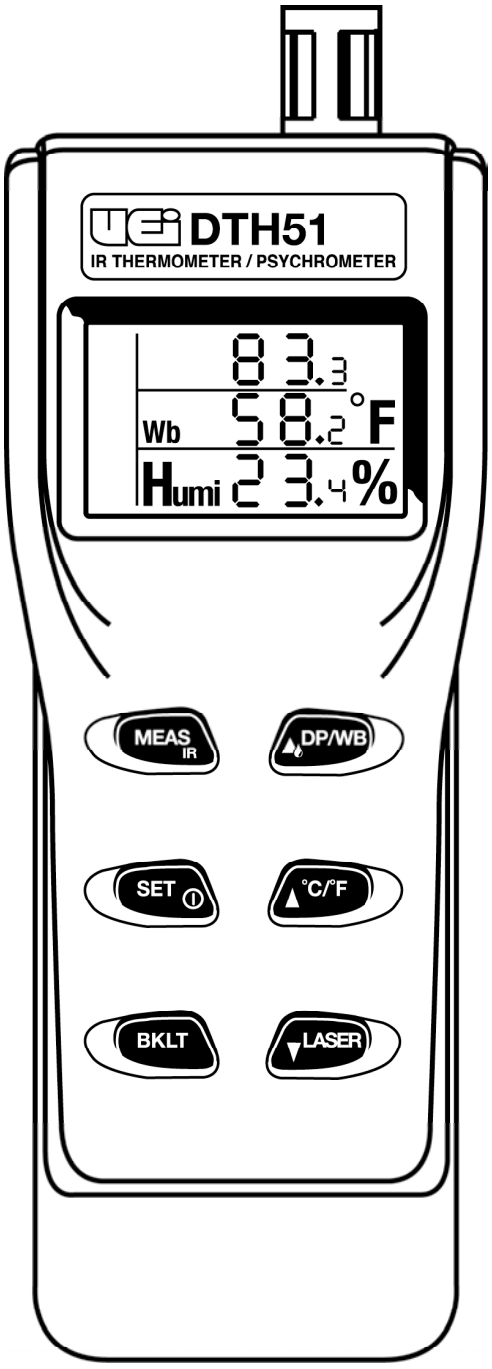
UEi Automotive

INSTRUCTION MANUAL

DTH51

IR Thermometer/Psychrometer



1-800-547-5740 • Fax: (503) 643-6322
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Introduction

The DTH51 gives you quick access to the information you need when installing or maintaining heating and cooling systems. Manufacturers of some of the newer "high-efficiency" cooling systems require you to charge them based on wet bulb and dry bulb specifications. The DTH51 offers you the fastest method to date of taking these measurements. It combines the speed and convenience of an infrared thermometer with the accuracy and reliability of a digital psychrometer and ambient temperature meter in one product.

The DTH51 is battery operated and measures Humidity, Dew Point, Wet Bulb, Air Temperature (Dry Bulb), Surface Temperature and the difference between the Dew Points of an IR measured surface and the ambient air. Its sensors are retractable to protect them when they are not in use.

Features include

- Triple LCD digital display
- Infrared temperature measurement with adjustable emissivity (Spot ratio 8:1)
- Built-in ambient-air temperature sensor
- Fast responding humidity sensor
- Wet Bulb - continuously updated
- Dew Point - continuously updated
- Differential dew-point function (surface temperature to dew-point differential)
- Backlit display
- Low battery indication
- Accurate and reliable microprocessor circuitry
- Auto power off with adjustable power-off timer
- Environmentally protected (retractable) sensor-set

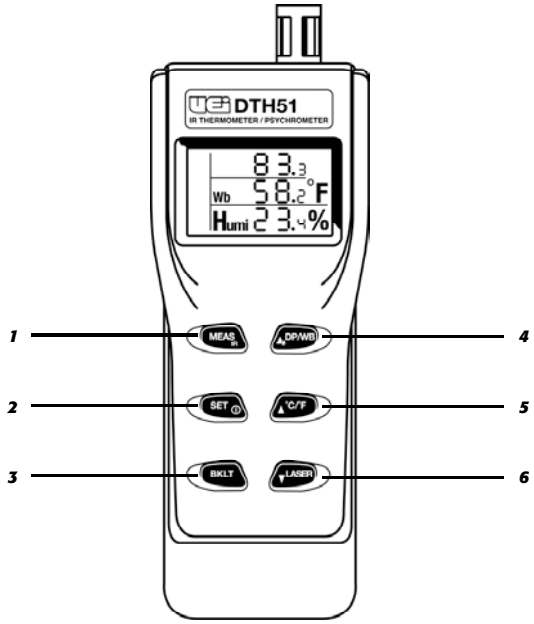
Safety Notes

Before using this meter, read all safety information carefully. In this manual the word **"WARNING"** is used to indicate conditions or actions that may pose physical hazards to the user. The word **"CAUTION"** is used to indicate conditions or actions that may damage this instrument.

WARNING!

DO NOT point the laser toward the eyes or face of a person or animal. Laser light can cause eye injury, if the beam makes direct eye contact. Reflective laser light can also cause damage, if a mirror or a glass-like surface reflects the beam directly into the eye. Laser's potential to cause damage is retained for hundreds of feet. Use caution.

Controls and Indicators



1. MEAS **Key:** Press to activate infrared (IR) thermometer (to measure surface temperature).
   - IR temperature is stored on the top line of the display when MEAS key is released
   - Differential dew point must not be displayed to take infrared temperature measurements with sensor-set retracted

   Press MEAS and LASER at the same time to turn ON/OFF laser targeting function.

2. SET **Key:** Press to turn ON/OFF ambient temperature and humidity functions, independent of the infrared thermometer.
   - Press to turn on
   - Press for about 3 seconds to turn off

   With the meter on, press to enter auto-off time and emissivity settings.
   - Use up or down arrow keys to change the settings - the longer these are held, the faster they change
   - Press the SET key to accept the change

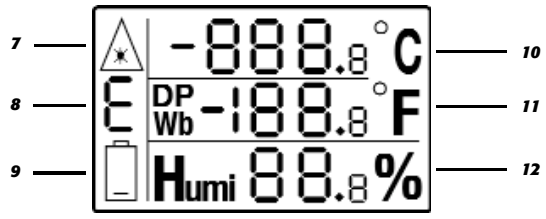
3. BKLT **Key:** Press to turn ON/OFF the back light.

4. DP/WB **Key:** Quickly press and release to select data to be displayed on second line:
   - Ambient Temperature, Dew Point or Wet Bulb

   Press for about 2 seconds and release to turn ON/OFF the differential-dew-point display on the top line.
   - This feature allows you to use the last-taken infrared measurement to determine if an object's surface will create condensation (i.e. a cold car going from outdoors into a paint shop)

5. (°C/°F) **Key:** Press to select between Centigrade or Fahrenheit temperature readings in both the first and second lines.
   - Use to increase auto-power-off time or emissivity settings (item 2)
   - Press (SET) and (°C/°F) at the same time to disable auto-power-off function
6. (LASER) **Key:** Press (MEAS IR) and (LASER) at the same time to turn ON/OFF laser targeting function.
   - Use to decrease auto-power-off time or emissivity settings (item 2)

LCD Display

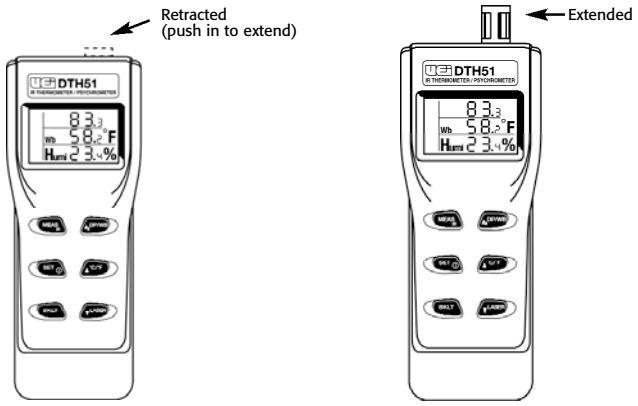


7. **IR Indicator**
8. **Emissivity**
9. **Battery Indicator**
10. **Surface Temperature**
11. **Air Temperature**
12. **Air Humidity**

Operating Instructions

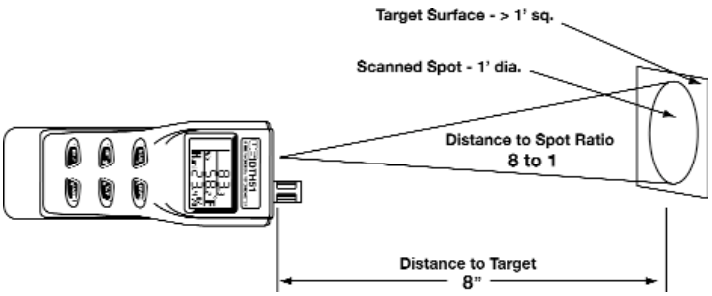
NOTE: *The sensor-set must be extended prior to using this instrument for any ambient air or humidity based measurements. To extend the sensor-set, press it down, then release as shown. The sensor-set is spring loaded and motion-dampened to ensure that it extends fully, without stressing the components. Reverse the process to retract the sensor-set.*

IMPORTANT: *Store your DTH51 with the sensor-set retracted to keep it away from dust, dirt and other elements.*



Infrared (IR) Thermometer

The infrared thermometer will measure from -40˚ to 932˚F (-40˚ to 500˚C). Infrared readings provide measurements of only an object's surface. Many surfaces, like air vents, registers and grills will quickly take on the temperature of the air moving past them at their outermost surface. This "skin effect" allows an infrared (IR) thermometer to provide you with inlet or outlet air temperature within seconds of turning on an HVAC system. The distance to spot ratio of the DTH51 is 8 to 1 (as explained in Fig 1).



(Fig 1)

1. The infrared thermometer function can be used independently of the ambient temperature and humidity functions provided that the differential dew point icon " ▲△ " is not displayed at the left side of the top line. When this icon is NOT present, you can take infrared temperature measurements with the sensor-set retracted. Simply press the " MEAS IR " push-button at any time to begin taking readings.
2. To use the IR function in conjunction with the ambient temperature and humidity functions, extend the sensor-set then turn your meter on by pressing the " SET ⓘ " push-button.
3. Press the " MEAS IR " push-button to measure the surface to begin taking readings. The temperature that you last-measured will be held on the top line of the LCD screen when you release the button.
4. The last-measured IR temperature reading is used to calculate the differential dew-point, based on the ambient temperature and humidity sensors readings.
   NOTE: *All other temperature and humidity functions are based on the measurements provided by the sensors in the sensor-set.*

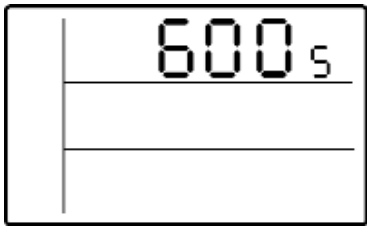
5. Press the " MEAS IR " and the " ▼LASER " at the same time to turn the laser targeting feature ON or OFF.
6. When the laser targeting feature is on, and the " MEAS IR " push-button is pressed, you will see the " ⚠ " symbol on the left side of the LCD screen.

Auto Power Off Time Setting

The auto power off function is factory set to turn the DTH51 off in 5 minutes (300 seconds). To override the auto power off function , press and hold down the " ▲°C/°F " push-button as you press the power " SET ⏻ " push-button. When an " ⎍ " appears (Non sleep mode) in the top line of the LCD, release both buttons and you will resume normal function with the ability to monitor readings over long periods without the instrument shutting itself off.

Auto power off disabled at turn-on

After turning the instrument on, you can adjust the amount of time before the auto power off function shuts off the DTH51 by briefly pressing the " SET ⏻ " push-button. The time that the instrument will remain on, shown in seconds from 5 to 600, will be displayed in the top line of the LCD.



Auto power off timer

1. Press the " (▲°C/°F) " push-button to increase on-time.
2. Press the " (▼LASER) " push-button to decrease on-time.
3. Press the " SET ⏻ " push-button to lock in the new timer setting and advance to the emissivity adjustment option, or press it twice to return to the measurement mode.

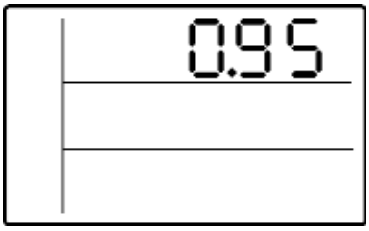
Adjusting Emissivity

Emissivity is an adjustment that you can use to calibrate your DTH51 when measuring different types of surfaces.

The chart (Fig 2) provides the specific values of different surfaces that you can use when setting the adjustable emissivity values (between .3 to .99). A ".95" emissivity value is most connonly used.

After turning the instrument on, you can enter the emissivity adjustment mode by briefly pressing the " SET ⏻ " push-button twice.

The emissivity value that your DTH51 will use when taking infrared measurements will be shown on the top line of the LCD.



Emissivity adjustment screen

1. Press the " (▲°C/°F) " push-button to increase emissivity.
2. Press the " (▼LASER) " push-button to decrease emissivity.
3. Press the " SET ⏻ " push-button to lock in your newemissivity setting and cycle back to the measurement mode.

Emissivity Values

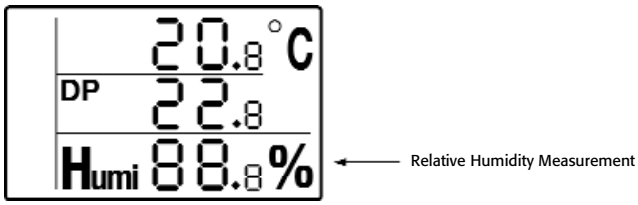
Surface	Emissivity
Iron and Steel	
Cast iron (polished)	0.2
Cast iron (turned at 100˚C)	0.45
Cast iron (turned at 1000˚C)	0.6 to 0.7
Steel (ground sheet)	0.6
Mild steel	0.3 yo 0.5
Steel plate (oxidized)	0.9
Iron plate (rusted)	0.7 to 0.85
Cast iron (rough) rusted	0.95
Rough ingot iron	0.9
Molten cast iron	0.3
Molten mild steel	0.3 to 0.4
Stainless steel (polished)	0.1
Stainless steel (various)	0.2 to 0.6
Aluminum	
Polished aluminum	0.1*
Aluminum (heavily oxidized)	0.25
Aluminum oxide at 260˚C	0.6
Aluminum oxide at 800˚C	0.3
Aluminum alloys, various	0.1 to 0.25
Brass	
Brass (polished)	0.1*
Brass (roughened surface)	0.2
Brass (oxidized)	0.6
Copper	
Copper (polished)	0.1*
Copper (oxidized at 25˚C)	0.8
Molten copper	0.15
Lead	
Lead (pure)	0.1*
Lead (oxidized at 25˚C)	0.3
Lead (oxidized, heated to 200˚C)	0.6

Surface	Emissivity
Nickel and its alloys	
Nickel (pure)	0.1*
Nickel plate (oxidized)	0.4 to 0.5
Nichrome	0.7
Nichrome (oxidized)	0.95
Zinc (oxidized)	0.1*
Galvanized iron	0.3
Tin-plated steel	0.1*
Gold (polished)	0.1*
Silver (polished)	0.1*
Chromium (polished)	0.1*

*Emissivity varies with purity.

Relative Humidity

Relative humidity is a measurement of moisture in the air compared to the maximum amount of moisture the air can accommodate at a given temperature. Air at higher temperatures can hold more "absolute humidity" than air at lower temperatures, thus the same absolute humidity in high-temperature air will have a lower relative humidity value than it would in colder air. Relative humidity is measured in percentage and is displayed in the bottom line of the DTH51 (Fig 3).



(Fig 3)

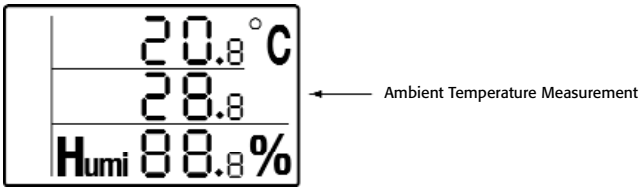
Ambient Temperature, Dew Point, and Wet Bulb

Ambient Temperature, based on readings taken by the extended sensor-set, is shown on the middle line of the DTH51 (Fig 4). Temperature scale can be toggled between Fahrenheit and Celsius using the "(▲C/F)" push-button.

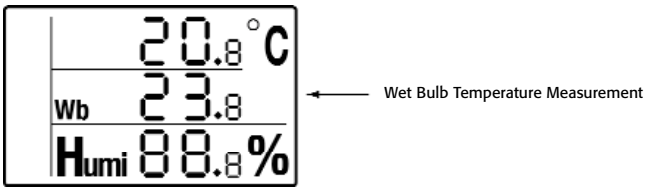
Dew Point is a calculation of the temperature at which moisture in the air will condense, based on the current level of relative humidity. This is particularly valuable in determining if moisture will condense on an object that has been moved from a colder temperature into warmer air. Dew point is shown on the second line of the DTH51 (Fig 5).

Wet Bulb is a calculation of the lowest temperature that an area can be cooled using a process of evaporating water. The evaporation process uses energy from surrounding heat in the air, thus cooling the area. Wet bulb temperature is limited by a combination of ambient temperature and relative humidity. Wet bulb temperature is shown on the second line of the DTH51 (Fig 6).

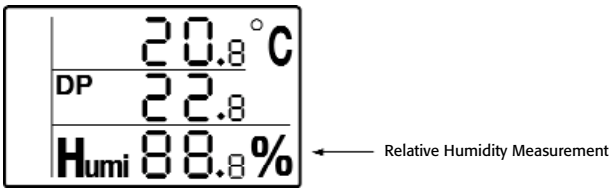
To cycle between Ambient Temperature, Dew Point and Wet Bulb temperature, extend the sensor set then press and release the "(▲DP/WB)" push-button quickly until the desired function is displayed.



(Fig 4)



(Fig 5)



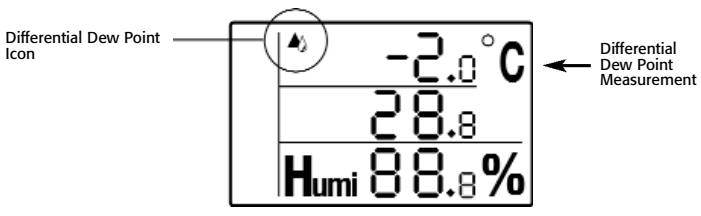
(Fig 6)

Differential Dew Point

Differential dew point is a calculation of the difference between the dew point of ambient air and the actual surface temperature of an object. This measurement can be particularly valuable when moving an object from a cold environment to a warm environment or when trying to determine if moisture will condense on equipment (potentially causing damage) if environmental controls are turned off.

Differential dew point is shown on the top line of the DTH51 when:

1. An infrared surface temperature has been measured (refer to the infrared thermometer section of this manual).
2. The "(▲DP/WB)" push-button has been pressed for two seconds then released to invoke the "▲💧" icon on the left side of the top line of the DTH51's LCD display (Fig 7).

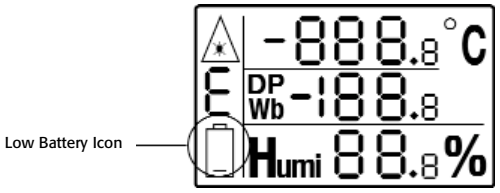


(Fig 7)

Low Battery Indication

The low battery indication appears when battery power runs low. Low batteries will adversely affect the accuracy of your readings. When the icon appears (Fig 8):

1. Remove the battery door.
2. Remove and replace all four "AA" batteries.
3. Replace the battery door.



(Fig 8)

Calibration

CAUTION!

DO NOT *perform this procedure unless you have calibration salts available.*

Annual calibration is recommended for this instrument. To calibrate, have 33% and 75% calibration salts ready, ensure that all materials and the ambient temperature are as close as possible to 73˚F (23˚C) and:

1. Turn off the meter and insert the sensor-set into a 33% salt bottle.
2. Press and hold in the " °C/°F " and " LASER " at the same time.
3. Press "SET ⏻ " to power on the instrument.
4. 32.8% will be flashing on the bottom line of the DTH51.
5. Leave the instrument in the 33% calibration-salt solution for 30 minutes.
6. After 30 minutes the 32.8% will stop flashing and become steady.
7. Move the sensor-set into the 75% calibration-salt solution.
8. Press the "SET ⏻" push-button again.
9. 75.2% will be flashing on the screen.
10. After 30 more minutes, press the "SET ⏻" push-button for the final time.

The calibration process is complete and stored in memory. Turn the meter off and back on to reboot.

NOTE: *You can exit (abort) calibration without storing new references by pressing the "SET ⏻" key for more than 2 seconds (turning the meter off) if performed prior to step 6.*

Auto Power Off is disabled during the calibration process.

RS232 Communications

Software (not provided)

This device can communicate with computers using Windows integrated Hyper Terminal software.

Communications set-up

RS232 Interface (3.0V level)

A. 9600 bps, 8 data bits, no parity
B. Format: DTH51 transmits one ASCII word per second while meter Txxx.xC: Txx.xC: Hxx.x%: Txx.xCLRC*CRLF*

Where:

The 1st value is IR temp.
The 2nd value is Air temp.
The 3rd value is Humidity
The 4th value is Wet Bulb
The 5th value is Dew Point

The x in the data string above indicates one of {0|1|2| |9|-}

C. Format for error value:

E01No value
E02 Overflow
E03 Underflow
The unit for error code is n. Ex.
If IR is disabled, then tx

TE01n:T23.5C:H45.3%:T14.9C:T12.3CLRC*CRLF*
Error value

Troubleshooting

No display	Power button must be depressed for more than 1 second
	Sensor-set extended?
	Batteries installed correctly?
	Remove batteries for one minute, reinstall and reboot
Display disappears	Auto Power Off function programmed for too short interval (see manual to adjust or disable)
E-1 or E-5 displayed on top, middle or bottom lines	Sensor-set or infrared measurement circuit malfunction (return for repair)
E-2 or E-3 displayed on middle line	Measured temperature exceeds maximum or minimum allowed (Ambient between -4˚ to 122˚F) (DP -90.4˚ to 122˚F)
	If measured temperature is within range - Sensor set malfunction (return for repair)
E-2 or E-3 displayed on top line	Measured temperature exceeds maximum or minimum allowed (Surface between -40˚ to 932˚F) (Ambient -4˚ to 122˚F)
	If measured temperature is within range - infrared circuit malfunction (return for repair)
E-9 on top line	-Calibration Process failure - Check battery power level Check ambient temperature (73˚F) Seal around Cal salt-bottle faulty
Other (not listed)	Call UEi (800) 547-5740

Specifications

Ambient temperature range	-4˚ to 122˚F (-20˚ to +50˚C)
RH% range	0 ~ 100% RH
Wet bulb range	-6.9˚ to 122˚F (-21.6 to 49.9˚C)
Dew point range	-90.4˚ to 122˚F (-68˚ to 49.9˚C)
IR temperature range	-40˚ to 932˚F (-40˚ to 500˚C)
IR distance to spot ratio	8:1
Accuracy	
RH%	±3% at 10 ~ 90%, others ±5%
Air temperature	±1˚F (0.6˚C)
IR temperature	±2% or ±2˚C (-20˚ to 450˚C) (whichever is greater - others ±3% or 3˚C)
Response time	0.5 sec (IR sensing)
Size	175 (H) mm x 50 (D) mm x 70 (W) mm
Power	4 x 1.5V (AAA) battery

DTH51
IR Thermometer/Psychrometer

Limited Warranty

The DTH51 is warranted to be free from defects in materials and workmanship for a period of one year from the date of purchase. If within the warranty period your instrument should become inoperative from such defects, the unit will be repaired or replaced at UEi's option. This warranty covers normal use and does not cover damage which occurs in shipment or failure which results from alteration, tampering, accident, misuse, abuse, neglect or improper maintenance. Batteries and consequential damage resulting from failed batteries are not covered by warranty.

Any implied warranties, including but not limited to implied warranties of merchantability and fitness for a particular purpose, are limited to the express warranty. UEi shall not be liable for loss of use of the instrument or other incidental or consequential damages, expenses, or economic loss, or for any claim or claims for such damage, expenses or economic loss. A purchase receipt or other proof of original purchase date will be required before warranty repairs will be rendered. Instruments out of warranty will be repaired (when repairable) for a service charge. Return the unit postage paid and insured to:

1-800-547-5740 • FAX: (503) 643-6322
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This warranty gives you specific legal rights. You may also have other rights which vary from state to state.

PLEASE
RECYCLE