
PACER INSTRUMENTS™

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Model DA500 HYGRO-THERMOMETER



User Manual

INTRODUCTION

Congratulations on your purchase of a DH500 Digital Thermo-Hygrometer! You now own one of the most accurate, reliable, and highly regarded temperature and humidity measurement instruments available today.

Pacer's model DH500 digital thermo-hygrometer is a versatile instrument for measuring temperature and humidity in various applications such as HVAC, indoor air quality studies, industrial process control, and research.

At the time of receipt, if more than 4 months has elapsed since the date of the original calibration, Miltronics will provide an initial complimentary calibration at the customer's request. If you elect to utilize this service, please include a copy of your dated proof of purchase and a copy of the original calibration certificate included with your unit. Call 603-352-0187 and request a Service/Repair (SR) number prior to shipping your unit. Shipping is not included.

Warranty

This product is fully warranted against defective materials and/or workmanship for a period of one year after purchase, provided it was not improperly used. For your protection, please use this product as soon as possible. If returned, it must be securely wrapped, sent prepaid and insured to:

Miltronics Mfg. Svcs., Inc.
Attn: Pacer Instruments
95 Krif Road
Keene, New Hampshire 03431
USA

Please include a note with name, address, telephone number and description of the problem. Although we provide assistance on Pacer Instrument products both personally and through our literature, it is still the total responsibility of the customer to determine the suitability of the product for use in their application.

This manual is provided by Miltronics Mfg. Svcs., Inc. without any kind of warranty. Precautions have been taken in accurately preparing this manual; however, we neither assume responsibility for any omissions or errors that may appear nor assume liability for any damages that result from the use of the products in accordance with the information contained in the manual.

IMPORTANT SAFETY INFORMATION

Classifications



Danger: To Prevent Serious Injury or Death

Warnings in this classification indicate danger that may result in serious injury or death if not observed.



Caution: To Prevent Damage to the Product

Warnings in this classification indicate risks of damage to the product that may void the product warranty and/or calibration.

Description of Symbols



ESD Caution: To Prevent Damage to the Product

Warnings in this classification indicate risks of damage to the product that may void the product warranty and/or calibration. Internal components are static sensitive and are not user serviceable. Opening the cases by a non-authorized service center and/or in a non-ESD safe environment may cause damage not covered by the manufacturer's warranty.



Important: Mandatory Action Required

The specific action is given near this symbol.



FCC Compliance Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular situation.

IMPORTANT SAFETY INFORMATION (continued)



EU – Declaration of Conformity

Miltronics Mfg. Svcs., Inc. declares that the product for this manual complies with the essential requirements and other relevant provisions of Directive 1999/5/EC. A copy of the Declaration of conformity is available on request.



RoHS RoHS Statement

Concerning EU-Directive 2011/65/EU (RoHS 2), to the best of our knowledge, based on supplier provided information, all Miltronics Mfg. Svcs., Inc. / Pacer Instrument brand products, are not intentionally manufactured or formulated with the following substances: Lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls (PBB), polybrominated diphenyl ethers (PBDE). Minimal levels established in the 2005 RoHS Directive still apply under Article 4(2), Annex II: 0.1% by weight in homogenous materials for lead, mercury, hexavalent chromium, polybrominated biphenyls and polybrominated diphenyl ethers; 0.01% by weight in homogenous materials for cadmium. Please be advised that we do not analyze for these substances.



WEEE – Waste Electrical and Electronic Equipment - 2002/96/EC

Miltronics Mfg. Svcs., Inc. asks that all our products to be recycled at the end of their current use, to comply with local waste requirements. Miltronics supports local Waste Electrical and Electronic Equipment (WEEE) directives where they are in operation. That means that WEEE may not be disposed as unsorted municipal waste but is to be collected separately. Miltronics consumer products are therefore labeled with a crossed-out “wheellie-bin” symbol which you can see above. Further, all our products bear any other appropriate symbols for their respective region. WEEE may contain hazardous substances which may negatively affect the environment and human health when disposed of through normal channels. Miltronics is committed to reduce the negative environmental and human health effects of WEEE.

DANGER



Never touch the vane assembly blades and/or thermal sensors.

The vane assembly blades may contain sharp edges which may cause minor cuts. The assembly contains precision bearings which are sensitive and the blades are finely adjusted to specific pitches. Touching this assembly or its parts may cause damage which can affect its operation and the calibration.

NOTE: If the vane assembly head or probe head requires cleaning we recommend a fine mist of isopropyl alcohol and a fine long-haired brush or send the unit in or servicing.



Do not disassemble or heat the batteries, or put them into a fire.

The may cause burns and the batteries may burst. Please dispose of used batteries in the proper manner per local ordinances.

CAUTION



When measuring, ensure that the direction arrow is facing the direction of airflow.

The arrow indicates the direction of airflow for the data provided on the calibration certificate. It is meant to allow for uniform and consistent readings as per the provided data. The probe will operate in the opposite direction but the data may be different.



Do not use or leave the instrument in a high temperature, high humidity, high speed airflows or dusty environments for prolonged periods.

The instrument may not function properly out of the specified operating conditions and/or have a greatly reduced operating life span.



Do not subject the instrument or the probe to strong impacts.

Dropping the instrument or the probe may cause damage or malfunction to the instrument and may change the calibration data. We recommend sending it in immediately to be checked.

CAUTION (continued)



Never disassemble, modify or repair the product.

Failure to observe the above may cause damage to the instrument or the probe. It may also void the manufacturer's warranty and calibration certificate.



Do not pick up or carry the instrument by the cable.

It may cause a malfunction or damage to the wiring of the cable.



Remove the batteries from the instrument when storing for long periods of time. When inserting the batteries, be sure to insert them with the polarity facing the correct direction.

Failure to do so may cause battery leakage and subsequent damage to the instrument. The manufacturer does not recommend any specific brand of batteries but a high-quality name brand alkaline battery seems to last the longest.



Do not wipe the instrument with a volatile solvent.

Use neutral solvents and simple cleaners to clean the instrument with a soft cloth.



Regularly check the head of the probe for contamination. Impurities (such as dust) on the blades and/or thermal sensor may affect the accuracy of the instrument.

NOTE: If the vane assembly head or probe head requires cleaning we recommend a fine mist of isopropyl alcohol and a fine long-haired brush or send the unit in or servicing.



When storing or shipping the instrument, the manufacturer recommends disconnecting the cable(s) and returning it to the original carrying case.

SECTION 1 - SPECIFICATIONS

Ranges

Relative Humidity (%RH): 5.0 to 95.0 %RH

Temperature (using combination HTP202 probe): -4° to 176°F (-20° to 80°C)

Temperature (using optional RTD probe): -148° to 1112°F (-100° to 600°C)

Dew Point: Calculated for full range of HTP202 probe

Accuracy

Temperature: $\pm(0.3^{\circ}\text{C} + 0.2\% \text{ of reading in } ^{\circ}\text{C})$

Temperature accuracy examples: $\pm 0.3^{\circ}\text{C}$ at 20°C
 $\pm 0.5^{\circ}\text{F}$ at 68°F

Relative Humidity: ± 2.0 %RH

Dew Point: $\pm 1.1^{\circ}\text{C}$ ($\pm 2.0^{\circ}\text{F}$)

Resolution

Temperature: 0.1°F or °C (1°F below -99.9°F)

Relative Humidity: 0.1 %RH

Response Time

Relative Humidity: Up to 90% of change in measured value in 15 seconds

Temperature: Approx. 60 seconds in still air

Approx. 10 seconds in moving air streams

Display

0.5" LCD, 4 digits, with LED backlight

Operating Temp

Instrument: 32° to 125°F (0° to 50°C)

HTP202 Probe: -4° to 176°F (-20° to 80°C)

Power Supply

3 AA alkaline batteries

Battery Check

Automatic low battery display

Battery Life

Approximately 150 hours, without backlight

Instrument Options Available – must be factory installed.

- Protective Rubber Boot and Splash-Proof Seal (P/N 10227)
- USB communications (P/N 10223)
- RS232 communications (P/N 10224)
- Analog 0-5 Volt output (P/N 10222)

Additional Probe Options Available

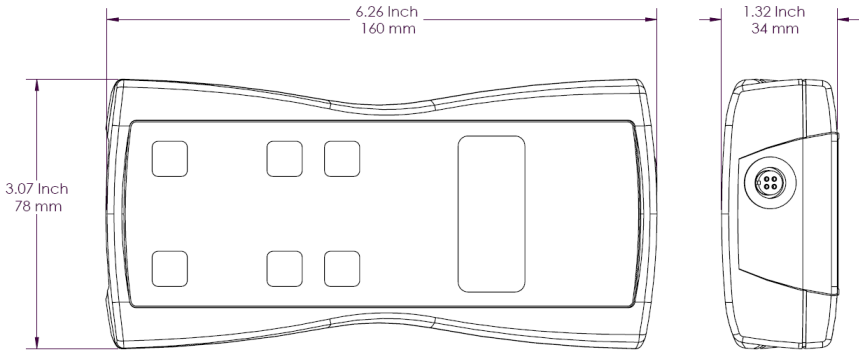
- Immersion RTD temperature probe (P/N PT211)
- Air RTD temperature probe (P/N PT212)
- Surface RTD temperature probe (P/N PT213)
- Penetration RTD temperature probe (P/N PT216)

Included:

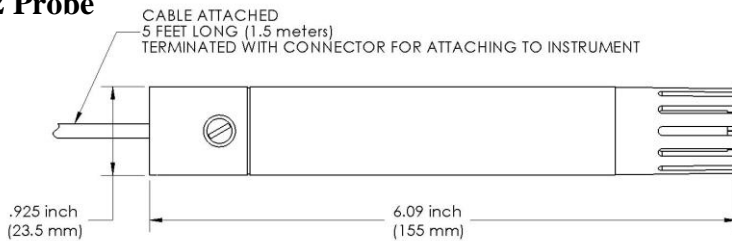
- (1) DH500 Instrument
- (1) HTP202 combination RH / temperature probe
- (3) Size AA 1.5V alkaline batteries (installed in instrument)
- (1) Hard-shell carrying case with foam liner
- (1) DH500 Operation Manual

Dimensions

Instrument



HTP202 Probe



SECTION 2 – SWITCH FUNCTIONS



Pressing the ON/OFF key switches the instrument ON. Hold down the key for 2 seconds to switch the unit OFF. The unit will automatically power off after 30 minutes without any key presses. To disable auto power-off, hold down the power button during turn-on. The unit will flash AOFF, which means that the auto power-off has been disabled. The auto power-off is re-enabled each time the instrument is turned on.



Press the BACKLIGHT key to turn the LCD backlight on for 30 seconds. To turn the backlight on permanently, hold the backlight key down for 3 seconds. The LCD will flash. The backlight is now switched on permanently. To switch the backlight off, press the backlight key again.



Press the PERCENT RELATIVE HUMIDITY key to display the percent relative humidity in the ambient air as measured by the HTP202 Combination Probe. **%RH** will be displayed along with the reading.



Press the TEMPERATURE key to display the current temperature of the ambient air as measured by the HTP202 Combination Probe. To switch the units between degrees Fahrenheit (°F) and degrees Celsius (°C), press the TEMPERATURE key again. Either **°C** or **°F** will be displayed along with the reading.



Press the DEW POINT key to display the current dew point of the ambient air. The value of the dew point is automatically calculated based on the ambient temperature and humidity measured by the HTP202 Combination Probe. To switch the units between degrees Fahrenheit (°F) and degrees Celsius (°C), press the DEW POINT key again. Either **°C** or **°F** will be displayed along with **DEW PT.** and the reading.



Press the MAX/MIN key to record and display the maximum reading. The maximum reading display will alternate with the letter "H" displayed with the number 2, which indicates that you're taking readings every two seconds. Press the MAX/MIN key again to record and hold the minimum reading. The minimum reading display will alternate with the letter "L" displayed with the number 2.

To exit MAX/MIN mode, press any key.



Press the HOLD/RESET key to freeze the current reading on the display. **HOLD** is displayed on the LCD and the reading is held.

Press the HOLD/RESET key a second time to clear this mode and return the unit to normal operation.

Press the HOLD/RESET key while in MIN/MAX mode to display BOTH the minimum and maximum readings since the MAX/MIN key was pressed. Once the HOLD/RESET key is pressed while in MAX/MIN mode, new readings are no longer recorded. To return to MAX/MIN mode, press the HOLD/RESET key again.

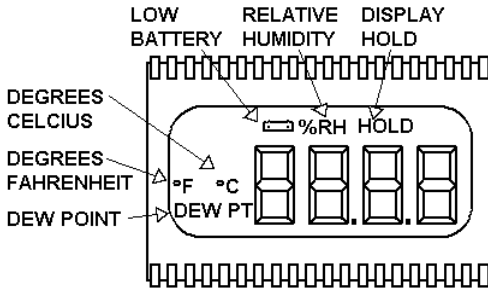
SECTION 3 – OPERATIONAL NOTES

9009 - Out of Range Error: If the HTP202 probe is exposed to temperatures or humidity levels outside of its range (see Section 1 – Specifications), the instrument will display **9009**. This is the out-of-range error. This error will also be displayed if the instrument is turned on without the HTP202 probe attached.

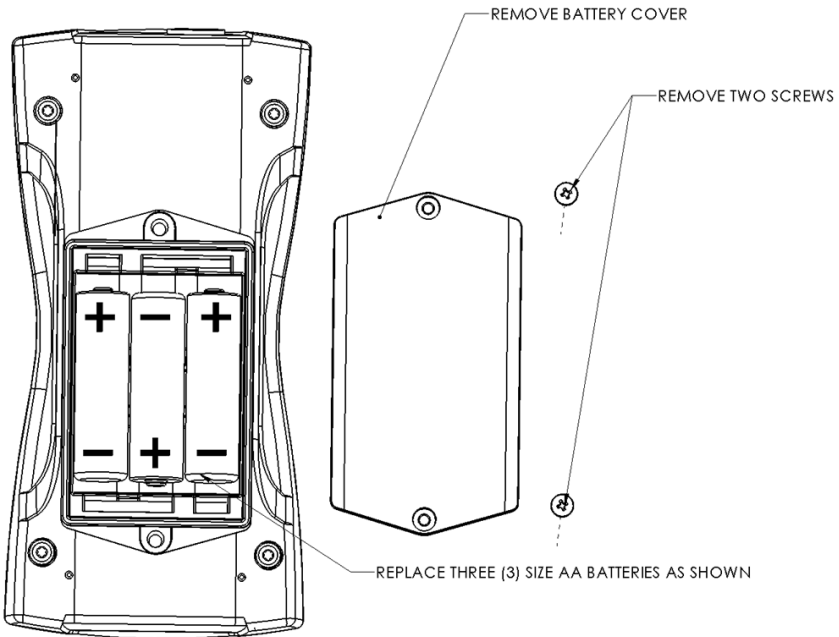
If the HTP202 probe is stored in a cold environment and is then exposed to a warm, humid environment while the probe is still cold, condensation will form on the humidity sensor. The humidity reading is invalid until the condensation has evaporated completely.

The temperature sensors will have a faster response time if they are exposed to a moving air stream. This is because forced convection will cool or heat the sensors faster than free convection. However, the humidity sensor is best used at flow rates lower than 20 liters per minute or 0.71 cubic feet per minute, based on the sensor manufacturer's recommendations.

APPENDIX A – LCD DISPLAY SYMBOLS



APPENDIX B – BATTERY REPLACEMENT



APPENDIX C – ANALOG OUTPUTS (IF EQUIPPED)

If the instrument is equipped with the analog output option, there will be a five-pin connector on the bottom of the instrument. Also, an analog output cable will be included with the instrument. This cable will have a five-pin connector on one end and four tinned wires on the other end.

The instrument will output a Voltage between 0 and 5 Volts that corresponds to the Temperature and Relative Humidity measured by the instrument. The output ranges, pin assignments, and wire colors are given in the table below. Also shown is a block diagram of the analog output circuit.

Wire Color	Pin #	Function	Analog Output Voltage Range	Corresponding Measurement Range	Equation to convert from Volts (V) to Measurement Value
BLK	1	Ground	--- N/A ---	--- N/A ---	--- N/A ---
GRN	2	--- Not Used ---	--- N/A ---	--- N/A ---	--- N/A ---
GRY	3	% Relative Humidity	0 to 5 Volts	0 to 100 %RH	Relative Humidity [%] = $20 \times V$
WHT	4	Temperature	0 to 5 Volts	-20°C to 80°C	Temperature [°C] = $20 \times V - 20$

*To convert from Volts to Percent Relative Humidity (%RH), multiply by 20.

- ▶ For example, an analog output of 3.722 Volts on the gray wire means that the instrument is measuring a relative humidity of 74.44 %RH.
- ▶ $3.722 \text{ Volts} \times 20 = 74.44 \text{ %RH}$

*To convert from Volts to Temperature in degrees Celsius (°C), multiply by 20 and subtract 20.

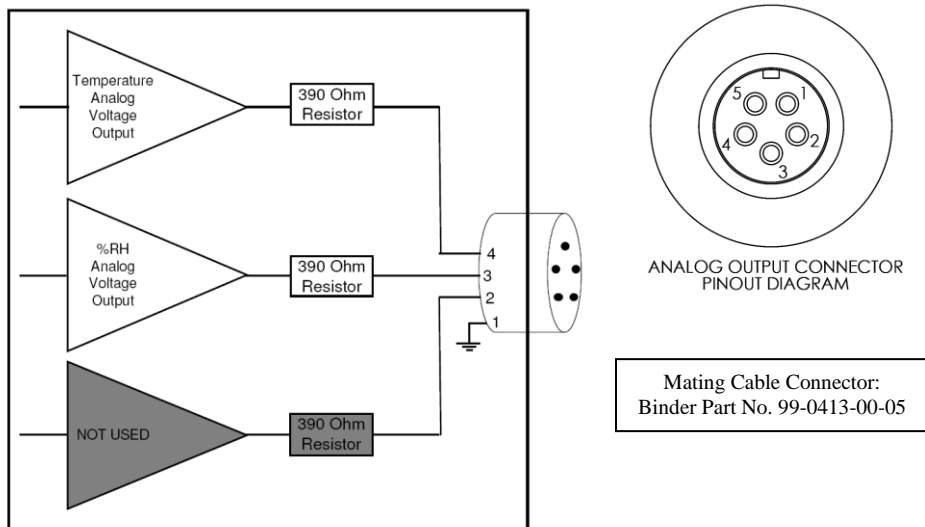
- ▶ For example, an analog output of 3.458 Volts on the white wire means that the instrument is measuring a temperature of 49.16 °C.
- ▶ $3.458 \text{ Volts} \times 20 - 20 = 49.16 \text{ °C}$

Note: When using analog outputs, there is an **additional $\pm 1\%$ error** in the analog output voltage. This is in addition to the normal measurement error.

- ▶ For example, an air velocity reading of 500 FPM would normally have an accuracy of $\pm 1\%$ of reading ± 1 digit (± 6 FPM) when the data is viewed on the LCD display.
- ▶ With the additional error associated with the analog output voltage, the effective accuracy of the analog output for this air velocity measurement will be $\pm 2\%$ of reading ± 1 digit (± 11 FPM).

Custom Analog Voltage Outputs are also available – contact Pacer for details.

Analog Output circuit block diagram and connector pin assignment



CALIBRATION

To maintain your instrument in top working order, we recommend that you send it back to us for calibration each year, beginning one year after purchase.

Our NIST-Traceable multi-point calibration services include ensuring the instrument performs within its accuracy tolerance, making any necessary adjustments, and inspecting all aspects of the instrument's functionality so that you'll have another year of dependable service. Calibration also includes a complimentary firmware upgrade so that you know you'll have the latest advances in accuracy and reliability in your instrument.

Additional points other than our standard calibration are also available from the factory. We can offer precise calibration tailored to your specific measurement needs using our state-of-the-art facilities and calibration equipment.

Please contact us or visit our website for the latest information on calibrating your instrument.



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