QUESTemp° 36
Thermal Environment Monitor

Operator’s Manual

Copyright 5/2004
Revision C
P/N 056-663

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1. UP AND RUNNING

1. Make sure the wet bulb's wick is clean. Fill the reservoir with distilled water.

2. Place the QUESTemp in the work area in a safe location approximately 3.5 feet off the ground.

3. Turn the unit ON. If the battery voltage displayed during the power-on sequence is less than or equal to 6.4 volts, replace or recharge the batteries.

4. Allow 10 minutes for the sensors to stabilize to the environment.

5. Press the RUN STOP key to begin datalogging.

6. Use the arrow keys to set the display to the desired items.

2. USING THE QUESTEMP

The QUESTemp should be placed at a height of 3.5 feet (1.1m) for standing individuals or 2 feet (.6m) for seated individuals. Tripod mounting is recommended to get the unit away from anything that might block radiant heat or airflow. A 1/4"x20 threaded bushing on the bottom of the instrument allows mounting to a standard photographic tripod. Do not stand close to the unit during sampling.

Make sure that the wet bulb reservoir is filled with distilled water and that the cotton wick is clean and fully wetted. After adding water or placing the unit in a new environment, allow ten minutes for the globe and wet bulb readings to stabilize.

3. MEASUREMENTS

The QUESTemp°36 data logging area heat stress monitor measures four parameters: ambient or dry bulb temperature (DB), natural wet bulb temperature (WB), globe temperature (G), and relative humidity (RH). It computes the Wet Bulb Globe Temperature (WBGT), stay times for three possible indices, and the Heat Index (HI) or the Canadian Humidex. Using inputs on the side of the instrument, two additional sensor arrays can monitor up to three locations simultaneously.

Measure airflow, in meters per second, by plugging an optional hot wire anemometer sensor into a side jack on the unit.

Determine thermal comfort indices, Predicted Mean Vote (PMV) and Predicted Percent Dissatisfied (PPD), using QuestSuite software.

WET BULB GLOBE TEMPERATURE

The WBGT is a weighted average of the three temperature sensors using the following formulas:

WBGT (indoor) = 0.7WB + 0.3G

WBGT (outdoor) = 0.7WB + 0.2G + 0.1DB

The resulting WBGT values can then be compared to indices of work-rest regimens (stay times) based upon work loads.

STAY TIMES

Stay times represent how long a worker should be able to safely work under heat stress conditions. Select one of three indices for displaying and printing from the unit: ACGIH Stay Times, NAVY PHEL's, or EPRI Action Limits. Refer to Appendix A for more information on the indices.

HEAT INDEX / HUMIDEX

The Heat Index is determined using the dry bulb temperature and relative humidity. Based upon charts available from the U.S. National Weather Service, Heat Index represents how an average person feels relative to climate conditions. For a given temperature, the higher the humidity, the higher the heat index.

The Heat Index is defined over a temperature range of 70°F - 120°F (21°C - 49°C) and a relative humidity range of 30% - 99%. Outside of this range, the instrument will show dashes in the display for the Heat Index.

The Humidex is used primarily in Canada and is very similar to the Heat Index. The values are slightly different. The Humidex is defined over a temperature range of 70°F - 109°F (21°C - 43°C) and a relative humidity range of 20% - 99%. Outside of this range, the instrument will show dashes in the display for the Humidex.

AIRFLOW

The QUESTemp°36 measures airflow if Quest's Air Probe accessory is used. The Air Probe uses an omni-directional anemometer sensor that measures air flow between 0 and 20 meters per second in 0.1m/s increments. Refer to Section 11 for more information.

THERMAL COMFORT

Thermal comfort readings for indoor environments are a benefit of QuestSuite software and are not displayed or printed from the instrument directly. Readings are derived from the dry bulb, relative humidity, mean radiant temperature, airflow, and user entered parameters of clothing, metabolic rate and external work.

Thermal comfort indices, Predicted Mean Vote (PMV) and Predicted Percent Dissatisfied (PPD), help predict the thermal satisfaction level of a person with their indoor environment. The PMV is a rating scale of +3 to -3 where +3 is much to warm, -3 is much too cool, and 0 is thermally neutral. The PPD reflects what percent of people in a given location would be dissatisfied with their thermal surroundings.

The formulas used by QuestSuite to derive the PMV and PPD come from the international standard ISO 7730 "Moderate thermal environments - Determination of the PMV and PPD indices and specification of the conditions for thermal comfort".

4. OPERATIONAL MODES

```
►VIEW   PRINT
 SETUP  RESET
```

Use the UP ARROW and DOWN ARROW keys to move the marker in the display in front of the desired mode. Pressing the I/O ENTER key will select the mode.

VIEW

Displays the measured data but does not log it. If more than one set of sensors is plugged into the unit, they can be displayed by pressing and releasing the I/O ENTER key. The displayed sensor set is shown in the upper right corner. Return to the menu by holding down the I/O ENTER key while a three second countdown is shown in the lower right corner of the display.

SETUP

Allows changing temperature units, language, time, date, logging rate, selecting between Heat Index and Humidex, turning air flow on or off, and setting stay time parameters. Use the ARROW keys to select an item and the I/O ENTER key to change it. Time and date require using the ARROW and I/O ENTER keys to modify each number.

Temperature: Celsius, Fahrenheit.
Language: English, Spanish, French, Italian, German.
Time: 24 hour clock only.
Date: Day-month-year format.
Log Rate: 1, 2, 5, 10, 15, 30, 60 minutes.
Heat Index (United States), Humidex (Canada)
Flow: On, Off
Index: none, ACGIH, Navy, EPRI
Using: WBGT indoor, WBGT outdoor (for use with Index)
Acclimated, Unacclimated (for use with Index)
Clo Correction: 0 - 9.9°C (*This is a clothing correction for the WBGT in degrees Celsius. Do not confuse this with clothing insulation values.*)

Notes for using the Index settings:

- Acclimated and unacclimated only apply to the ACGIH Index. EPRI and Navy will ignore this setting.
- Clothing Correction will be applied to the selected WBGT when the work duration is calculated but will not affect the WBGT as displayed by the unit. This value should typically be set to 0.0 for the Navy.

Exit SETUP by pressing the RUN STOP key.

PRINT
Allows printing to a parallel or serial printer or to a computer. The unit will recognize the cable plugged in and configure itself for serial or parallel. If no cable is plugged in it will default to serial. Press I/O ENTER to begin printing. Press RUN STOP to return to the menu.

RESET
Allows clearing the logged data from memory. Press the I/O ENTER key to enter the RESET mode. Clear the memory by holding down the I/O ENTER key while the display counts down from three.

RUN
Begins a session in memory and logs the data. Begin a session by pressing the RUN STOP key from either the menu or VIEW mode. An asterisk in the lower right corner indicates the run mode. End the session by again pressing the RUN STOP key or by holding down the I/O ENTER key while a countdown is displayed in the lower right corner.

If the logging memory is full or if there are no sensors plugged into the unit, attempting to enter the RUN mode will result in an error message. If the memory fills while running, the asterisk in the lower left corner of the display will turn into an “F” and the memory remaining screen will show “0.0”.

5. KEYPAD OPERATION

The unit operates using a membrane keypad with 4 keys. The I/O ENTER key responds when the key is released while all other keys respond when the key is pressed.

I/O ENTER
The unit turns on with a single key press. The unit turns off by holding the key down while a countdown of 3-2-1 occurs in the lower right corner of the display. This key is also used to select a mode or enter setup changes.

Pressing and releasing the key while viewing temperatures causes the display to view the next available sensor bar (indicated in the upper right corner of the display).

UP ARROW
Changes items appearing in the display. Scrolls up.

DOWN ARROW
Changes items appearing in the display. Scrolls down.

RUN STOP
From the menu or view modes, pressing this key starts or stops the run mode. Pressing this key will exit the setup, print or reset modes.

6. DISPLAYED ITEMS

```
WET    80.5°F ►1
DRY    92.2°F  *
```

For the QUESTemp°36, the number in the upper right corner indicates which sensor bar's data is displayed. 1 indicates the sensor bar placed on (or attached to) the top of the instrument. Sensors 2 and 3 are labeled on the side of the unit. W indicates the weighted average which only appears if a WBGT is displayed and all three sensor bars are attached. An asterisk in the lower right corner indicates that the unit is in the run mode and is logging data.

The following measurements can be accessed on the display:

Screen 1: WET (WET BULB)
DRY (DRY BULB)

Screen 2: GLOBE

Screen 3: WBGTi (WBGT INDOORS)
WBGTo (WBGT OUTDOORS)

Screen 4: RH (Relative Humidity)
H.I. or HU (Heat Index or Humidex)

Screen 5: AIR FLOW (If turned ON through setup)

Screen 6: STAY TIME DATA

Screen 7: TIME (24 hour format)
DATE

Screen 8: BAT (Battery voltage)
MEM (Logging memory available in days)

A series of dashes appear in the display if one of the following occur:

- the Heat Index or Humidex is outside of its allowable range
- the temperature is outside of its allowable range
- a temperature sensor has failed
- stay times temperatures are outside of the their defined range

STAY TIME DATA

The screen(s) displaying stay time data appear different for each of the possible indices.

If ACGIH is selected, the recommended working minutes per hour are shown for each of the workload categories Light (L), Moderate (M), Heavy (H), and Very Heavy (VH).

```
 L  M  H VH  ►1
60 45 30 15
```

If the Navy Phels are selected, the recommended working hours are shown based on a maximum of eight hours. Three screens are used to display the PHELs two at time. 8:01 following one of the PHELs indicates greater than eight hours.

```
PHEL_5 3:10  ►1
PHEL_6 2:10
```

If EPRI is selected, the recommended working hours are shown based on a maximum of four hours. Working hours for Light (L) , Moderate (M), and Heavy (H) workload categories are shown. 4:01 indicates greater than four hours.

```
 L    M    H ►1
4:01 3:00 1:30
```

7. DATA LOGGING

Data from each sensor is recorded at the interval set by the logging rate. Every time RUN STOP is pressed, a session is either started or ended in memory. Each session contains a header with time, date, and summary information.

MEMORY TABLE: Gives the number of logging DAYS.

Log Rate	**1 min**	**2 min**	**5 min**	**10 min**	**15 min**	**30 min**	**60 min**
1 sensor	11.2	22.5	56.2	112.4	168.6	337.3	674.5
2 sensors	5.6	11.2	28.1	56.2	84.3	168.6	337.3
3 sensors	3.7	7.5	18.7	37.5	56.2	112.4	224.8

8. PRINTING

The recorded data can be sent to a computer through the serial RS232 port or to a parallel printer. Serial transmission requires Quest cable #54-715. Parallel transmission requires Quest cable #56-875. With the cable plugged in, select PRINT from the menu and press the I/O ENTER key to enter the PRINT mode. Begin printing by pressing the I/O ENTER key. Press the key again to abort printing.

SERIAL

QuestSuite™ software is recommended for downloading, storing, and graphing your data. Communications programs such as Window's Hyperterminal may also be used to capture the printout into a file. The baud rate is fixed at 9600.

PARALLEL

Data can be sent directly to parallel printers that accept direct ASCII test input without special drivers. Make sure the printer is powered on and is ONLINE, ready to accept data, prior to printing.

SAMPLE PRINTOUT

```
                          QUEST TECHNOLOGIES                    Page 1
                          HEAT STRESS REPORT

File Name      ________________________   Questemp 36  Rev 1.00
                                          Serial # TK09090909
Employee       ________________________

Facility       ________________________   Session (3)
                                          Start: 21-FEB-01  11:07:32
Department     ________________________   Stop:  21-FEB-01  11:10:15

Job            ________________________   Printed: 21-FEB-01  11:16:00

Comments/Notes_____________________________________________________________

_____________________________________________________________________________

_____________________________________________________________________________

Logging Interval:  1 minutes
Degrees Fahrenheit


MAXIMUM LEVELS,  Sensor 1
    WBGT IN       69.2    21-FEB-01  11:10:14
    WBGT OUT      68.3    21-FEB-01  11:10:08
    WET BULB      59.7    21-FEB-01  11:10:08
    DRY BULB      82.7    21-FEB-01  11:09:56
    GLOBE         91.4    21-FEB-01  11:10:12
    HEAT INDEX       0    00-XXX-00  00:00:00
    REL HUMIDITY   14%    21-FEB-01  11:07:32
    FLOW (m/s)     0.6    21-FEB-01  11:09:08

MAXIMUM LEVELS,  Sensor 2
    WBGT IN       81.2    21-FEB-01  11:10:06
    WBGT OUT      80.5    21-FEB-01  11:10:11
    WET BULB      70.5    21-FEB-01  11:10:11
    DRY BULB      99.2    21-FEB-01  11:09:07
    GLOBE        106.1    21-FEB-01  11:10:06
    HEAT INDEX       0    00-XXX-00  00:00:00
    REL HUMIDITY   15%    21-FEB-01  11:07:32

MAXIMUM LEVELS,  Sensor 3
    WBGT IN       69.0    21-FEB-01  11:09:56
    WBGT OUT      68.6    21-FEB-01  11:09:56
    WET BULB      58.8    21-FEB-01  11:09:56
    DRY BULB      88.6    21-FEB-01  11:10:08
    GLOBE         93.0    21-FEB-01  11:10:03
    HEAT INDEX       0    00-XXX-00  00:00:00
    REL HUMIDITY   11%    21-FEB-01  11:07:32

MAXIMUM LEVELS,  Sensor(WEIGHTED AVERAGE)
    WBGT IN       72.1    21-FEB-01  11:10:14
    WBGT OUT      71.4    21-FEB-01  11:10:14
```

Session: 3 Page 2
Sensor: 1
Degrees Fahrenheit
Stay Times: ACGIH, Acclimated, WBGTi, clo correction = 1.0 C

TIME	WBGTi	WBGTo	WET	DRY	GLOBE	RH	HI	FLOW	L	M	H	VH
11:08	68.7	67.9	59.4	82.4	90.7	13	0	0.5	60	60	60	60
11:09	69.0	68.1	59.5	82.6	91.3	12	0	0.5	60	60	60	60

Session: 3 Page 3
Sensor: 2
Degrees Fahrenheit
Stay Times: ACGIH, Acclimated, WBGTi, clo correction = 1.0 C

TIME	WBGTi	WBGTo	WET	DRY	GLOBE	RH	HI	L	M	H	VH
11:08	79.9	79.3	69.4	98.9	104.5	15	0	60	45	30	15
11:09	80.8	80.2	70.3	99.2	105.6	15	0	60	45	30	15

Session: 3 Page 4
Sensor: 3
Degrees Fahrenheit
Stay Times: ACGIH, Acclimated, WBGTi, clo correction = 1.0 C

TIME	WBGTi	WBGTo	WET	DRY	GLOBE	RH	HI	L	M	H	VH
11:08	68.6	68.1	58.3	88.0	92.7	11	0	60	60	60	60
11:09	68.8	68.4	58.6	88.3	92.9	11	0	60	60	60	60

Session: 3 Page 5
Sensor: WBGT(W-AVG) = .50*WBGT(1) + .25*WBGT(2) + .25*WBGT(3)
Degrees Fahrenheit
Stay Times: ACGIH, Acclimated, WBGTi, clo correction = 1.0 C

TIME	WBGTi W-AVG	WBGTo W-AVG	L	M	H	VH
11:08	71.5	70.8	60	60	60	60
11:09	71.8	71.1	60	60	60	45

9. PC COMMUNICATIONS

The QUESTemp°36 has the flexibility to be set up and controlled through computer software. The programmable start and stop time feature is only accessible through the computer. The instrument also has the capability of sending live data while measuring. These features are best utilized using QuestSuite™ software. To write custom software for working with the QUESTemp°36, call Quest Technologies for the programming commands.

10. SENSORS

NATURAL WET BULB THERMOMETER

The natural wet bulb thermometer gives an indication of the effects of humidity on an individual. Relative humidity and wind speed are taken into account by measuring the amount of evaporative cooling taking place at a thermometer covered with a moistened wick. The QUESTemp uses a cotton wick immersed into a reservoir containing distilled water. Ordinary tap water should not be used, as the contaminants that are left behind after evaporation will shorten the life of the wick and cause high readings. If the wick is discolored it should be replaced. To replace the wick, slide the old wick off the top of the sensor. Place a new wick over the sensor, making sure that the bottom of the wick is down in the reservoir.

GLOBE THERMOMETER

The globe thermometer gives an indication of the radiant heat exposure on an individual due to either direct light or hot objects in the environment. This is accomplished by placing a temperature sensor inside a blackened copper sphere and measuring the temperature rise. The WBGT index is based on the response of a 6 inch diameter globe. The QUESTemp uses a 2 inch diameter globe for a faster response time. The temperature of the 2 inch globe is correlated to match that of a 6 inch globe.

As an option, a sensor array with a 6 inch diameter globe is available.

DRY BULB THERMOMETER

The dry bulb thermometer measures the ambient air temperature. This measurement is used in the outdoor WBGT calculation when a high solar radiant heat load may be present. The series of white plates surrounding the sensor shield it from radiant heat.

RELATIVE HUMIDITY SENSOR
A relative humidity sensor is located in a compartment inside of the sensor bar housing. Slots in the housing allow air to circulate around the sensor.

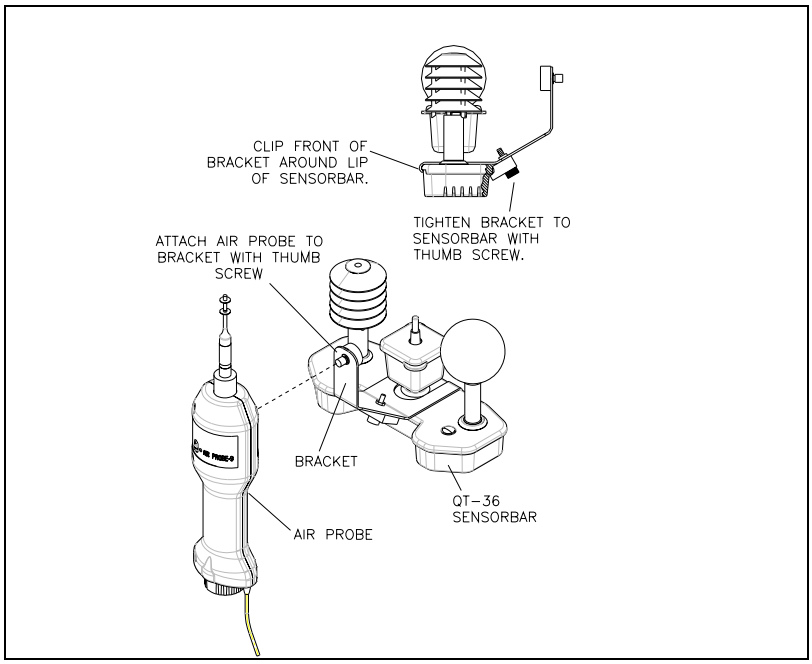
11. AIRFLOW

(Available using Quest's Air Probe)

Airflow is measured in meters per second over a range of 0 to 20m/s in 0.1m/s increments. The sensor should be placed or held perpendicular in the air stream. Unlike many anemometers, the omni-directional sensor does not require rotating to find the maximum reading. Be careful not to block the airflow with your body during measurements. The sensor's measuring tip is fragile; be cautious if measuring in ducts.

The Air Probe may be either hand held or mounted behind the Questemp°36 using the mounting bracket hooked to the sensor bar beneath the wet bulb.

A green lamp indicator in the Air Probe indicates that it is turned on and the battery is good. If the green indicator turns off while the switch is in the ON position, replace or recharge the battery.



OPERATING SEQUENCE

1. Turn FLOW ON in the setup menu of the Questemp°36.
2. Plug the Air Probe into the port labeled FLOW on the side of the Questemp°36 .
3. Turn on the Air Probe ON and make sure the green lamp is lit.

In the VIEW or RUN modes airflow is the fifth screen displayed.

DATA LOGGING AIRFLOW

To data log airflow in the Questemp°36, the following two conditions must be met. First, turn FLOW ON in the setup menu. Second, make sure that a temperature sensor bar is connected to the SENSOR 1 location (top) of the Questemp°36. FLOW prints out with the SENSOR 1 data therefore airflow data will only be reported if a sensor bar is plugged in. Airflow is recorded during the run mode at the interval the Questemp°36 is setup for.

BATTERIES FOR AIR PROBE

The Air Probe uses a single NiMH Black&Decker® VersaPak™ Gold battery. Typical operating time of the battery is between 6 and 8 hours.

To change the battery, push in and twist, counterclockwise, the cap on the bottom of the Air Probe. Pull out the battery. Insert a fully charged battery and replace the cap.

To recharge the batteries, set the battery into the VersaPack™ charger. The supplied charger accepts one or two batteries. A full charge takes 9 hours. An indicator light shows that the battery is properly charging and it will remain on as long as the battery is in the charger. Continuous charging is not a safety concern.

12. REMOTE, SENSORS 2 AND 3

The top sensor bar (sensor 1) may be removed from the instrument and used through a remote cable. Shelter the instrument and remote the sensor bar if the measured environment is expecting heavy rain or if temperatures are above 60°C.

The sensor 2 and sensor 3 jacks on the side of the instrument allow simultaneous monitoring of up to three sensor arrays using connecting cables.

Cable lengths of up to two hundred feet (61 meters) may be used without a decrease in accuracy provided the environment does not contain strong electromagnetic fields.

The data from these arrays may be viewed separately or combined into a weighted average WBGT reading per ISO 7243. Change the displayed sensor bar by pressing and releasing the enter key. The upper right corner of the display shows the current sensor bar. 1 refers to the top sensor bar, 2 and 3 are labeled on the side of the unit, W indicates the weighted average which only appears if a WBGT is displayed and all three of the sensor bars are attached.

TRI-SENSOR WEIGHTED AVERAGE

Per the recommendations outlined in ISO 7243 : 1989, when the temperature in the space surrounding a worker is not uniform, it is necessary to determine the WBGT index at three heights corresponding to the worker's ankles, abdomen and head and perform a weighted average on those values. It is computed using the formula:

$$WBGT_w = (WBGT_{head} + (2 \times WBGT_{abdomen}) + WBGT_{ankles})/4$$

The QUESTemp°36 always assigns the top sensor bar the double weighting. This calculation is shown if a WBGT display has been selected and if 3 sensor sets are connected.

13. OPERATIONAL CHECK

A verification module, Quest model 053-923, may be used to check the operation of the QUESTemp. Remove the top sensor bar and plug the verification module into the top of the unit. With the QUESTemp set to read in degrees Celsius, verify that the displayed readings match those printed on the module within +/-0.5°C.

If the readings are not within the +/-0.5°C tolerance, then have the unit serviced and calibrated.

14. POWER OPTIONS

There are 3 options for powering the QUESTemp: a 9 volt alkaline battery, a NiMH (Nickel Metal Hydride) rechargeable 6-cell battery pack, and an AC adapter. A door on the back of the unit allows the user access to the 9 volt battery. The rechargeable battery pack is located inside of the unit. If the

rechargeable battery pack ever needs to be replaced, it can be accessed by removing the screws from the bottom panel of the unit.

The 2-position switch located in the battery compartment must be set by the user if the power supply method is changed. The up position is for the 9 volt battery. The down position allows for either the AC adapter or the rechargeable batteries. The AC adapter will trickle charge the rechargeable batteries if they are in place or it will simply allow for line power operation of the unit.

9 VOLT ALKALINE BATTERY REPLACEMENT

WARNING: Replace batteries only in a non-hazardous environment.

The 9 volt battery should be replaced or the NiMH battery pack should be recharged when the voltage drops below 6.4 volts. The battery voltage is displayed when the instrument is turned on. While turned on, the battery voltage can be displayed at any time by pressing the up or down arrow keys to move through the display until the battery voltage screen appears. If, while operating, the battery voltage drops below 6.4 volts, the display will automatically switch to the display showing the battery voltage along with a low battery message. After a low battery occurs, the unit will continue to operate for approximately 8 hours. When the battery voltage falls to 6.2 volts or below, the unit will automatically turn off.

Replace only with an approved 9 volt alkaline battery.

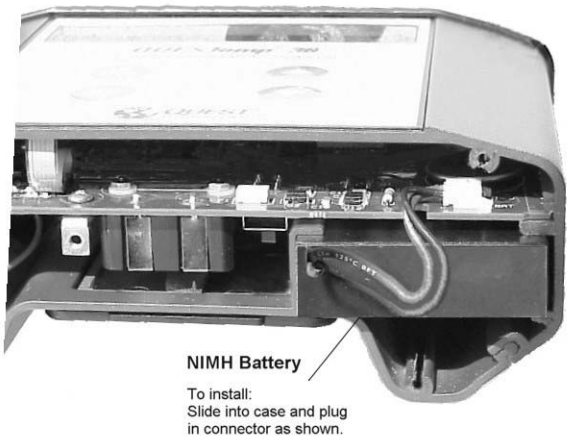
APPROVED 9 VOLT BATTERIES

Eveready: Energizer 522, EN22, 6LR61
Duracell: MN1604
Panasonic: 6LR61, 6AM6X
Rayovac: A1604
UltrLife: U9V

NiMH BATTERY PACK

WARNING: Recharge batteries only in a non-hazardous environment.

The NiMH rechargeable battery pack is charged in the instrument using Quest's AC adapter #015-910. A discharged battery pack requires an "overnight" charge of 16 hours. Leaving the AC adapter plugged in for extended lengths of time or when operating the instrument will not harm the rechargeable batteries.



15. SPECIFICATIONS

Measurements:

Globe, dry bulb, wet bulb, WBGTin, WBGTout, WBGT weighted average (if 3 sensor sets), relative humidity, and Heat Index / Humidex.

Temperatures given in Celsius or Fahrenheit.

Data Logging:

Records and prints all measurements at user selected interval of 1, 2, 5, 10, 15, 30, or 60 minutes. 128K bytes of data memory.

Languages:

English, French, Spanish, Italian, German

Housing:

Designed water resistant to a light rain or mist. If rain is frequent, best practice would be to remote the sensor bar and keep the instrument sheltered.

Size:

Height 9.2in (23.5cm); Width 7.2in (18.3mm); Depth 3.0in (7.5mm)
Dimensions include mounted sensor assembly

Weight:

2.6 lbs. (1.2 kg) with mounted sensor assembly

Sensor Types:

Temperature: 1000 ohm platinum RTD
Humidity: Integrated circuit with capacitive polymer sensor

Accuracy:

Temperature: +/-0.5°C between 0°C and 100°C
Relative Humidity: +/-5%

Operating Temperature Range:

Sensor Assembly: -5°C to +100°C
Electronics: -5°C to 60°C

Operating Relative Humidity Range:

0 to 100% (extended exposure to humidity > 90% can cause a reversible shift of 3%)

Remote Sensor Bars:

2 x 15pin D-sub jacks are located on the side of the unit for plugging in 1 or 2 additional sensor bars by using remote cables up to 200 feet (61m). The top sensor bar can also be remote with a cable.

Power Options:

9V alkaline, 7.2V NiMH rechargeable pack (charged in the unit), or AC adapter wall power cube (AC adaptor will operate the unit or recharge the NiMH battery pack)

Battery Life:

9V alkaline: 140 hours
Rechargeable Nickel Metal Hydride: 300 hours
(Adding additional sensor bars to the QUESTemp°36 reduces battery life.)

Charge Time (NiMH Battery Pack):

16 hours (charge in the unit)

Safety Approvals:

ETL, cETL: Class I,II,III Groups A,B,C,D,E,F,G, Temperature code T3
KEMA 04ATEX1072 X <Ex> II 2 G EEx ia IIC T3
CE mark

AIR PROBE ACCESSORY

Range:

0 - 20 meters per second. 0.1m/s increments

Sensor:

Omni directional heated thermistor

Accuracy:

+/- (0.1 m/s + 4%) of measurement value

Battery Life:

6 - 8 hours for fully charged NiMH battery

Charge Time:

9 hours

16. PRODUCT MARKINGS AND SPECIAL CONDITIONS

KEMA 04ATEX1072 X
<Ex> II 2 G EEx ia IIC T3

Compliance with Essential Health and Safety Requirements has been assured by compliance with: EN 50014 : 1997 and EN 50020 : 2002

The year of manufacture is determined by the third character in the instrument's serial number. "A" was manufactured in 2001, "B" in 2002, "C" in 2003, "D" in 2004 and so forth.

Special conditions for safe use:

1. Only the following battery types may be used:
   Non-rechargeable battery:

Type	Manufacturer
U9V	Ultralife
MN1604	Duracell
522 or EN22 or 6LR61	Energizer
A1604 or BR232	Rayovac
6LR61 or 6AM6	Panasonic

   Rechargeable battery:
   Integral NiMH battery pack type DC2121.

2. The batteries may not be replaced or charged within the hazardous area.

3. The rechargeable battery may only be recharged with class 2 charger, rated 9Vdc, 1 A max.

4. The plugs or sockets market "SENSOR 2", "SENSOR 3", "FLOW", and "DATA" may not be used within the hazardous area.

17. APPENDIX A : HEAT EXPOSURE TABLES

ACGIH

Screening Criteria for Heat Stress Exposure. WBGT values in °C (°F).

Acclimatized

Work Demands	Light	Moderate	Heavy	Very Heavy
100% Work	29.5 (85.1)	27.5 (81.5)	26.0 (78.8)	
75% Work; 25% Rest	30.5 (86.9)	28.5 (83.3)	27.5 (81.5)	
50% Work; 50% Rest	31.5 (88.7)	29.5 (85.1)	28.5 (83.3)	27.5 (81.5)
25% Work; 75% Rest	32.5 (90.5)	31.0 (87.8)	30.0 (86.0)	29.5 (85.1)

Unacclimatized

Work Demands	Light	Moderate	Heavy	Very Heavy
100% Work	27.5 (81.5)	25.0 (77.0)	22.5 (72.5)	
75% Work; 25% Rest	29.0 (84.2)	26.5 (79.7)	24.5 (76.1)	
50% Work; 50% Rest	30.0 (86.0)	28.0 (82.4)	26.5 (79.7)	25.0 (77.0)
25% Work; 75% Rest	31.0 (87.8)	29.0 (84.2)	28.0 (82.4)	26.5 (79.7)

from "American Conference of Governmental Industrial Hygienists - Threshold Limit Values and Biological Exposure Indices for 2001"
Reprinted with permission from ACGIH

ACGIH CLOTHING CORRECTIONS

The following clothing corrections are in degrees Celsius. When a clothing correction is entered into the setup portion of the Questemp°36, the value is added to the WBGT only for looking up the stay times. The WBGT value displayed by the unit does not reflect corrections.

Clothing Type	Clothing Correction
Summer work uniform	0
Cloth (woven material) overalls	+3.5
Double-cloth overalls	+5.0

UNITED STATES NAVY

PHYSIOLOGICAL HEAT EXPOSURE LIMITS (PHEL) TIME TABLE
(Without the presence of fuel combustion gases/fuel vapors)

The recommended working hours are shown based on a maximum of eight hours. Naval personnel will follow a category, I - VI, based upon their function.

PHEL Curves (Total Exposure Time in Hours:Minutes)

WBGT(F)	I	II	III	IV	V	VI
80.0	>8:00	>8:00	>8:00	8:00	6:35	4:30
81.0	>8:00	>8:00	>8:00	7:45	6:00	4:05
82.0	>8:00	>8:00	8:00	7:05	5:25	3:40
83.0	>8:00	8:00	7:45	6:25	4:55	3:20
84.0	>8:00	8:00	7:05	5:55	4:30	3:05
85.0	8:00	7:45	6:30	5:20	4:05	2:50
86.0	8:00	7:05	5:55	4:55	3:45	2:35
87.0	7:25	6:30	5:25	4:30	3:25	2:20
88.0	6:45	5:55	4:55	4:05	3:10	2:10
89.0	6:10	5:25	4:30	3:45	2:50	2:00
90.0	5:40	5:00	4:10	3:25	2:40	1:50
91.0	5:15	4:35	3:50	3:10	2:25	1:40
92.0	4:50	4:10	3:30	2:55	2:15	1:30
93.0	4:25	3:50	3:15	2:40	2:00	1:25
94.0	4:05	3:35	3:00	2:25	1:50	1:15
95.0	3:45	3:15	2:45	2:15	1:45	1:10
96.0	3:25	3:00	2:30	2:05	1:35	1:05
97.0	3:10	2:45	2:20	1:55	1:25	1:00

PHEL Curves (Continued)

WBGT(F)	I	II	III	IV	V	VI
98.0	2:55	2:35	2:10	1:45	1:20	0:55
99.0	2:40	2:20	2:00	1:40	1:15	0:50
100.0	2:30	2:10	1:50	1:30	1:10	0:45
101.0	2:20	2:00	1:40	1:25	1:05	0:45
102.0	2:10	1:50	1:35	1:15	1:00	0:40
103.0	2:00	1:45	1:25	1:10	0:55	0:35
104.0	1:50	1:35	1:20	1:05	0:50	0:35
105.0	1:40	1:30	1:15	1:00	0:45	0:30
106.0	1:35	1:25	1:10	0:55	0:45	0:30
107.0	1:30	1:15	1:05	0:50	0:40	0:25
108.0	1:20	1:10	1:00	0:50	0:35	0:25
109.0	1:15	1:05	0:55	0:45	0:35	0:25
110.0	1:10	1:00	0:50	0:40	0:30	0:20
111.0	1:05	1:00	0:50	0:40	0:30	0:20
112.0	1:00	0:55	0:45	0:35	0:25	0:20
113.0	0:55	0:50	0:40	0:35	0:25	0:15
114.0	0:55	0:45	0:40	0:30	0:25	0:15
115.0	0:50	0:45	0:35	0:30	0:20	0:15
116.0	0:45	0:40	0:35	0:25	0:20	0:15
117.0	0:45	0:40	0:30	0:25	0:20	0:10
118.0	0:40	0:35	0:30	0:25	0:15	0:10
119.0	0:35	0:35	0:25	0:20	0:15	0:10
120.0	0:35	0:30	0:25	0:20	0:15	0:10
121.0	0:35	0:30	0:25	0:20	0:15	0:10
122.0	0:30	0:25	0:20	0:15	0:15	0:10
123.0	0:30	0:25	0:20	0:15	0:10	0:10
124.0	0:25	0:25	0:20	0:15	0:10	0:05

ELECTRICAL POWER RESEARCH INSTITUTE

The recommended working hours are shown based on a maximum of four hours. A time of 4:01 indicates greater than 4 hours.

WBGT °C	Light	Mod	Heavy
28	4:01	4:01	3:00
29	4:01	4:00	2:00
30	4:01	3:00	1:30
31	4:01	2:00	1:15
32	4:00	1:30	1:00
33	3:30	1:15	0:45
34	3:00	1:00	0:40
35	2:30	0:53	0:35
36	2:00	0:45	0:30
37	1:45	0:40	0:25
38	1:30	0:35	0:20
39	1:15	0:33	0:18
40	1:00	0:30	0:15
41	0:53	0:28	0
42	0:45	0:25	0
43	0:38	0:23	0
44	0:30	0:20	0
45	0:28	0:18	0
46	0:25	0:15	0
47	0:23	0	0
48	0:20	0	0
49	0:18	0	0
50	0:15	0	0

18. APPENDIX B : ACCESSORIES

Sensor array with 2 inch globe	56-795
Sensor array with 6 inch globe	56-780
6 Foot shielded remote sensor cable	53-924
25 Foot shielded remote sensor cable	53-925
100 Foot shielded remote sensor cable	53-926
200 Foot shielded remote sensor cable	53-927
Serial computer cable	54-715
Parallel printer cable	56-875
120VAC to 9VDC adapter	15-910
220VAC to 9VDC adapter	15-680
Verification module	53-923
Tripod	59-045
Replacement wicks	56-679
Water bottle 2 oz.	56-068
User's manual	56-663

Air Probe Accessories

NiMH battery	53-039
Dual 120 volt charger	53-037
Dual 220 volt charger	53-038

19. QUEST SERVICE AND WARRANTY POLICY

Service Information

Congratulations! You have purchased one of the finest instruments available, manufactured by one of the most respected names in safety & industrial hygiene instrumentation. Your instrument is backed by a limited warranty that seeks complete customer satisfaction. Should your instrument require service for any reason, you can expect prompt and courteous attention.

You must obtain a return authorization prior to shipment. We reserve the right to refuse any shipments forwarded without prior authorization. **The following information will expedite the service process and is required when obtaining return authorization:**

1. Model and serial number of each instrument.
2. Description of work required and symptoms of any failures for each instrument.
3. VISA, MasterCard or American Express credit card -- or -- company purchase order number (non-warranty service only).
4. Billing and/or return shipping addresses.

Use one of the methods below to obtain return authorization, service pricing and shipping instructions.

International Customers

Contact your local, factory-authorized distributor from whom the product was purchased. To obtain the name of the local factory-authorized distributor, contact us via email at service@quest-technologies.com, via telephone at +(1)-262-567-9157 or via fax at +(1) 262-567-4047.

U.S Customers Only

- Go to the service section of our web site at www.quest-technologies.com.
- Contact us via email at service@quest-technologies.com
- Contact us at (800) 245-0779. Office hours are 8:00 AM to 5:00 PM U.S. Central Time.

Warranty Policy

Quest Technologies warrants our instruments to be free from defects in materials and workmanship for one year under normal conditions of use and service. For U.S.A. customers, we will replace or repair (our option) defective instruments at no charge, excluding batteries, abuse, misuse, alterations, physical damage, or instruments previously repaired by other than Quest Technologies. Microphones, sensors, printers, and chart recorders may have shorter warranty periods. This warranty states our total obligation in place of any other warranties expressed or implied. Our warranty does not include any liability or obligation directly resulting from any defective instrument or product or any associated damages, injuries, or property loss, including loss of use or measurement data.

For warranty outside the U.S.A., a minimum of one year warranty applies subject to the same limitation and exceptions as above with service provided or arranged through the authorized Quest sales agent or our Quest European Service Laboratory. Foreign purchasers should contact the local Quest authorized sales agent for details.