

3M Occupational Health and Environmental Safety Division

3M™ QUESTemp°™ Heat Stress Monitors

Robust Construction



**From the
Market Leader**

QUESTemp° 44 and QUESTemp° 46 User Manual

©3M 2011. All Rights Reserved



Copyright

This document is copyrighted by Quest Technologies, a 3M company. Permission is hereby granted to copy and distribute this manual provided that this Copyright Page is included. This grant does not include permission to modify the manual's text or illustrations in any way. This manual may not be translated without obtaining permission in advance.

Trademarks

- Quest Technologies, the Quest logo, and QuestSuite™ Professional II are registered trademarks of Quest Technologies. All rights are reserved.
- Microsoft and Windows are registered trademarks of Microsoft, Inc.

Updates

In the interests of continuous product improvements, Quest Technologies reserves the right to make changes to product specifications without notice. To understand the latest updates that have been implemented into this product and to download the most current version of this user manual, visit our web site at www.quest-technologies.com.

Copyright © 2011 Quest Technologies, a 3M company

Contents

Introduction.....	1
QUESTemp ^o Models	1
Getting Started	2
Up and Running overview	2
Keypad Operation	2
I/O Enter key.....	3
Up Arrow key.....	3
Down Arrow key.....	3
Run/Stop key.....	3
Escaping or moving back one screen.....	3
Turning on/off and basic operation	4
Placing the QUESTemp ^o 44/46 on the job site	4
Sensors	5
About the sensor bar	5
Globe thermometer	5
Waterless wetbulb sensor and relative humidity sensor	5
Dry bulb thermometer	5
Remote, Sensors 2 and 3	6
Tri-sensor weighted average	6
Measurements	7
Waterless wetbulb	7
Computing waterless wetbulb and wind speed.....	7
WetBulb globe temperature	8
Stay times/rest times (QT ^o 46 only)	8
Heat index/Humidex	8
Airflow	8
Thermal comfort.....	9
Operating QUESTemp^o 44/46	10

View	10
Setup.....	10
Setup for waterless wetbulb measurement (airflow rate)	11
Print	12
Reset.....	12
Run	12
Displayed items.....	13
Stay time date.....	14
Data logging	15
Printing.....	16
Serial	16
Parallel	16
Airflow functionality.....	18
Operating sequence.....	19
Data logging airflow.....	19
Batteries for air probe	19
Operational check.....	19
Power options	20
9-Volt alkaline battery replacement.....	20
Approved 9-volt batteries.....	20
NiMH battery pack	21
Appendix A: Specifications.....	22
Appendix B: Heat Exposure Tables	24
ACGIH	24
ACGIH Clothing Corrections.....	25
United States Navy	25
Flag Conditions for U.S. Navy/Marine Corp. Ashore.....	27
Electrical power research institute (EPRI).....	27

Appendix C: Accessories	28
Air probe accessories	28
Appendix D: PC Communications	29
QSP-II quick overview	29
Retrieving your studies into QSP-II	29
Downloaded node (where your data is stored)	30
Viewing your heat stress data in QSP-II	31
Adding panels (charts/graphs)	33
Saving your customized layout (charts/graphs)	33
Creating reports	34
Viewing and printing reports	35
Quest Service	36
Contacting Quest Technologies	36
International customers	36
Warranty	36

List of Figures

Figure 1-1: QUESTemp [®] 44/46 in a thermal environment	1
Figure 1-2: Keypad explained	3
Figure 1-3: Main menu of the QT [®] 44/46	4
Figure 1-4: About sensor bar and serial number	5
Figure 1-5: Sensors identified	5
Figure 1-6: Viewing measured data	10
Figure 1-7: Setting the airflow for Waterless Wetbulb sensor	11
Figure 1-8: Run mode indicator	12
Figure 1-9: Wet and Dry screen	13
Figure 1-10: Globe screen	13
Figure 1-11: WBGTi & WBGT _o screen	13
Figure 1-12: RH and H.I/HU screen	13
Figure 1-13: Air Flow screen on QT [®] 46	13
Figure 1-14: Stay times (ACGIH)	14
Figure 1-15: Time & Date screen	14
Figure 1-16: Battery & Memory screen	14
Figure 1-17: Navy Stay time screen	14
Figure 1-18: Marine heat condition flag system	15
Figure 1-19: EPRI Stay time screen	15
Figure 1-20: Sample printout (page 1)	16
Figure 1-21: Sample printout (page 2)	17
Figure 1-22: Airflow configuration	18

Figure 1-23: 9-volt battery	20
Figure 1-24: NiMH rechargeable battery.....	21
Figure 1-25: Communicating to QSP-II	29
Figure 1-26: Download data screen in QSP-II.....	30
Figure 1-27: Viewing your studies from QSP-II	31
Figure 1-28: Downloaded data	31
Figure 1-29: Viewing layout view (charts and graphs) in QSP-II	32
Figure 1-30: Saving a customized template of the layout view (charts/graphs).....	34
Figure 1-31: Sample Heat Stress report from QSP-II.....	35

List of Tables

Table 1-1: Example of a memory table.....	15
Table 1-2: Downloading data in QSP-II explained	32
Table 1-3: Explanation of panels (graphs and charts) components.....	33

Introduction

The new heat stress instruments, the QUESTemp[®] 44 and QUESTemp[®] 46, offer traditional heat stress monitoring without the aggravation of maintaining a wet bulb. Through collaboration with Professor Dr. Thomas Bernard, from the College of Public Health at the University of South Florida, mathematical models were implemented to create a **Waterless Wet Bulb calculation** through a combination of dry bulb temperature, globe temperature, relative humidity, and air flow. The Waterless Wet Bulb is used to calculate the Wet Bulb Globe Temperature (WBGT) which is a widely-used method to monitor environmental conditions related to heat stress.



Figure 1-1: QUESTemp[®] 44/46 in a thermal environment

QUESTemp[®] Models

QUESTemp[®] 44 and QUESTemp[®] 46 both measure and calculate the dry bulb, wet bulb, globe, WBGT indoors, WBGT outdoors, relative humidity, and Heat Index or Humidex.

With the QUESTemp[®] 46, you have the capability to measure stay times in order to manage work/rest regimens. Guidance is based on the screening criteria for heat stress as defined in the ACHIH TLV Handbook, U.S. Navy PHEL charts, U.S. Navy/Marine Corp. Ashore Flag system, and EPRI Action Limits.

An additional feature with the QUESTemp[®] 46 is an optional detachable probe for measuring air velocity to determine appropriate levels of indoor thermal comfort monitoring.

Getting Started

Up and Running overview

1. Place the QUESTemp[®] 44/46 in the work area in a safe location approximately 3.5 feet off the ground.
2. 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.
3. Be aware that the sensors require 10 minutes to stabilize to a new environment.
4. In the main menu, View will be selected (an indicator arrow denotes the selected menu). Press the **I/O Enter** key to select.
5. Press the **Run/Stop** key to begin datalogging. Use the arrow keys to set the display to the desired items.

Keypad Operation

The unit operates using a 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 key

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 (such as Setup or View) 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 key

Changes items appearing in the display. Scrolls up.

Down Arrow key

Changes items appearing in the display. Scrolls down.

Run Stop key

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.

Escaping or moving back one screen

If you are in the setup, print, reset, or calibration screens, you can press **Run/Stop** key to escape or move back one screen.

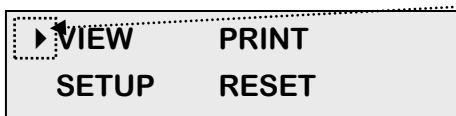


Figure 1-2: Keypad explained

Turning on/off and basic operation

To quickly get you started with the QUESTemp^o 44/46, the following section explains how to turn on the instrument, run, and stop your session.

1. Press the **I/O Enter** key to **turn on**. Proceeding the model and revision information displayed on the screen, the main menu will appear.



Indicator arrow

Indicates the selected menu option. Then press I/O enter to select or press up/down arrows to select another option

Figure 1-3: Main menu of the QT°44/46

2. Press the **I/O Enter** key (when view is selected) to access the measurement screens.
 - (The Wet and Dry measurements screen will display. See Figure 1-6, page 10 for an example).
3. To view different measurements, press the **Up** or **Down arrow** key to toggle through the views.

☑ NOTE: *There are 5-user selectable languages included in the QUESTemp^o 44/46. If you see the fields such as Wet, Dry, WBGTi, and WBGT to this indicates the measurements are displaying in English.*

 - *To display an alternative language, select **Setup** from the main menu. Press the **Down** arrow repeatedly until "English" (or the appropriate language) appears. Then repeatedly press the **I/O enter** key to toggle through the languages. Once selected, all menus and measurement screens will change to the selected language. To return to the main menu, press the Run/Stop key.*
4. To return to the **main menu**, press and hold the **I/O Enter** key (3, 2, 1 countdown will appear) and the main menu will display.
 - a. To select an option on the main menu, press the **up or down arrow** until an arrow appears directly in front of the appropriate menu selection and then press **I/O enter** key.
5. To **power off**, press and hold the **I/O enter** key from the main menu.

Placing the QUESTemp^o 44/46 on the job site

The QUESTemp^o 44/46 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"x 20 threaded bushing on the bottom of the instrument allows mounting to a standard photographic tripod. Do not stand close to the unit during sampling.

Before datalogging, allow ten minutes for the sensors readings to stabilize.

Sensors

About the sensor bar

The sensor bar, on the QT[®] 44/46, is calibrated to its specific instrument and is not interchangeable with other QT[®] 44/46. The instrument has a sensor bar label which includes the serial number of the instrument and a sensor bar number. (This is indicated in the diagram below.)

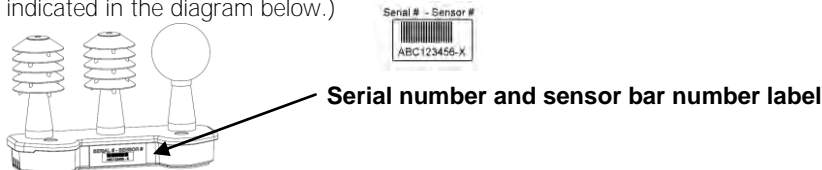


Figure 1-4: About sensor bar and serial number
Globe Thermometer

The globe thermometer (left position) gives an indication of the radiant heat exposure on an individual due to either direct sunlight 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.

Waterless Wetbulb Sensor and Relative Humidity Sensor

The relative humidity sensor (middle position) is used to calculate the Waterless Wetbulb from a combination of dry bulb temperature, humidity and wind speed measurements. The Waterless Wetbulb is used to calculate an estimated WBGT value. (Please see "Waterless Wetbulb" on page 7 for more details.)

Dry Bulb Thermometer

The dry bulb thermometer (right position) 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.

- A. Globe thermometer**
- B. Relative humidity sensor**
- C. Dry bulb thermometer**



Figure 1-5: Sensors identified

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:

$$\text{WBGT}_w = (\text{WBGT head} + (2 \times \text{WBGT abdomen}) + \text{WBGT ankles}) / 4$$

The QUESTemp® 44/46 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.

Measurements

The QUESTemp[®] 44/46 data logging area heat stress monitor directly senses three parameters: dry bulb temperature (DB), globe temperature (G), and relative humidity (RH).

It computes the wet bulb (WB), the Wet Bulb Globe Temperature (WBGT), stay times for four 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.

On the QUESTemp[®] 46 model, you can 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.

Waterless Wetbulb

The Waterless Wetbulb is an estimated measurement using the % of Relative Humidity, Dry Bulb Temperature, and Globe Bulb Temperature to determine the psychrometric wetbulb. The psychrometric wetbulb value is adjusted based on airflow to provide the waterless wetbulb estimate.

Computing Waterless wetbulb and wind speed

When computing the waterless wetbulb, you can increase accuracy by setting the airflow to the current environments wind speed. The recommended airflow setting for an indoor environment is 0.3 m/s unless otherwise determined with an air-probe measurement (available only on the QT[®]46 model). The recommended setting for outdoor environment is 2.0 m/s.

NOTE: To convert wind speed from miles/hour to meters/sec use the following formula:

- **Miles/hour * .447 = meters/sec.** (Example: If the average wind speed is 5mph, then enter $5 * .447 = 2.2$ meters/sec.)

If you are using the QUESTemp[®]46 with the Air Probe attached, you would not set the airflow setting. (It will automatically calculate with the current reading.)

Please see "Setup for Waterless Wetbulb measurement" on page 11 for details on setting the Airflow.

WetBulb Globe Temperature

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

- $WBGT \text{ (indoor)} = 0.7WB + 0.3G$ (denoted as “WBGTi” on the display)
- $WBGT \text{ (outdoor)} = 0.7WB + 0.2G + 0.1DB$ (denoted as “WBGT_o” on the display)

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

Stay Times/Rest Times (QT^o46 only)

Stay times represent how long a worker should be able to safely work under heat stress conditions. Select one of four indices for displaying and printing from the unit: **ACGIH Stay Times**, **NAVY PHEL's**, **U.S. Navy/Marine Corp. Ashore Flag Conditions**, or **EPRI Action Limits**. Refer to Appendix B 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, used primarily in Canada, works on the same concept as 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^o 46 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. Please see “Airflow Functionality”, page 18 for more details.

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 too 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"**.

Operating QUESTemp[®] 44/46

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**.



Figure 1-6: Viewing measured data

- ☑ **NOTE:** To return to the menu, hold down the **I/O ENTER** key while a 3, 2, 1 countdown is shown in the lower right corner of the display. Then the menu screen will appear (see Figure 1-3, page 4 for an example).

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.

- To Setup parameters do one of the following:
1. From the main menu, select **Setup** by pressing the **I/O Enter** key.
 2. Use the **Arrow keys** to select an item (listed below).
 - **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 (QT[®]46 only), Off with fixed rate. (0.3 m/s is the recommended value for indoor applications and 2.0 m/s for outdoor applications)

11 | Operating QUESTemp[®] 44/46

Setup for Waterless Wetbulb measurement (airflow rate)

- **Index:** none, ACGIH, Navy, Marine, EPRI and select either: WBGTi (indoor), WBGT_o (outdoor) for Index setting.

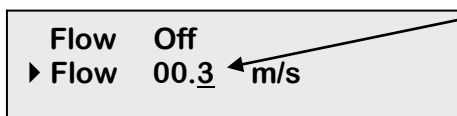
Index Setting Notes

- **TLV and action limit** only apply to the ACGIH Index. EPRI Navy, and Marine will ignore this setting.
- **Clothing Correction** parameters are set from 0 - 9.9°C. This is a clothing correction for the WBGT in degrees Celsius and is applied to the selected WBGT when the work duration is calculated. (It will not affect the WBGT as displayed by the unit.) This value should typically be set to 0.0 for the Navy. (The field is noted as "Clo Corr".)
 3. Press the **I/O Enter** key to change a parameter. Time and date require using the **Up/Down Arrows** and **I/O Enter** keys to modify each number.
 - ☑ **NOTE:** at any time, you can move back one level, by pressing the **Run/Stop** key.
 4. Exit Setup by pressing the **Run/Stop** key.

Setup for Waterless Wetbulb measurement (airflow rate)

For the Waterless Wetbulb sensor calculation, an airflow rate (or wind speed) of 0.3 m/s is recommended and is the default setting of the instrument. *NOTE: only QT[®]46 supports the optional air-probe accessory.*

If an air probe is not selected, the average wind speed of the environment should be configured. This value is then entered into the Flow screen under the setup menu.



Airflow rate

The selected value will be underlined. Press the Up/Down arrow key to change. Press I/O Enter key to select a value position.

Figure 1-7 Setting the airflow for Waterless Wetbulb sensor

► To Setup Airflow rate

1. In the setup menu, select **Flow** by pressing the **Up/Down Arrow** key to select.

2. Press **I/O Enter** key and press **Up/Down Arrow** key to change the values. The **I/O Enter** key is pressed to toggle through the changeable fields and to return to the first column.

Print

Allows printing to a parallel or serial printer or to a computer. The QuesTemp^o 44/46 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** key to begin printing. Press **Run/Stop** key to return to the menu.

NOTE: *if you wish to stop the printing, press I/O enter key until you return to the main menu. When the printer has stopped printing, remove the cable from the printer to the instrument.*

Reset

Resetting enables you to clear 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

The run mode begins a session in memory and logs the data.

1. Begin a session by pressing the **Run/Stop key** from the view mode (or measurement view). An asterisk in the lower right corner indicates the run mode.

- ☑ To toggle through the views, press the up or down arrow.



Figure 1-8 Run mode indicator

2. End the session by pressing the **Run/Stop key** again. (The session will stop recording when the asterisk is no longer displayed.)

NOTE: *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 capacity is exceeded, the asterisk in the lower right corner of the display will turn into an "F" and the memory remaining screen will show "0.0".*

Displayed Items

For the QUESTemp[®] 44/46, 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 as "Sensor 2", and "Sensor 3".
- "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)

WET	80.5° F	▶ 1
DRY	92.2° F	*

Figure 1-9 Wet and Dry screen

Screen 2: GLOBE

GLOBE	92.4.° F	▶ 1
		*

Figure 1-10: Globe screen

Screen 3: WBGT_i (Indoors)
 WBGT_o (Outdoors)

WBGT _i	84.1 ° F	▶ 1
WBGT _o	107.5 ° F	*

Figure 1-11: WBGT_i & WBGT_o screen

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

RH	66.2 %	▶ 1
H.I.	84.3° F	*

Figure 1-12: RH and H.I/HU screen

Screen 5: Air Flow (QT[®]46 only)
 (If turned ON via setup)

FLOW	0.3m/s	▶ 1
------	--------	-----

Figure 1-13: Air Flow screen on QT[®]46

Screen 6: Stay times (QT[®]46 only)

L	M	H	VH	▶ 1
60	45	30	15	*

Figure 1-14: Stay times (ACGIH)

Screen 7: Time (24 hour format)
Date (day, month, year)

TIME	11:04:13	▶ 1
DATE	26-JUN-08	*

Figure 1-15: Time & Date screen

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

BAT	11:04:13	▶ 1
MEM	10.4dy	*

Figure 1-16: Battery & Memory screen

- ☑ **NOTE:** 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

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). (Please see Figure 1-13 above.)

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.

- ☑ **NOTE:** "8:01" following one of the PHELS indicates greater than eight hours.

PHEL_5	3:10	▶ 1
PHEL_6	2:10	

Figure 1-17: Navy Stay time screen

If **Flag** is selected, the Flag Conditions for U.S. Navy/Marines Corp. Ashore warning system screen will appear. There are five flag systems, no flag, yellow, green, red, and black, which provide heat exposure guidelines for acclimated individuals. (For more information, please refer to the “U.S. Navy/ Marine Corp. Ashore **Flag System**” on page 27.)

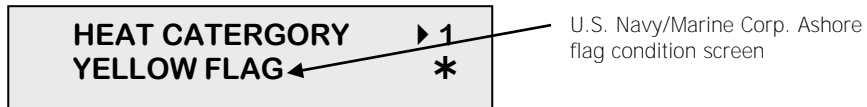


Figure 1-18: Flag Conditions for U.S. Navy/Marine Corp. Ashore

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 displayed below.

NOTE: "4:01" indicates greater than four hours.



Figure 1-19: EPRI Stay time screen

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

Table 1-1: Example of a memory table

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 Professional II 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 text input without special drivers. Make sure the **printer** is **powered on** and is **online**, ready to accept data, prior to printing.

Page 1		QUEST TECHNOLOGIES	
		HEAT STRESS REPORT	
File Name	_____	Questemp 36 Rev 1.00	
Employee	_____	Serial # TK09090909	
Facility	_____	Session (3)	
11:07:32		Start: 21-FEB-08	
Department	_____	Stop: 21-FEB-08	
11:10:15			
Job	_____	Printed: 21-FEB-08	
11:16:00			
Comments/Notes	_____		

Logging Interval: 1 minutes			
Degrees Fahrenheit			
MAXIMUM LEVELS,	Sensor 1		
WBGT IN	69.2	21-FEB-08	11:10:14
WBGT OUT	68.3	21-FEB-08	11:10:08
WET BULB	59.7	21-FEB-08	11:10:08
DRY BULB	82.7	21-FEB-08	11:09:56
GLOBE	91.4	21-FEB-08	11:10:12
HEAT INDEX	0	00-XXX-00	00:00:00

Figure 1-20: Sample printout (page 1)

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

TIME	WBGTi	WBGT _o	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	WBGT _o	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	WBGT _o	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	WBGT _o 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

Figure 1-21: Sample printout (page 2)

Airflow functionality

(Available using Quest's Air Probe on QUESTemp° 46 model only)

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° 46 using the mounting bracket hooked to the sensor bar beneath the center bulb sensor. (See Figure 1-22 below.)

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.

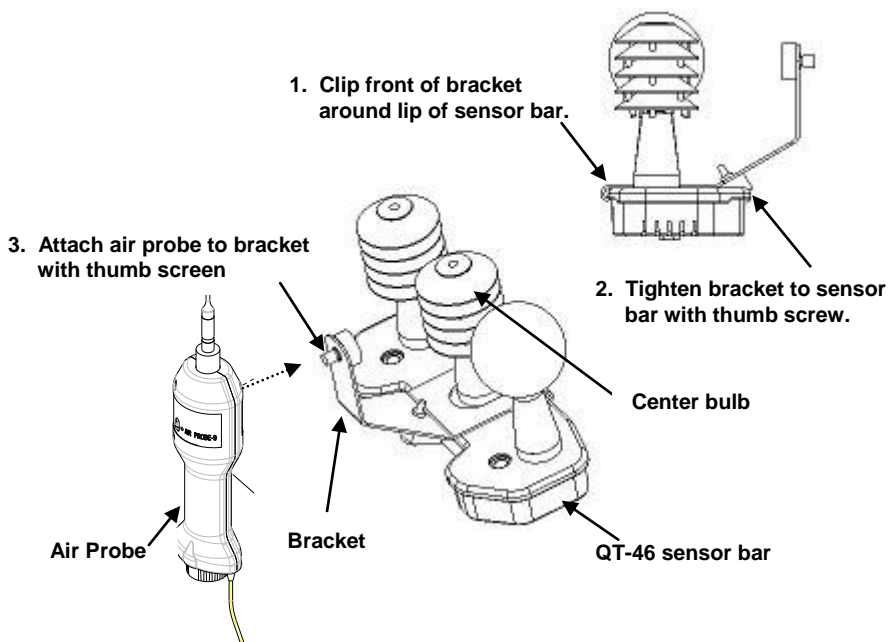


Figure 1-22: Airflow configuration

Operating sequence

1. Turn **Flow On** in the setup menu of the QUESTemp°46.
2. Plug the Air Probe into the port labeled **Flow** on the side of the QUESTemp° 46.
3. Turn on the Air Probe **ON** and make sure the green lamp is lit.
 - In the View or Run modes, airflow is displayed on the fifth screen.

Data Logging Airflow

To data log airflow in the QUESTemp° 46, the following two conditions must be met.

1. First, turn **Flow On** in the setup menu.
2. Second, make sure that a temperature sensor bar is connected to the Sensor 1 location (top) of the QUESTemp°46. 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° 46 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.

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 $\pm 0.5^{\circ}\text{C}$.

If the readings are not within the $\pm 0.5^{\circ}\text{C}$ tolerance, then have the unit serviced and calibrated.

Power options


There are 3 options for powering the QUESTemp[®] 46: 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.



Figure 1-23: 9-volt battery

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

UltraLife: 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 120V AC to 9V DC adapter (part #015-910) or 220V AC to 9V DC adapter (part #015-680). A discharged battery pack requires an "overnight" charge of 16 hours (for the 120V adapter).** Leaving the AC adapter plugged in for extended lengths of time or when operating the instrument will not harm the rechargeable batteries.

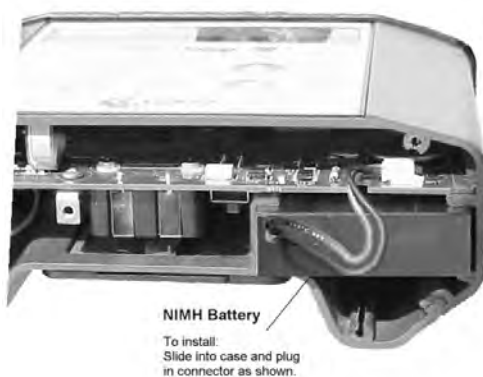


Figure 1-24: NiMH rechargeable battery

Appendix A: Specifications

Measurements

- Globe temperature, dry bulb temperature, wet bulb temperature, % relative humidity, WBGT_{in}, WBGT_{out}, WBGT weighted average (if 3 sensor sets), and Heat Index / Humidex.
- Temperatures given in Celsius or Fahrenheit.
- Index (QT[®]46 only): ACGIH TLV, U.S. Navy PHEL Charts, Flag Conditions for U.S. Navy/Marine Corp. Ashore, and EPRI

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

- Dry Bulb and Globe Temperature: +/-0.5°C between 0°C and 120°C
- Waterless Wet Bulb Temperature: Expanded measurement uncertainty of 1.1°C (k=2) between 0°C and 80°C
- Relative humidity: +/- 5% between 20 to 95% (non-condensing)

Operating Temperature Range

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

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: 80 hours

Rechargeable Nickel Metal Hydride: 160 hours

(Adding additional sensor bars reduces battery life.)

Charge Time (NiMH Battery Pack)

16 hours (charge in the unit)

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

Appendix B: Heat Exposure Tables

ACGIH

Screening Criteria for Heat Stress Exposure. WBGT values in °C. *NOTE: according to the ACGIH's guidelines, the temperature values represent a work and rest process which is explained in the standards. Please refer to the ACGIH TLVs and BEIs for specific details.*

Work and recovery (TLV)	Light	Moderate	Heavy	Very Heavy
75% to 100%	31.0	28.0	26.0*	23.5*
50% to 75%	31.0	29.0	27.5	25.5*
25% to 50%	32.0	30.0	29.0	28.0
0% to 25%	32.5	31.5	30.5	30.0

Work and recovery (Action Limit)	Light	Moderate	Heavy	Very Heavy
75% to 100%	28.0	25.0	22.5*	20.0*
50% to 75%	28.5	26.0	24.0	22.5*
25% to 50%	29.5	27.0	25.5	24.5
0% to 25%	30.0	29.0	28.0	27.0

*Values not specified by ACGIH have been estimated for continuity.

ACGIH Clothing Corrections

The following clothing corrections are in degrees Celsius. When a clothing correction is entered into the setup portion of the QUESTemp[®] 46, 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 (Addition to WBGT (°C))
Work clothes (long sleeve shirt and pants)	0°
Cloth (woven material) coveralls	0°
Double-layer woven clothing	3°
SMS polypropylene coveralls	0.5°
Polyolefin coveralls	1°
Limited-use vapor-barrier coveralls	11°

Cited from "American Conference of Governmental Industrial Hygienists - Threshold Limit Values and Biological Exposure Indices for 2008"; Reprinted with permission from ACGIH

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)	<u>I</u>	<u>II</u>	<u>III</u>	<u>IV</u>	<u>V</u>	<u>VI</u>
80.0	>8:00	>8:00	>8:00	8:00	6:35	4:30
81.0	>8:00	>8:00	>8:00	8:00	6:35	4:30
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

WBGT(F)	<u>I</u>	<u>II</u>	<u>III</u>	<u>IV</u>	<u>V</u>	<u>VI</u>
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
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

Flag Conditions for U.S. Navy/Marine Corp. Ashore

The following chart details the heat stress monitoring Flag Conditions for U.S. Navy/Marine Corp. Ashore in Degrees Fahrenheit and Celsius.

Flag Degrees F	No Flag	Green	Yellow	Red	Black
	<80.0	80.0-84.9	85.0-87.9	88.0-89.9	>90
Flag Degrees C	<26.7	26.7-29.4	29.4-31.1	31.1-32.2	>32.2

* Rest means minimal physical activity (sitting or standing) and should be accomplished in the shade if possible.

Electrical power research institute (EPRI)

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	Moderate	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

Appendix C: Accessories

Sensor array with 2 inch globe	57-902
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

Appendix D: PC Communications

The QUESTemp° 44/46 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 Professional II software. To write custom software for working with the QUESTemp° 44/46, call Quest Technologies for the programming commands.

QSP-II Quick overview

The focus of this section is to briefly introduce the following QSP-II topics: retrieving your data, setting up parameters, and downloading your data, and viewing your data in charts, graphs, and reports. (For further details on QSP-II, please refer to the online Help and select Contents.)

Retrieving your studies into QSP-II

Loading your studies entails loading the software, plugging in the Quest supplied cable into the data connector output of the QUESTemp 44/46, and navigating to **retrieve data** button in QSP-II. The software will then automatically pull your heat stress data from the instrument into QSP-II (also called **downloading**).

➤ Retrieving your studies

1. Ensure QuestSuite Professional II software is loaded on your pc.
☒ Follow the install directions on the CD.
2. Plug the Quest cable into the side jack of the QUESTemp° 44/46 labeled "Data".

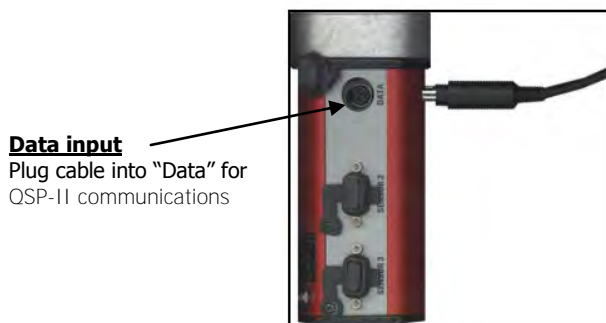

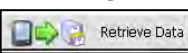


Figure 1-25: Communicating to QSP-II

3. **Power on** the QUESTemp^o 44/46 by pressing and holding the **I/O Enter** key.
4. Open QSP-II and choose **Heat**  from **My instruments** section of the start-up screen and click on **QT^o44/46**.
5. Select the **Retrieve Data**  button.
6. Click the **Download** button.
 - ☒ The progress bar will fill to 100% and it will state successful in the status field once completed.

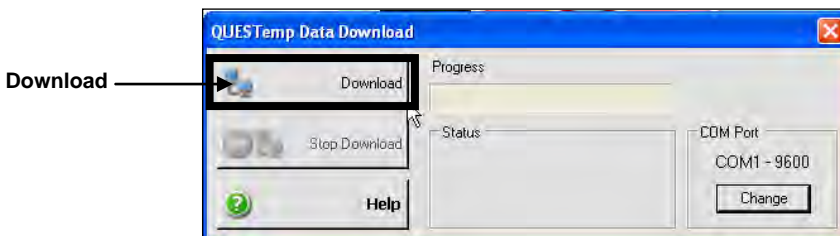


Figure 1-26: Download data screen in QSP-II

7. The data will load and dock under **Downloaded** node. (See next section, "Downloaded Node" for more details).

Downloaded Node (where your data is stored)

When you retrieve the files from the QUEST^o 44/46 into QSP-II, the data is **automatically stored under the node titled "Downloaded"** and a generic name is assigned to your data.

- **Analogy:** *The concept of storing files is similar to how your inbox works in Microsoft Outlook. In Outlook, the files are automatically sent to a general inbox and it is up to you to organize your mail into subfolders. Likewise, with QSP-II, once the files are imported, they are stored in a general inbox called "Downloaded node". With a simple right-click, you can quickly rename the file and create a user-friendly filing system to manage your data.*

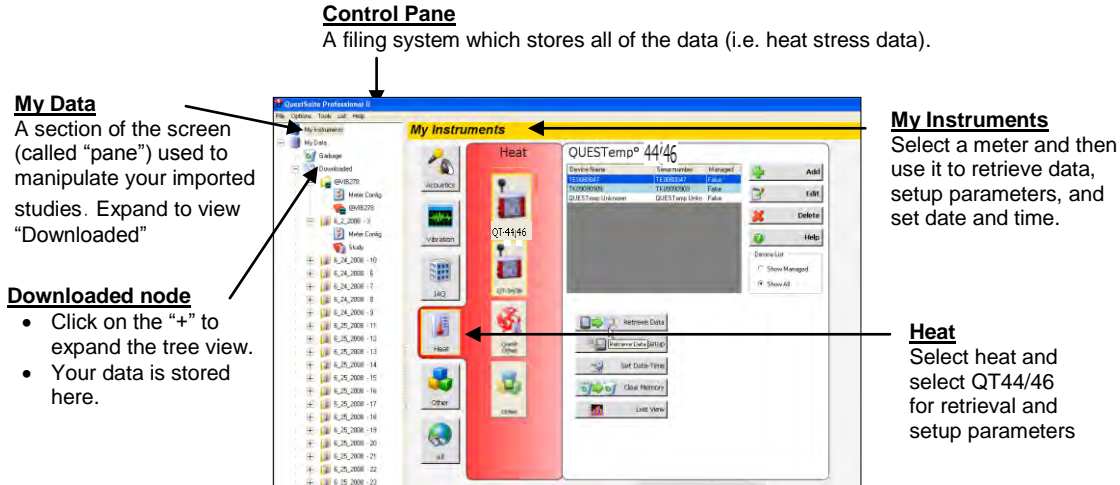


Figure 1-27: Viewing your studies from QSP-II

Viewing your Heat Stress data in QSP-II

- Expand "My Data" node by clicking on the "+" sign.
- On the **Downloaded node**, click on the "+" sign to expand the node/file cabinet.
 - ☒ Your data will display under the folder system.
- Next, click on **Session folder**. Then click on the **Heat Stress Study** which is indicated with a red book icon.
 - **NOTE:** Refer to Table 1-2 for detailed explanation of QSP-II's filing system.

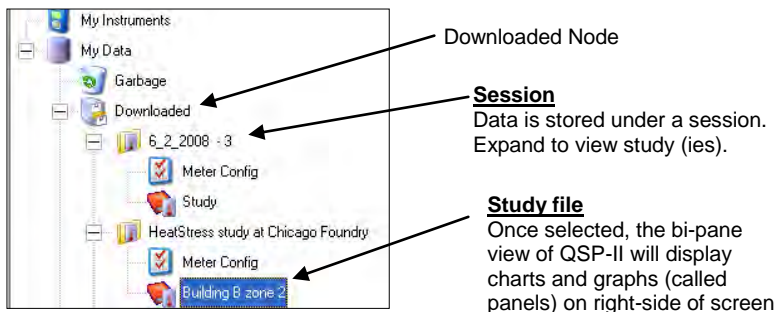


Figure 1-28: Downloaded data






Filing system	Explanation
 Organizer Node	Used to organize your data. When the data is first retrieved/downloaded, it is stored under the "Downloaded Node". You can organize your studies into topics as you may do with your email system or your computer files. <ul style="list-style-type: none"> Right-click to display the menu options (rename, find, delete, add a node, combine a node, export). To rename, right-click rename and type in a new name.
 Meter Config	In a table format, this displays the set-up parameters (i.e. thresholds, peak, logging, auto-run, etc.) or "meter configuration" of the particular study.
 Session	A session folder stores one study or a series of studies. A number of studies in a session file depend on the number of studies (Run/Stops) that are stored in the instrument when data is retrieved. (The data will stay on the instrument until you clear it.)
 Study	A study is comprised of data from one sampling (performed when you press Run then Stop on the QT*44/46). Once selected, you can customize the panels (charts/graphs) and reporting features. <ul style="list-style-type: none"> Right-click to display the menu options (export, print report)
 Session Report	If you created a report, this will store as an Acrobat Adobe .pdf file under the study file.

Table 1-2: Downloading data in QSP-II explained

4. The right-side pane displays graphs and charts which are customizable via the layout icon toolbar. (For further information, please refer to QSP-II's Help Contents.)

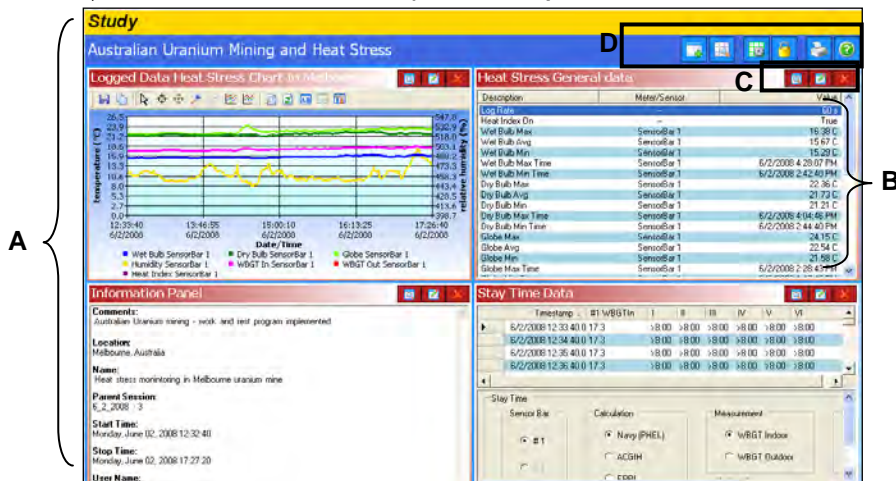


Figure 1-29: Viewing layout view (charts and graphs) in QSP-II





Graphs & Charts layout view	Explanation
A. Layout	QSP-II is divided into two panes (or sections). One is the layout view and the second pane is the "control pane". The layout is divided into "panels", also known as charts and graphs. You can add charts and/or graphs, move them in the appropriate position, and/or customize the data values.
B. Panel	For the heat stress monitors, the standard layout has three panels. The panels can be moved, edited, and expanded or collapsed. (see "Chart and Graph icons")
C. Chart & Graph icons	Used to enlarge or hide a panel (also called chart or graph), edit the data, or close the view.  <input checked="" type="checkbox"/> Expand or Collapse the panel (graph/chart)  <input checked="" type="checkbox"/> Edit (edit the parameters of the selected screen)  <input checked="" type="checkbox"/> Delete (closes the window)
D. Layout icon toolbar	This toolbar is used to add tables and/or charts, arrange tables or charts, manage the layout view, lock it, print reports and access to the help files.


Table 1-3: Explanation of panels (graphs and charts) components

Adding Panels (charts/graphs)

1. Ensure you selected the appropriate study and are viewing panels (graphs/charts) on the right-hand side of your screen.
2. Click on the **Add** icon. 
3. Select a chart or graph. An edit screen may appear. Select the appropriate settings and click **Ok**. It will display on your screen.

Saving your Customized Layout (charts/graphs)

You may have spent some time organizing your study data by adding new charts and/or graphs, rearranging the panes (right-click on a graph/chart heading and drag and drop to a specific spot), and/or formatting the chat/table properties. With the save template button, you can save your customized layout so every time you open a study the appropriate charts and graphs are displayed.

1. In the layout view of QSP-II, click on the **Manage Templates** icon  (see layout icon toolbar, "D", in Figure 1-23).
 - a. The Manage Session Templates screen will appear.
2. To create a new template, type a name in the **Templates Name field**.
3. Click the Save **Template button**.

4. Select the appropriate template name in the “available templates field” and Click the **Apply Template button**.

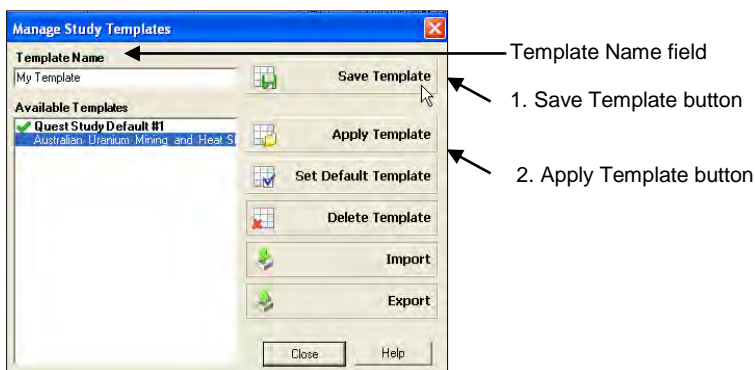


Figure 1-30: Saving a customized template of the layout view (charts/graphs)



Creating reports

QSP-II reports are saved in Adobe PDF format for easy viewing and printing.


- **NOTE:** *The report will print in the order that the panels (charts/graphs) appear on your computer screen. To rearrange, click on the title of a chart or table. Then drag and drop the chart/table on the title bar of a panel you wish to move it to. (For example, click and drag the last panel on top of the first panel.)*

- ⊘ : If your cursor displays this icon, ⊘, it indicates the panel cannot be dropped into the current position of your cursor.
- : If your cursor displays this icon, □, it indicates the panel can be inserted into the current position of your cursor.

Viewing and printing reports

1. Right-click a Session  or Study  and select **Print Session** from the menu.
- ☒ The report will dock under the study node.

☒ To remove, **right-click** the report and click **Delete Report**.

☒ To save the report in an alternative folder/directory (i.e., on your desktop and then you can email it and share the information.), select **Save As** and add it to a directory or folder on your pc (or network).
2. Alternatively, select the **Printer Icon**  when the Session or Study data is displayed in the chart and tables panels.
- ☒ When the Generate Reports Icon is selected, the following screen will appear.

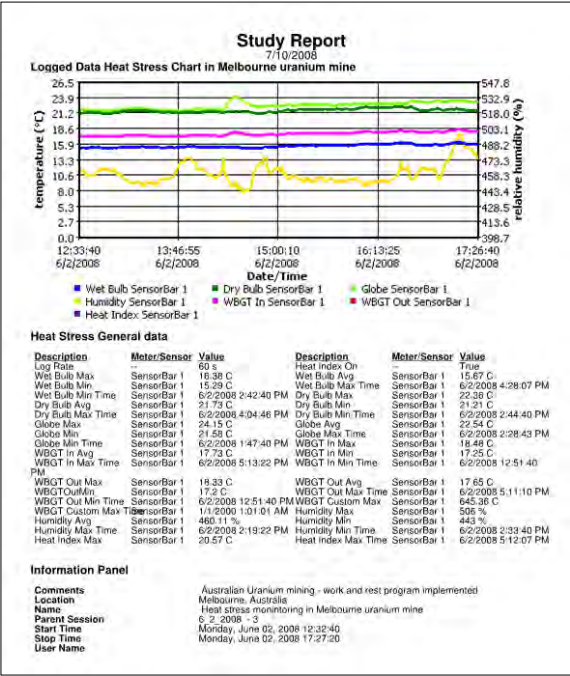


Figure 1-31: Sample Heat Stress report from QSP-II

Quest Service

Contacting Quest Technologies

Should your Quest Technologies equipment need to be returned for repair or for recalibration, please contact the service department at the following number or access the online form via the website. For technical issues, please contact Technical Support.

Service Department and Technical Support: 1 (800) 245-0779.

Fax: 1 (262) 567-4047. Office hours are 8:00 a.m. to 5:00 p.m. United States Central.

- **E-mail** at <mailto:sales@questtechnologies.com>
- **Internet** at www.questtechnologies.com

International customers

Contact your local, factory-authorized distributor from whom the product was purchased. You can obtain the name and contact information of your local factory-authorized distributor from Quest by using the e-mail, telephone, or fax information given under "Contacting Quest Technologies" above.

Warranty

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 United States 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 or longer warranty periods. This warranty states our total obligation in place of any other warranties expresses 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 United States, 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 distributor or our Quest European Service Laboratory. Foreign purchases should contact the local Quest authorized sales agent for details.

About Quest Technologies, a 3M company

Quest Technologies, a 3M company, is a world class manufacturer and leader in the field of occupational safety, industrial hygiene and environmental instrumentation. Quest products are used in more than 80 countries worldwide. Quest has a strong reputation of rugged, reliable instrumentation and software systems that monitor and evaluate occupational and environmental health and safety hazards including noise, vibration, heat stress, indoor air quality and toxic/combustible gases.

Quest monitoring instruments serve a variety of occupations and industries with clients in mining, research, enforcement, military, education, insurance and manufacturing business sectors.

- Visit www.questtechnologies.com for further information.



Occupational Health & Environmental Safety Division

Quest Technologies, a 3M company
ISO 9001 Registered Company
ISO 17025 Accredited Calibration Lab
1060 Corporate Center Drive
Oconomowoc, WI 53066
Customer Service: 262-567-9157
Toll Free: 800-245-0779



www.questtechnologies.com

Please recycle. Printed in USA.
© 2011 3M
All rights reserved.
053-664, Rev.C 5/11