

Model 8552/8554
Q-TRAK™ Plus
IAQ Monitor

TRAKPRO™ Data Analysis Software enclosed

Operation and Service Manual

1980417, Revision H
February 2005

Model 8552/8554

**Q-TRAK™ Plus
IAQ Monitor**

**Operation and Service
Manual**

*February 2005
P/N 1980417, Rev H*

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To obtain any of the listed Application Notes, contact TSI at:
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These Application Notes can also be found under TSI's web site:
<http://www.tsi.com>.



Chapter 1

Unpacking and Parts Identification

Unpacking the Q-TRAK™ Plus IAQ Monitor

Carefully unpack the Q-TRAK™ Plus IAQ Monitor from the shipping container. Use the tables and illustrations below to make certain that there are no missing components. Contact TSI immediately if anything is missing or damaged.



Figure 1-1: Models 8552/8554 Q-TRAK Plus IAQ Monitor with Calibration Collar and Batteries

Ref	Qty	Item Description	Part/Model
1	1	Q-TRAK Plus IAQ Monitor	8552 or 8554
2	1	Calibration Collar	801679
3	4	Batteries (AA alkaline)	N/A
4	1	Computer Interface Cable (RS-232)	800563
5	1	AC Adapter 115 V, NEMA-5 230 V, Eur., CEE 7/16 230 V, Great Britain 240 V, Australian	2613033 2613078 800169 2613105
6	1	Probe Stand (not shown)	800679

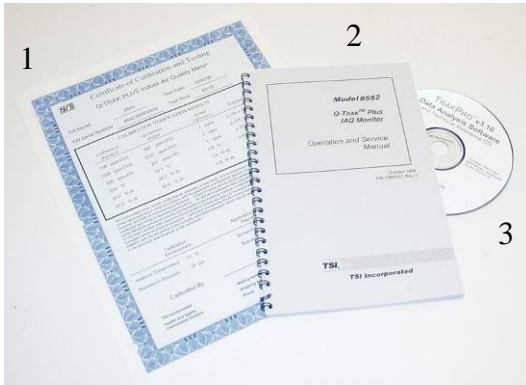


Figure 1-2: Calibration Certificate, Operation and Service Manual, TRAKPRO™ Data Analysis Software

Ref	Qty.	Item Description	Part/Model
1	1	Calibration Certificate	N/A
2	1	Operation and Service Manual	1980417
3	1	TRAKPRO™ Data Analysis Software	N/A

Optional Accessories

The following pages contain component identification information for optional accessories available for the Q-TRAK™ Plus IAQ Monitor.

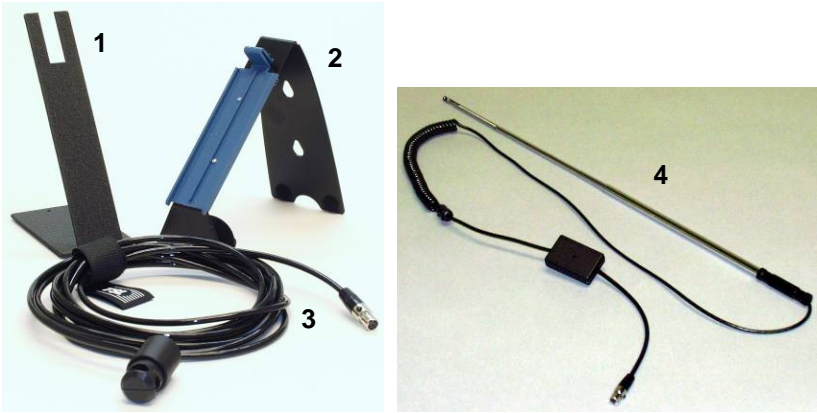


Figure 1-3: Auxiliary Sensor, Probe Stand, Instrument Stand

Ref	Item Description	Part/Model
1	Probe Stand	800679
2	Instrument Stand	1206526
3	Auxiliary Temperature Sensor	8590
4	Air Velocity Probe	8592



Figure 1-4: Model 8928 Portable Printer Kit

Ref	Qty	Item Description	Part/Model
1	1	RJ45 to 9-pin Printer Cable	8926
2	1	Model 8928: portable printer	8928
3	1	AC adapter/charger for printer	2613049
4	1	User Guide	8928
5	1	Thermal paper (roll)	802011

Chapter 2

Setting Up

Supplying Power to the Q-TRAK™ Plus IAQ Monitor

The Model 8552/8554 Q-TRAK™ Plus IAQ Monitor may be powered with four AA alkaline batteries or the optional AC adapter.

Installing the Batteries

Insert four AA-size batteries, as indicated by the diagram located on the inside of the battery compartment. TSI ships the Q-TRAK Plus monitor with alkaline batteries. Rechargeable batteries may also be used (battery charger and batteries are not included and are not available from TSI).

Using the AC Adapter

The AC adapter allows you to power the Q-TRAK Plus monitor from an AC wall outlet. When using the AC adapter, the batteries (if installed) will be bypassed. The AC adapter is not a battery charger and will not charge rechargeable batteries.

The Q-TRAK Plus monitor has an internal, non-user accessible battery that is used to keep memory intact when power is turned off. Changing the AA-size batteries or disconnecting the AC adapter will not cause data to be lost. This battery is designed to last for years. TSI will install a new battery, if necessary, when the unit is returned to the factory for service.



Caution

The use of an improper AC adapter will cause severe damage to the instrument.

Instrument Software and Communications Setup

The Q-TRAK Plus IAQ Monitor comes with special software called TRAKPRO™ Data Analysis Software, which is designed to provide you with maximum flexibility and power when using the Q-TRAK Plus monitor. The following sections describe how to install the software and set up the computer.

Setting up TRAKPRO™ Data Analysis Software

Follow the instructions on the label of the TRAKPRO software to install the software on your computer. TRAKPRO software contains a very comprehensive Help Function. This utility provides all the necessary information to guide you in all aspects of software operation. The software is shipped on a CD-ROM. It is available on diskette format, upon special request. Updates are available from the TSI website.

Connecting the Q-TRAK Plus IAQ Monitor to the Computer

Each Q-TRAK Plus monitor comes equipped with an RS-232, 9-pin serial cable. One end of the cable is a 9-pin D subminiature connector labeled COMPUTER; the other end is an RJ-45 modular connector that connects with the Q-TRAK Plus communications port. Serial port connectors always have pins (male) on the computer side.

1. Locate an available RS-232 serial port on your computer: for example, COM1 or COM2.
2. Connect the RS-232 cable to the available serial port on your computer.
3. Connect the RJ-45 connector to the Q-TRAK Plus monitor communications port.

Setting up the Communications Port

To communicate with the Q-TRAK Plus monitor, the software must be configured for the proper COM port. The TRAKPRO software can be manually set to operate on a specific COM port, or it can automatically find a Q-TRAK Plus monitor that is attached to any COM port. To set up the COM port, do the following:

1. Turn on the Q-TRAK Plus monitor.
2. Start the TRAKPRO software.
3. Select **Instrument Setup, Communications** in the TRAKPRO software. The following dialog is displayed:

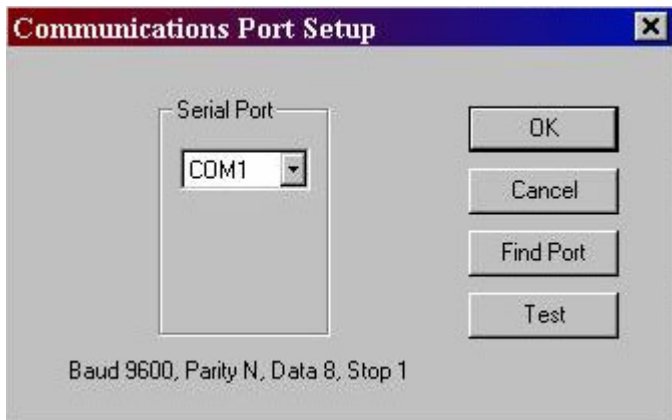


Figure 2-1: Instrument Setup, Communications Dialog Box

4. Select the correct serial port (such as, COM2); then select **T**est. The software will verify that you have set up the communications port correctly and that it is communicating with the Q-TRAK Plus monitor. The system displays an information message indicating whether it was able to establish communications.
5. As an alternative, select **F**ind Port, to have the monitor search the available COM ports, looking for an attached Q-TRAK Plus monitor.
6. Select **O**K to accept the setup, or **C**ancel to discard the changes.

Using the Optional Instrument Stand

The Q-TRAK Plus IAQ Monitor can be used with an instrument stand (available as an accessory). When placed on a level surface, the instrument stand is designed to hold the instrument and the probe at a convenient viewing angle. The instrument stand may also be used to hang the monitor on a wall.

To use the stand, simply detach the battery door from the monitor and replace it with the instrument stand (see Figure 2-2).

Using the Optional Probe Stand

A separate probe stand is available as an accessory. Use the bracket that is located on the probe and slide it on the probe stand as shown in Figure 2-2.



Figure 2-2: Optional Probe and Instrument Stands

Connecting the Optional Model 8928 Portable Printer

To connect the Model 8928 printer to the Q-TRAK Plus monitor, do the following:

1. Ensure that the Q-TRAK Plus monitor and printer are off.
2. Locate the printer interface cable and connect the 9-pin end labeled **PRINTER** to the printer and the other end to the communications port on the Q-TRAK Plus monitor.
3. Turn on the Q-TRAK Plus monitor; *then* turn on the printer.

Note: *Always turn on the Q-TRAK Plus monitor before turning on the printer. If the printer prints question marks (??????), asterisks (*****), or random characters, reset it by turning it off and then on again. If necessary, refer to the Model 8928 Portable Printer Operation and Service Manual.*

Chapter 3

Operation

Overview

The Model 8552/8554 Q-TRAK™ Plus IAQ Monitor measures CO₂, temperature, relative humidity, calculates dew point, wet bulb, and % outside air, and measures one (1) additional parameter. The Model 8554 will also measure CO. The instruments have three main modes of operation: Survey, Sample, and Data Log.

Survey mode: When the Q-TRAK Plus monitor is first turned on, it will be in the Survey mode. This mode is used to display the real-time readings of the sensors. The instrument will update the displayed readings once each second.

Sample mode: The Sample mode is used to capture a 10-second, averaged reading of all the parameters. These “single sample points” may be stored in memory and can be displayed later, or downloaded to a computer using the TRAKPRO software.

Data Log mode: The Data Log mode is used to record readings over a period of time, and store these readings in the instrument memory. Data files may be downloaded to a computer for later analysis using the TRAKPRO software. Q-TRAK Plus has three different data log modes.

Q-TRAK Plus IAQ Monitor Keypad

The Model 8552/8554 Q-TRAK Plus IAQ Monitor is controlled through a series of menus that are navigated using the arrow keys (▲, ▼, ◀, ▶) (see Figure 3-1). The Enter key (↵) is used to select the desired option, while the Escape key (⌫) is used to go back to the previous menu. Each screen contains prompting words and symbols. When pressing the keys on the front panel, the monitor beeps to confirm each key press. The ⌫ key allows access to the Main Menu from the Survey mode.

Turning the Instrument On

Use the ON/OFF key to turn the Q-TRAK Plus monitor on and off. The instrument's power-up sequence consists of a startup screen that displays the instrument's model number, serial number, firmware version, available memory, date and current time. The display will also show various status messages. The startup sequence lasts for 20 seconds before entering Survey mode. A reminder may appear when the instrument is due for servicing.



Figure 3-1: Q-TRAK Plus IAQ Monitor Keypad and Display

Survey Mode

After the instrument has completed its power-up sequence, the Q-TRAK Plus monitor will automatically go into the Survey mode.

Note: *It is not unusual for gas sensors to take some time to become stable. If readings appear unusual at start-up, please allow about one-half minute for the sensors to stabilize.*

In the Survey mode, the Q-TRAK Plus monitor displays all parameters simultaneously. The values are updated once per second. You may select any of the parameters to be shown in large font at the top of the display. This is called the primary parameter. Select the primary parameter by using the ▲ or ▼ keys to highlight the parameter of interest, then press the ←key to display that parameter in large font at the top of the screen. In addition, the units of some parameters may also be changed. For example, temperature may be shown in either °F or °C. To adjust the units, scroll to the desired parameter using the ▲ or ▼ keys, then adjust the units using the ◀ or ▶key (refer to the units section in this chapter, see Figure 3-2).

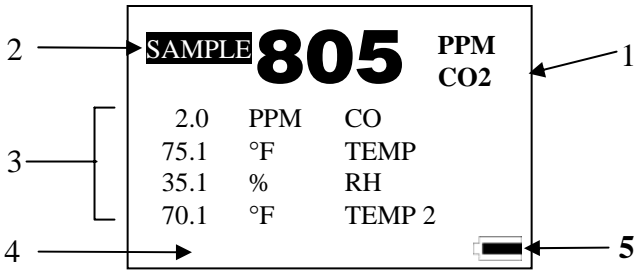


Figure 3-2: Survey Mode Screen (sample)

Ref	Description
1	Primary Parameter (CO ₂ concentration is shown).
2	Sample mode. Used for capturing single data points.
3	Remaining parameters.
4	Status message area.
5	Battery status.

Units

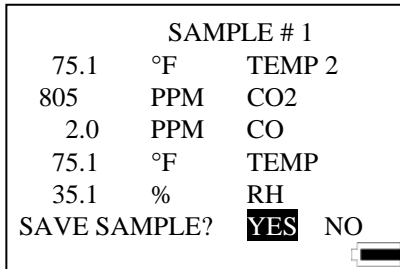
To change units displayed in the Survey mode use the ▲ or ▼ key to select the parameter. Press either the ◀ or ▶ key and the units of the selected parameter will change accordingly. The units displayed on the instrument will be the same units that are stored during the log mode.

Sample Mode

The Sample mode is the default selection in the Survey Mode (the reverse highlight indicates that it is selected). The Sample mode is used to capture a single, 10-second averaged data point of all measured parameters.

Recording and Saving a Single Data Point

With **SAMPLE** selected and the ←key pressed, the Q-TRAK Plus monitor begins a countdown. During these 10 seconds, it is taking an average reading of each parameter. At the end of the averaging period, the following sample screen is displayed:



SAMPLE # 1		
75.1	°F	TEMP 2
805	PPM	CO2
2.0	PPM	CO
75.1	°F	TEMP
35.1	%	RH
SAVE SAMPLE?	YES	NO

Figure 3-3: Record Single Data Point

The **YES** selection is highlighted by default. If you press the ↓ key, the single data point will be stored in memory. Press the ► key to highlight **NO** to discard the data point.

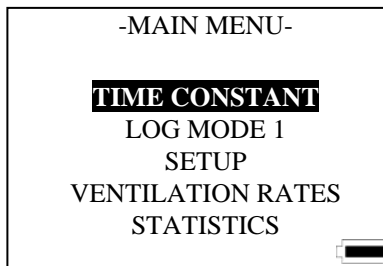
Note that the first sample is given the name/number “Sample 1.” The sample number will automatically increment for each subsequent sample.

Printing Saved Single Data Points

A hardcopy of the results of the saved test sample can be generated if the Model 8928 Printer is attached to the Q-TRAK Plus monitor and the Printer Output feature is enabled.

Main Menu

The Main Menu can be accessed through the **SURVEY MODE** by pressing the ↑ key. The Main Menu Mode is the highest level in the menu structure. It provides a central point where you can select alternate modes of operation.



```
-MAIN MENU-  
  
TIME CONSTANT  
LOG MODE 1  
SETUP  
VENTILATION RATES  
STATISTICS
```

Figure 3-4: Main Menu

Time Constant

Highlighting and selecting **TIME CONSTANT** displays the *Time Constant Menu*. This allows you to adjust the dampening time-constant that will affect the real-time display of parameters, *in the Survey mode only*. The values shown in the Survey Mode are updated once per second; however, the readings shown are averaged over the time-constant period.

Log Mode

To select a Log Mode, scroll to **LOG MODE 1** using the ▲ or ▼ key. Adjust the mode using the ◀ or ▶ key to select LOG MODE 1, 2, or 3. Press the ←key to start logging data. Log Mode 1 is programmed and initiated by the keypad. Log Mode 2 and Log Mode 3 are programmed using the TRAKPRO software. Log Mode will only record data that is visible on the display.

Log Mode: Display of Real-Time Data

To begin a data logging session, select a log mode from the Main Menu and press the ↵ key. The Q-TRAK Plus monitor will begin recording logged data into the instrument memory and display the real-time values (see Figure 3-5).

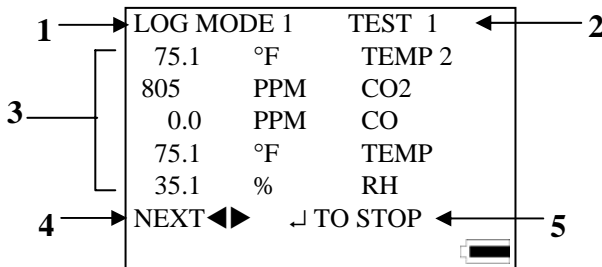


Figure 3-5: Log Mode: Statistical Data

Ref	Description
1	The Q-TRAK Plus monitor is in Log Mode 1.
2	The Test ID number is 1. This number is automatically incremented for each new test.
3	The real-time values for each parameter are displayed.
4	Use the ◀ or ▶ key to view the statistics for the current test.
5	Pressing the ←key will terminate the current test.

While logging, you are able to view statistical summary data of the current test. Pressing the ◀ or ▶ key will display the statistics for each parameter. The CO₂ summary screen is shown in Figure 3-6.

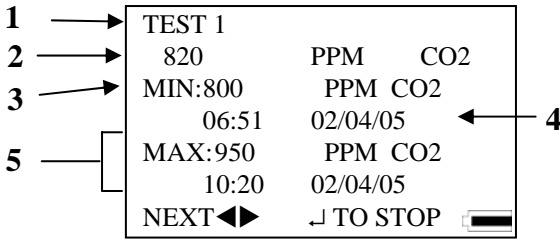


Figure 3-6: Log Mode: CO₂ Summary Screen

Ref	Description
1	Test ID
2	Current CO ₂ reading.
3	Minimum CO ₂ reading during the test.
4	Time and date at which the minimum CO ₂ reading occurred.
5	Maximum CO ₂ reading, with time and date.

Log Mode 1: Log Interval

The log interval is both a frequency and an averaging period. For example, when the log interval is set to 5 minutes, readings will be recorded at 5-minute intervals. Each reading will be the average value measured over that 5-minute interval.

The Select Log Interval menu allows you to view the current logging interval used during LOG MODE 1 (see “Log Mode 2 and 3” section, later in this chapter, for more information about data logging). The menu screen is shown below in Figure 3-7.

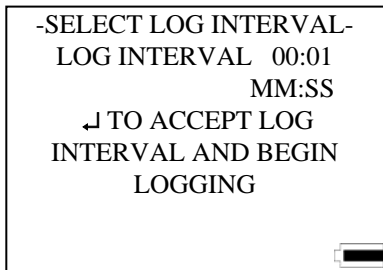


Figure 3-7: Log Mode 1: Select Log Interval

The default values for log intervals are set at 1 second, 1 minute, 5 minutes, 15 minutes and 30 minutes. To select the logging interval, press either the ▲ or ▼ key until the desired interval is shown. When the ↵ key is pressed, the program begins the data logging process.

The log interval options for LOG MODE 1 may be programmed using TRAKPRO software.

1. Make sure the Q-TRAK Plus monitor is connected to the computer and turned on.
2. Select **Instrument Setup, Parameters, Logging Intervals**, from the software menu. The current settings in the Q-TRAK Plus monitor will be retrieved and displayed in the dialog box. You may program in new values for each of the five log intervals (within defined limits).

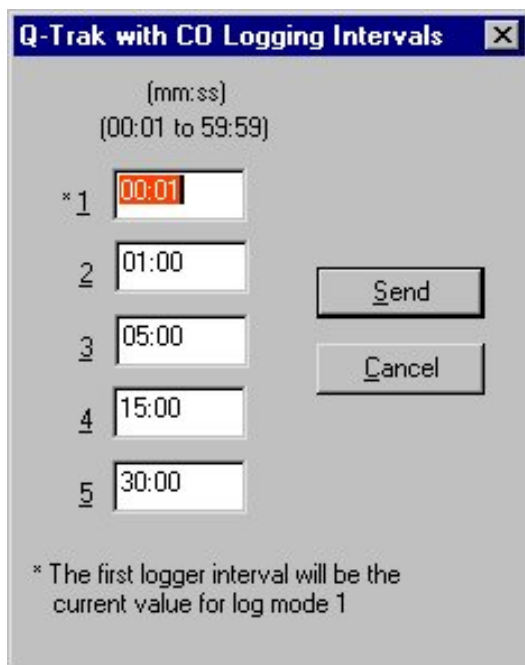


Figure 3-8: Logging Intervals

3. Select **Send** to program the Q-TRAK Plus monitor with the new values.
4. Disconnect the Q-TRAK Plus monitor from the computer.

Note: This log interval only applies to Log 1 mode. The log interval for Log 2 and Log 3 modes is adjustable only within TRAKPRO software.

Log Mode 2 and 3

The Q-TRAK Plus monitor may be programmed for more sophisticated data logging modes, using the TRAKPRO software and Log Modes 2 and 3. The software programs the start date, start time, test length, logging interval, number of tests, and the time delay between tests. Once the parameters are set, the monitor can be placed in the field to begin data logging in either Log Mode 2 or Log Mode 3. If no start time or start date is set, the log mode is initiated by pressing the ↵ key.

Programming Log Mode 2 or 3 Using TRAKPRO Data Analysis Software

1. Make sure the Q-TRAK Plus monitor is connected to the computer and turned on.
2. Select **Logging Setup** from the **Instrument Setup** menu. The TRAKPRO software retrieves the current settings for Log Modes 2 and 3 from the Q-TRAK Plus monitor and displays them in the following dialog box.

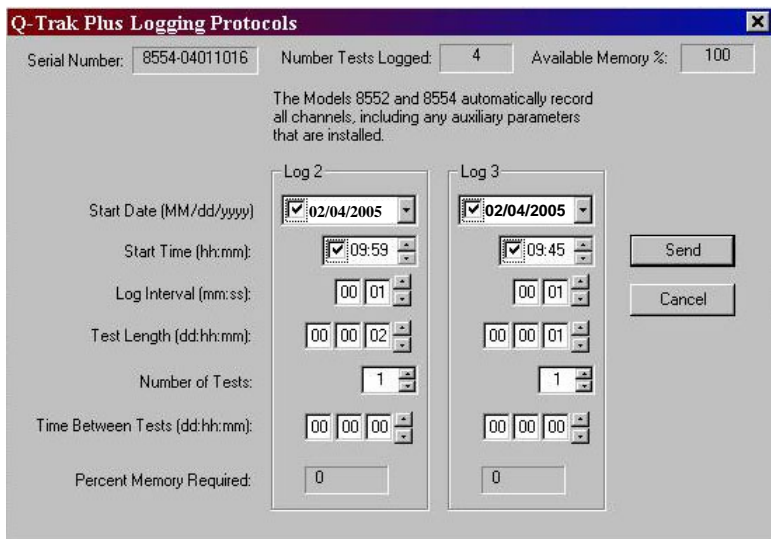


Figure 3-9: Q-TRAK Plus Monitor Logging Protocols

The following table summarizes the information displayed in the Q-TRAK Plus Logging Protocols dialog box.

Item	Description
Serial Number	Displays the serial number of the Q-TRAK™ Plus IAQ Monitor.
Number Tests Logged	Displays the number of tests currently logged and stored in the instrument.
Available Memory %	Displays the percent of available memory in the Q-TRAK Plus monitor (data logging only; single point memory is not included).
Start Date	Displays the start date for LOG 2 and LOG 3 modes.
Start Time	Displays the start time for LOG 2 and LOG 3 modes.
Log Interval	Displays the log interval for LOG 2 and LOG 3 modes.
Test Length	Displays the test length for LOG 2 and LOG 3 modes.
Number of Tests	Displays the number of tests for LOG 2 and LOG 3 modes. Selecting more than one test will cause the instrument to cycle through the logging test more than once, separated by the "Time Between Tests."
Time Between Tests	Displays the time between tests for LOG 2 and LOG 3 modes.
Percent Memory Required	Displays the percent of logger memory required to perform a LOG 2 or a LOG 3 mode sample. To store the results of a LOG 2 or LOG 3 mode sample, the Available Memory must be equal to or greater than the percent memory required.

To program the Q-TRAK Plus monitor for Log Mode 2 or 3, enter the following:

Item	Description
Start Date Start Time	Enter the date and time to begin the sample: <ul style="list-style-type: none"> • If the start date field is left blank, the date defaults to the current date. The test starts at the start time. • If both of the start date and time fields are left blank, the test begins as soon as you press the ↵ key in the appropriate log mode.
Log Interval	Enter the log interval to use for the test.
Test Length	Enter the length for the sample: <ul style="list-style-type: none"> • The instrument automatically turns off when the last test is complete at the end of the test length. • If the field is left blank, you must manually stop the sample by pressing the ↵ key in the logging screen.
Number of Tests	Enter the number of tests to perform.
Time between tests	Enter the time between tests, if there is more than one test. If 0 or blank is entered, the next test is started immediately after the previous test.

While entering values for Log Mode 2 or 3, the “Percent Memory Required” is dynamically updated to show the amount of logger memory required to take the programmed sample. If the protocol defined requires more than 100% of memory, decrease the amount of memory required by changing one of the following parameters:

- Increase the logging interval.
- Decrease the length for the test.
- Decrease the number of tests.

The settings for each separate Log mode must *not* require more than 100% of the logger memory.

Note: *If the percent memory required is greater than the available memory, the TrakPro software will not allow you to program Log Mode 2 or 3.*

3. When finished defining parameters for LOG 2 and LOG 3 modes, select **Send**.
4. Disconnect the Q-TRAK Plus monitor and cable from the computer.
5. The instrument is ready for data logging.

Sample Protocol for Log Mode 2 or 3

The following steps describe how to program a sample protocol for Log Mode 2 or 3.

Log Mode 2 sample protocol features:

- The sample protocol for Log Mode 2 is set to take unattended readings for one day.
- Logging takes place on 02/04/2005.
- The logging sample begins at 8:00 a.m.
- Logging continues for eight hours.

Log Mode 3 sample protocol features:

- The sample protocol for Log Mode 3 is set up to take unattended readings for four days.
- Logging first takes place on 02/04/2005.
- The logging sample begins at 8:00 a.m.
- Logging continues for eight hours.
- The instrument is off for 16 hours, and then repeats an eight-hour test each day for the next three days.

The following graphic gives the appearance of the dialog box displayed in the TRAKPRO software, with above-described logging parameters.

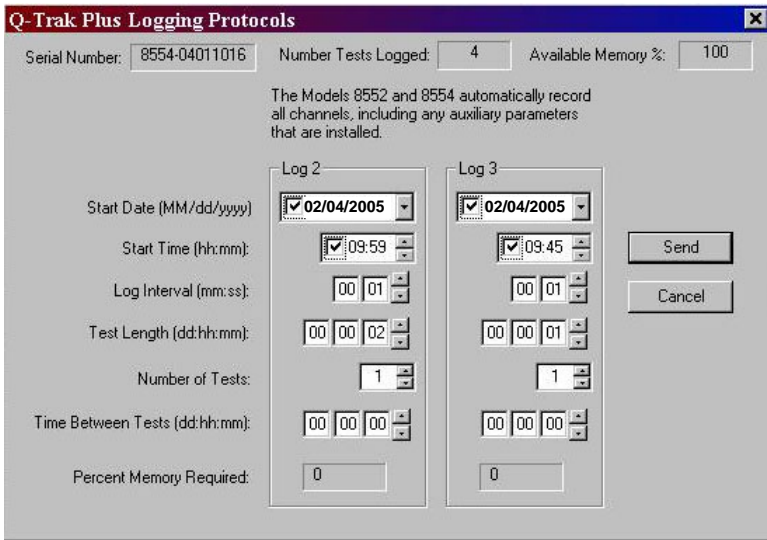


Figure 3-10: Q-TRAK Plus IAQ Monitor Logging Example

To program this logging example, do the following:

1. Make sure the Q-TRAK Plus monitor is connected to the computer and turned on.
2. Select **Logging Setup** from the **Instrument Setup** menu. TRAKPRO software retrieves the current settings for Log Modes 2 and 3 from the Q-TRAK Plus monitor and displays them (as shown in the previous dialog box).
3. Enter the following for Log Mode 2 and 3:

Setting	LOG 2	LOG 3
Start Date	<i>today's date</i>	<i>today's date</i>
Start Time	<i>five minutes from now</i>	<i>five minutes from now</i>
Log interval	01:00	05:00
Test length	00:08:00	00:08:00
Number of tests	1	4
Time between tests	00:00:00	00:16:00

4. Select **Send**. The logging instrument is programmed for the mode 2 and mode 3 protocols.

5. Note in the example that the LOG 2 test requires 4% of the available memory and LOG 3 requires 4% of the memory. A total of 100% of the memory is available for use.
6. Disconnect the Q-TRAK Plus monitor from the computer. Refer to other sections of this Operation and Service Manual for details on making measurements using LOG 2 and LOG 3 modes.

After programming the Q-TRAK Plus monitor with the TRAKPRO™ Data Analysis Software, take the monitor to the desired location and turn it on. From the Main Menu, put the monitor into LOG MODE 2 or LOG MODE 3 (whatever was programmed) by pressing the ◀ or ▶ key. Press the ↵ key to initiate the Log Mode. The display will show the current time and date.

The following will happen, depending upon the protocol:

If....	Then....
no start time was set...	...the Q-TRAK Plus monitor begins logging immediately after the ↵ key is pressed. This happens no matter what is entered for the start date.
a test start time was set, but no start date...	...the Q-TRAK Plus monitor begins at the next specified time, regardless of the date.
a start time and start date have been set that are in the future...	...the Q-TRAK Plus monitor will display the time and date of the next test and the next test ID.
the test start date and/or time has passed...	...pressing the ↵ key has no impact. The program will never execute (no data will be logged).
no test length is set...	...the Q-TRAK Plus monitor samples continuously until the ↵ key is pressed or until the memory is full.
↵ was pressed during sampling...	...the program stops data logging (unless the keypad is locked out).
When a pre-programmed test sequence ends...	...the Q-TRAK Plus monitor automatically returns to the Survey Mode.

Memory Considerations

The Q-TRAK™ Plus IAQ Monitor has a great deal of memory and will not normally run out. The instrument contains separate memory for the single points and for the logged tests (filling up the memory for one type of data will have no affect on the other type).

The Q-TRAK Plus monitor can store approximately 440 separate single points; in addition to 48,671 logged data points separated by as many as 110 tests. That is, the instrument can also store approximately 811 hours (33 days) of logged tests, when recording at 1 minute logging intervals (the number of hours of logged tests may be more or less, depending upon the logging interval).

The total test time should be considered when selecting a logging interval. Shorter logging intervals use memory more quickly than longer intervals. The logging interval and the available memory determine the maximum possible duration of a data logging session.

Maximum logging duration = %memory available x 48,671 x logging interval

To prevent loss of any logged data, it is recommended you download your data to the computer using the TRAKPRO software as often as possible.

Auxiliary Sensor

For each of the logging modes the auxiliary sensor parameter is logged along with the standard parameters as long as the auxiliary probe is connected to the instrument prior to the start of logging.

If....	Then....
the auxiliary sensor is connected <i>before</i> the start of logging...	...the Q-TRAK Plus monitor will record the sensor data during logging.
the auxiliary sensor is connected <i>after</i> the start of logging...	...the Q-TRAK Plus monitor will NOT record the sensor data during logging.
the auxiliary sensor is disconnected during logging...	...the Q-TRAK Plus monitor will display "Invalid Data" for the sensor for any time while the sensor is disconnected.

Keypad Lockout Switch

Recording data over extended time periods in Log Mode 1, 2, or 3 often requires leaving the Q-TRAK Plus monitor unattended. To reduce the risk of having an unauthorized person either intentionally or inadvertently interrupt the measurements, you can lock the keypad. When lockout is engaged, no values can be seen on the display.

The keypad lockout switch is located on the side of the Q-TRAK Plus monitor between the probe mounting brackets. It is a small slide switch and is recessed so that a pointed instrument must be used to move it.

The instrument case is labeled next to the switch with the symbols "|" and "0." With the switch in the "|" or on (up) position, all keypad functions will work normally. There are two ways to use the lockout switch.

If....	Then....
...the lockout is engaged <i>prior</i> to the start of logging (switch is in the "0" position)...	...the Q-TRAK Plus monitor will operate normally until logging begins.
...the lockout is engaged <i>after</i> the start of logging.	...the keypad will ignore any key presses until the switch is placed in the position.

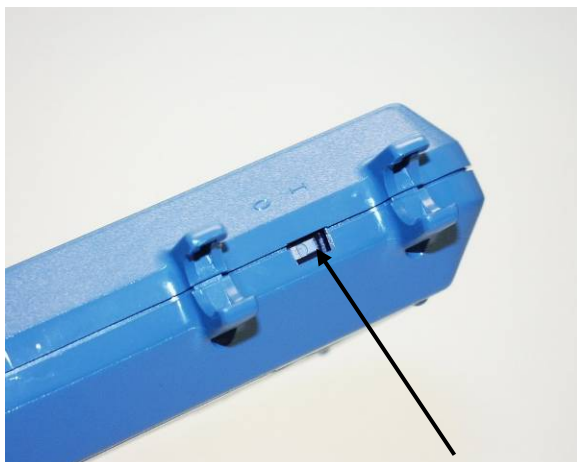


Figure 3-11: Keypad Lockout Switch

Setup Menu

The setup menu allows access to a wide range of options for reviewing data, examining statistics, changing operational parameters, performing calibration and more.

To reach the Setup menu from the Survey Mode press \uparrow key. To access any of the submenus use the \blacktriangle or \blacktriangledown key to highlight the menu and press the \leftarrow key.

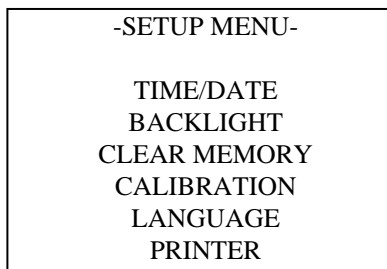


Figure 3-12: Setup Menu

Time/Date

The Q-TRAK Plus monitor has an internal clock that keeps track of the time of day and the date. It is very important to have the time and date correctly set for the monitor; otherwise, time and date stamping of recorded data will not be correct.

The time clock is set correctly at the factory (for U.S. Central Standard Time). If it requires adjustment, you may change it by selecting **TIME/DATE** from the Setup menu. The following screen is displayed:

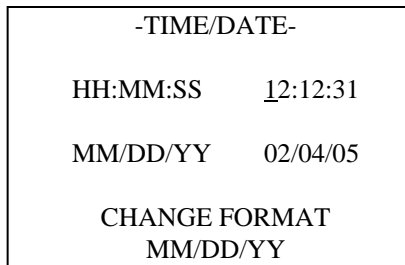


Figure 3-13: Time/Date

When first entering this screen, the first character in the time field will have a cursor underneath it. Use the ▲ or ▼ key to increment and/or decrement values. Use the ◀ or ▶ key to move to the required field. When all adjustments are complete, press the ↵ key to accept the changes and return to the Setup menu.

The Q-TRAK Plus monitor offers three different formats for displaying the date: U.S., European, and ISO 8601. Press ◀ or ▶ key to select and highlight **CHANGE FORMAT**, then press either the ▲ or ▼ key to cycle through the date formats: *MM:DD:YY*, *DD:MM:YY*, *YYYY:MM:DD*. Once the desired format is selected, press the ↵ key to confirm the choice.

Programming Time/Date Using TRAKPRO Data Analysis Software

The time and date may also be adjusted using the TRAKPRO software. To program the date and time:

1. Make sure the Q-TRAK Plus monitor is connected to the computer and turned on.
2. Using the TRAKPRO software, select **Parameters**, **Instrument Setup**, **Clock**. The software retrieves the current date and time settings from the Q-TRAK Plus monitor and displays them in the dialog box displayed in Figure 3-14.

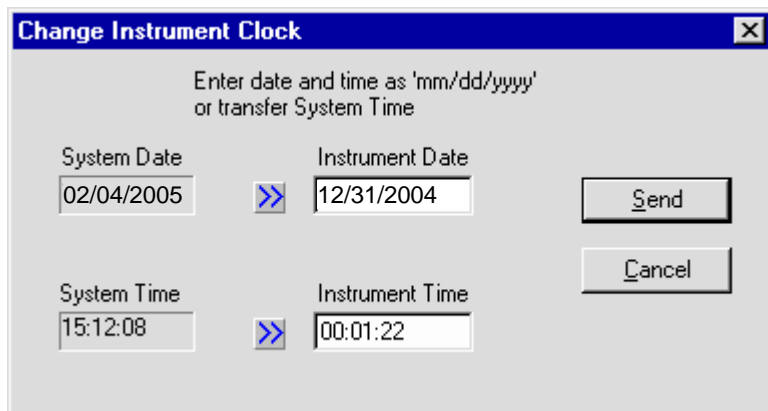


Figure 3-14: Time/Date Programming with TRAKPRO Data Analysis Software

3. The system date and time (from the computer) can be transferred to the monitor using the “arrow” keys.

Alternately, the date and time can be manually entered into the dialog box.

4. Select **S**end to reprogram the Q-TRAK Plus monitor.

Backlight

The **BACKLIGHT DELAY** option on the Setup menu adjusts how long the display backlight stays on after any key is pressed. After the delay has elapsed, the backlight will automatically turn off. To change the backlight delay, use the ▲ or ▼ key. The options are: *No Backlight, 10 second, 30 seconds, or 10 minutes*. Press the ↵ key to select the value and return to the Setup Menu.

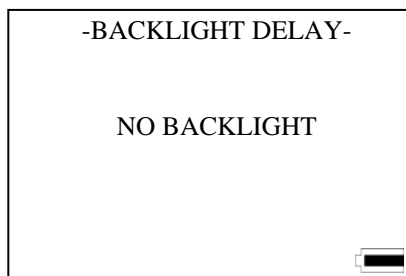


Figure 3-15: Backlight Screen

Note: *Prolonged use of the backlight may severely reduce the overall battery life.*

The backlight delay may also be adjusted using TRAKPRO Software.

1. Make sure the Q-TRAK Plus monitor is connected to the computer and turned on.
2. In TRAKPRO Software, select **P**arameters, **I**nstrument Setup, **O**ther. The TRAKPRO software retrieves the current settings from the Q-TRAK Plus monitor and displays them in the dialog box displayed in Figure 3-16.

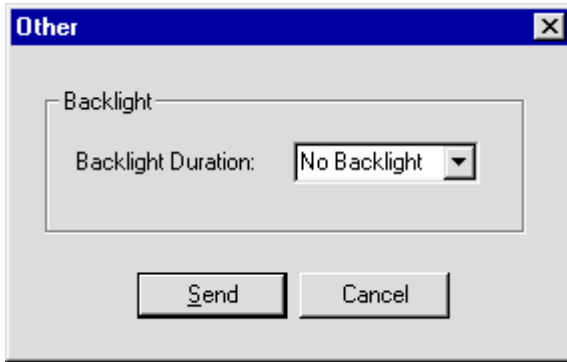


Figure 3-16: Instrument Parameters

3. Click a time duration in the backlight box.
4. Click **S**end to reprogram the Q-TRAK Plus monitor.

Clear Memory

The **CLEAR MEMORY** option on the Setup menu allows you to clear the instrument memory. To preserve data integrity, the Q-TRAK Plus monitor does not automatically erase the “older” data files. It requires a deliberate step on your part to clear the memory.

Note: *Performing this step will erase all logged data files or recorded single data points from the instrument's memory. There is no reversing this step once it is performed! It is recommended that you download all desired logged data or single data points using the TRAKPRO software before clearing the memory.*

To clear the memory, select the **CLEAR MEMORY** option on the Setup menu. After pressing the ↵ key, the following screen is displayed.

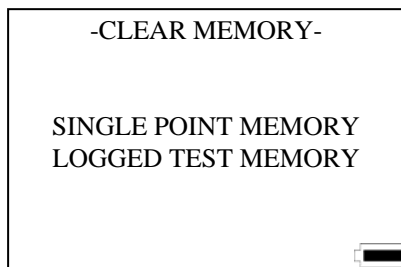


Figure 3-17: Clear Memory

The highlighted default selection is Single Point Memory. Pressing ↵ erases all Single Point data. The Logged Test Memory is unaffected. Logged Test Memory is cleared in a similar manner.

Single Point Memory or Logged Test Memory cannot be cleared through the TRAKPRO software.

Calibration

See Chapter 4, “Calibration and Maintenance,” later in this manual.

Printer

The **PRINTER** option allows you to enable or disable the printing function of the single sample test results. To enable or disable the printing option, scroll and highlight **PRINTER** using the ▲ or ▼ key on the Setup menu and press ↵.

Once in the printer submenu, use either the ▲ or ▼ key to enable or disable the printer output (see Figure 3-18).

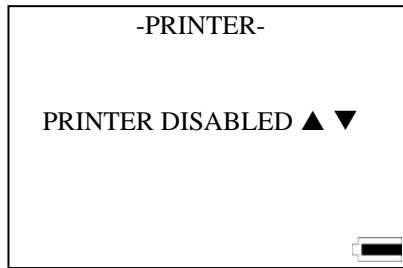


Figure 3-18: Printer Output Enable/Disable Screen

Ventilation Rates

Ventilation rates can be measured with the Q-TRAK Plus monitor in terms of % Outside Air. To select one of these options, choose **VENTILATION RATES** by using the ▲ or ▼ key while in the Main Menu and press the ↵ key.

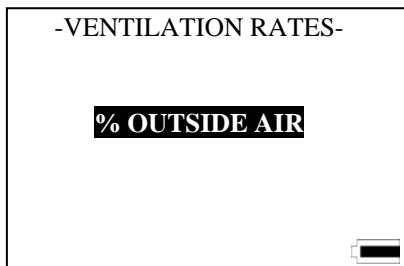


Figure 3-19: Ventilation Rates Select Screen

% Outside Air

Percentage Outside Air may be calculated by using a temperature- or CO₂-based method. Percentage Outside Air is calculated from the ratio between the differences of the supply air, return air, and outside air by using the following formula:

$$\% \textit{Outside Air} = \frac{(RA - SA) \times 100\%}{RA - OA}$$

Where:

RA = PPM of CO₂ or temperature in return air.

SA = PPM of CO₂ or temperature in supply air.

OA = PPM of CO₂ or temperature in outside air.

The following variables must be entered to perform the calculation: OUTSIDE AIR, SUPPLY AIR, and RETURN AIR. Values for each variable may be entered manually or by capturing a sample at the appropriate location.

Calculating the %Outside Air

1. While in the **VENTILATION RATES** menu, use the ▲ or ▼ key to scroll and select **%OUTSIDE AIR** and press the ↵ key.
2. Select either CO₂ or TEMPERATURE using the ▲ or ▼ key and press the ↵ key. Press the ▼ key to continue.

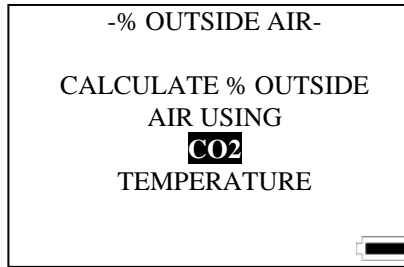


Figure 3-20: % Outside Air Screen

The following examples assume that CO2 was selected as the measured parameter. The % OUTSIDE AIR info screen will display.

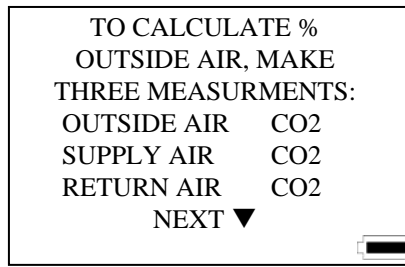


Figure 3-21: % Outside Air Info Screen

- Use the ▲ or ▼ key to select an appropriate variable (OUTSIDE AIR, SUPPLY AIR, or RETURN AIR).

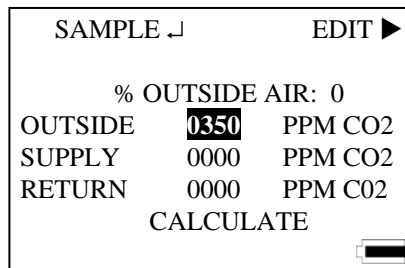


Figure 3-22: Sample or Edit CO₂ Parameters

- Screen selections allow you to press the ► or ↵ key to either edit the value or take a sample.
- Repeat steps 2 through 4 until all three variables have a valid value.

6. Use the ▲ or ▼ key to select **CALCULATE** and press the ↵ key. The **%OUTSIDE AIR** value will display at the top of the screen.
7. For repeated calculations repeat steps 3 through 6.
8. To exit press the ⏶ key.

Note: *None of the % Outside Air data is stored in memory. It is recommended that data be recorded before you exit the screen.*

If unrealistic data is entered (e.g. supply CO₂ value greater than return CO₂), the instrument will return an error message.

Statistics

The STATISTICS menu allows you to review either Single Point Statistics or Logged Test Statistics.

Single Point Statistics

The Single Point Statistics screen displays the results of each recorded single data point that was taken in the Survey Mode. When the screen is first displayed, it shows the information for the most recent single data point. Previous samples can be viewed by using the ▲ or ▼ key. A sample screen is shown below.

-SAMPLE 3-		
15:13:39		02/04/05
75.1	°F	TEMP 2
805	PPM	CO2
2.0	PPM	CO
67.1	°F	TEMP
35.1	%	RH

Figure 3-23: Single Point Statistics

Logged Test Statistics

The Logged Test Statistics screen displays the statistical summary for all valid data for each logged test. When the screen is first displayed, it shows a summary of the most recent test. A sample screen is shown in Figure 3-24.

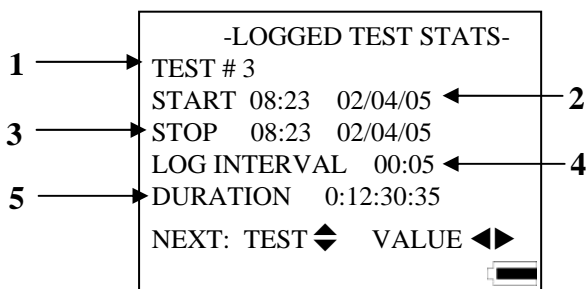


Figure 3-24: Logged Test Statistics Summary

Ref	Description
1	Test number (not user adjustable).
2	Start time and date.
3	Stop time and date.
4	Log interval used during sampling.
5	Duration of test.

To view the actual parameter statistics for each logged test statistics, use the ◀ or ▶ key. To view the previous test, use the ▲ or ▼ key. Press the ↵ or ⏶ key to return to the statistics menu. The CO₂ summary screen is shown in the following example.

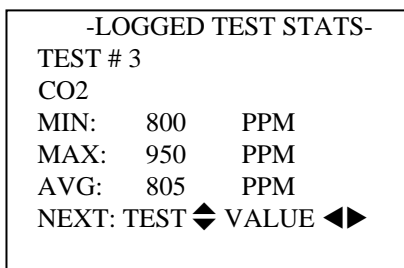


Figure 3-25: Logged Test Statistics, CO₂ Summary

Chapter 4

Calibration and Maintenance

The Model 8552/8554 Q-TRAK™ Plus IAQ Monitor requires very little maintenance to keep it performing well.

The Q-TRAK Plus monitor may be calibrated in the field using the instructions below. Even so, we recommend that you return your Q-TRAK Plus monitor to TSI for calibration annually. For a nominal fee, we will quickly clean and recalibrate the unit, update software and firmware, and return it to you in “as new” working condition along with a Certificate of Calibration and NIST Traceability. The factory calibration is more precise than can be accomplished with the procedures below. This “annual checkup” helps ensure that the Q-TRAK Plus monitor is always in good operating condition.

Calibrating the CO₂ Sensor

TSI recommends calibrating the Q-TRAK Plus monitor CO₂ measurement monthly to help ensure accurate readings.

To calibrate the CO₂ sensor, please follow the procedure below. You can also follow the prompts displayed on the screen while in user calibration mode. You will need a cylinder of zero CO₂ air or nitrogen for the zero calibration and a cylinder of gas with a known concentration of CO₂ for the span calibration. Contact your local TSI distributor for available CO₂ calibration kits (see Figure 4-4).

Note: *If using air for zero calibration, it must be specified to have less than 10 ppm CO₂. Ambient room air cannot be used (see Appendix A).*

The calibration procedure can be aborted at any time by pressing the ↑ key. Any step in the calibration procedure can be repeated by pressing the ▲ key.

1. To put the Q-TRAK Plus monitor into CO₂ calibration mode, press the ▲ or ▼ keys to select **CALIBRATION** in the Setup Menu.
2. Select **CO₂** by pressing the ▲ or ▼ keys the in the calibration submenu and press the ↵ key (see Figure 4-1).

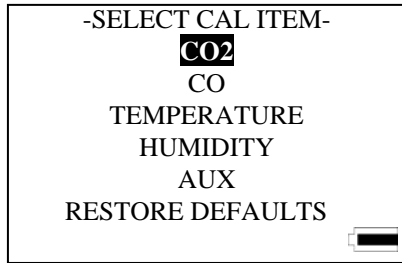


Figure 4-1: Calibration Submenu Screen

Locate the calibration collar and slide it over the main probe (see Figure 4-4).

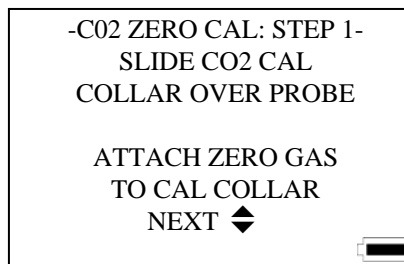


Figure 4-2: CO₂ Zero Calibration: Step 1 Screen

3. Install the regulator onto the zero calibration gas cylinder and connect tubing from the cylinder to the fitting marked **GAS IN**. Press the ↵ or ▼ key to continue.
4. Turn the gas on (0.3 L/min). Make sure the cylinder is not empty. It should quietly “hiss” when it is on. Press the ↵ or ▼ key to begin zero gas calibration (see Figure 4-3).

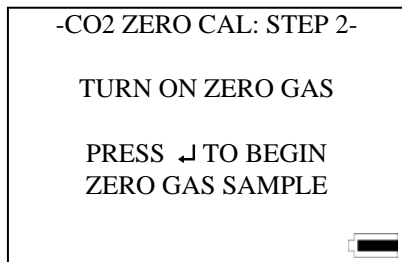


Figure 4-3: CO₂ Zero Calibration: Step 2 Screen



Figure 4–4: CO₂ Calibration

5. The Q-TRAK Plus monitor will indicate the status of the calibration process. After the instrument has averaged the zero gas, the display will highlight "ZERO CAL COMPLETE" (see Figure 4-5).

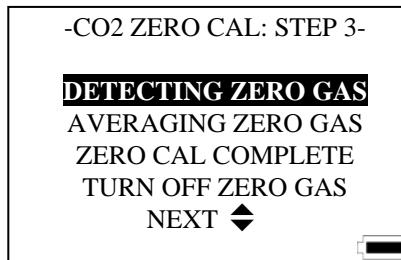


Figure 4–5: CO₂ Zero Calibration: Step 3 Screen

- Once the zero calibration is complete, turn the gas off. Press the \downarrow or \blacktriangledown key to continue to the span gas calibration step.
- Detach the regulator from the zero gas cylinder and install the regulator onto the span calibration gas cylinder. Press the \downarrow or \blacktriangledown key to continue (Figure 4-6).



Figure 4-6: CO₂ Span Calibration: Step 1 Screen

- Adjust the span value of the calibration gas being used by pressing \blacktriangleleft , or \blacktriangleright keys to move the cursor to the required field, and either the \blacktriangle or \blacktriangledown keys to increment or decrement the value. Press \downarrow to accept the calibration gas (Figure 4-7).

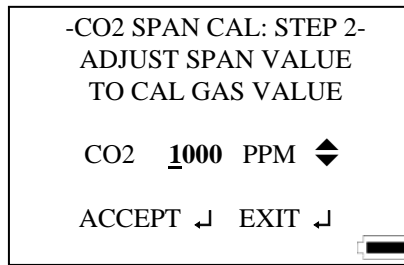


Figure 4-7: CO₂ Span Calibration: Step 2 Screen

- Turn on the span gas (0.3 L/min) and press the \downarrow key to begin calibrating the span (Figure 4-8).

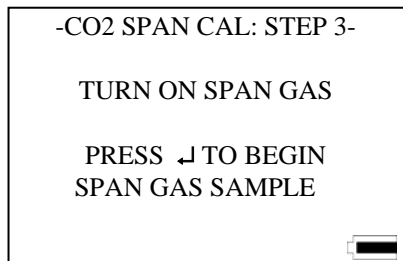


Figure 4-8: CO₂ Span Calibration: Step 3 Screen

10. The Q-TRAK Plus monitor will indicate the status of the calibration process. The process will end successfully when "SPAN CAL COMPLETE" message highlights (Figure 4-9).

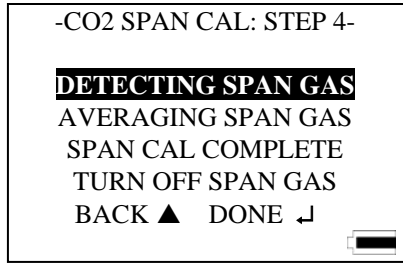


Figure 4–9: CO₂ Span Calibration: Step 4 Screen

11. Turn off the span gas, press the ↓ key to complete CO₂ user calibration, and remove the calibration collar.

If an error is detected during the zero or span calibration process, an error message will be displayed. The previous calibration values are kept. Press the ↑ or ↓ key to return to the Calibration Menu.

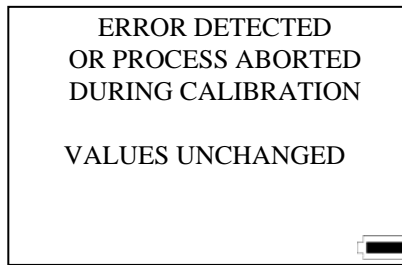


Figure 4–10: Error Detected or Process Aborted Screen

Calibrating the CO Sensor



Caution

The CO sensor in some models of TSI IAQ monitors may be adversely affected when exposed to isopropyl alcohol vapors released from TSI instruments utilizing condensation particle counting (CPC) technology. For maximum performance, keep CO sensors away from CPC-based instruments utilizing isopropyl alcohol.

TSI recommends calibrating the Q-TRAK Plus monitor's CO measurement monthly to help ensure accurate readings. The CO concentration measurement is affected by changes in temperature and atmospheric

pressure. Normal day-to-day variations due to local weather conditions have little effect. However, changes in altitude can cause more significant errors. For best accuracy, calibrate the Q-TRAK Plus monitor's CO measurement for your local conditions or if conditions change.

To calibrate the CO sensor, follow the procedure below. You can also follow the prompts displayed on the screen while in the user calibration mode. You will need a cylinder of pure air for the zero calibration and a cylinder of gas with a known concentration of CO for the span calibration, 35 ppm or 200 ppm is recommended. Contact your local TSI distributor for available CO calibration kits (Figure 4-11).

- Notes:**
- *Calibration with CO gas should always be done in a well-ventilated area.*
 - *100% Nitrogen cannot be used as a zero gas for the CO sensor.*

The calibration procedure can be aborted at any time by pressing the ↵ key.

1. To put the Q-TRAK Plus monitor into CO calibration mode, press the ▲ or ▼ keys to select **CALIBRATION** in the Setup Menu.
2. Select CO by pressing the ▲ or ▼ keys in the calibration submenu and press the ↵ key.

Locate the calibration collar and slide it over the main probe (Refer to Figure 4–11).



Figure 4–11: CO Calibration

3. Turn the gas on (0.3 L/min). Make sure the cylinder is not empty. It should quietly “hiss” when it is on. Press the \downarrow key to begin zero gas calibration (Figure 4-12).

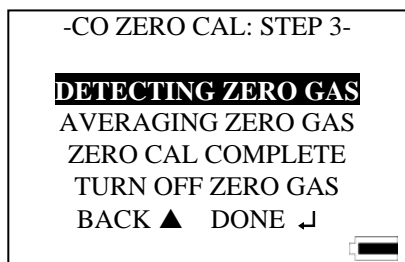


Figure 4–12: CO Zero Calibration Step 4

4. The Q-Trak Plus monitor will indicate the status of the calibration process. After the instrument has averaged the zero gas, the display will indicate "ZERO CAL COMPLETE".

5. Turn gas off. Detach the regulator from the zero CO calibration gas cylinder. Press the ↵ key to continue to the span gas calibration step.
6. Install the regulator onto the span calibration gas cylinder. Press the ↵ or ▼ key to continue.
7. Adjust the span value of the calibration gas being used by pressing the ▲ or ▼ key. Press the ↵ key to accept the calibration gas.
8. Turn on the span gas (0.3 L/min) and press the ↵ key to begin calibrating the span.
9. The Q-TRAK Plus monitor will indicate the status of the calibration process. The process will end successfully when "SPAN CAL COMPLETE" message blinks (Figure 4-13).

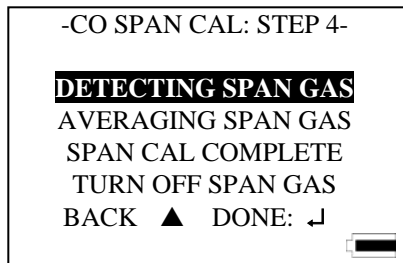


Figure 4–13: CO Span Calibration Step 4

10. Turn off the span gas, remove the calibration collar, and press the ↵ key to complete CO user calibration.

If an error is detected during the zero or span calibration process, an error message will be displayed. If an error is detected during the zero or span calibration process, an error message will be displayed. The previous calibration values are kept. Press the ↑ or ↵ key to return to the Calibration Menu.

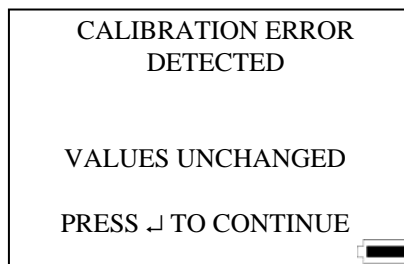


Figure 4–14: Error Detected or Process Aborted Screen

Calibrating the Temperature or Relative Humidity Measurement

To perform a temperature or humidity calibration on the Q-TRAK Plus monitor you will need a reference temperature or humidity device, one that is more accurate than the Q-TRAK Plus monitor. To obtain the best accuracy, care must be taken so that both the Q-TRAK Plus probe and the reference device are able to sense the same air. Also, it's best to calibrate at a temperature and humidity that is near the range you typically measure.

Note: *User calibration of humidity sensor can only be done in units of %RH.*



Caution

Never submerge the probe or Q-TRAK Plus monitor in water or any other liquid. The sensor will be damaged.

1. Locate the Q-TRAK Plus probe and the reference device sensor so that they sense the same air conditions.
2. Put the Q-TRAK Plus monitor into calibration mode by selecting either temperature or humidity in the Calibration Menu by using the ▲ or ▼ keys and press the ↵ key (refer to Figure 4-15).

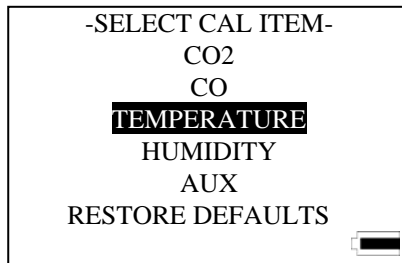


Figure 4-15: Calibration Submenu Screen

3. A reminder appears to ensure that the environmental conditions are stable before continuing with the calibration.
4. Compare the reading on the Q-TRAK Plus monitor with the reading from the reference device. If they differ, use the ▲ or ▼ key to adjust the Q-TRAK Plus display as needed so that the displayed measurement matches the measurement indicated by the reference device. Press the ↵ key to accept and continue.

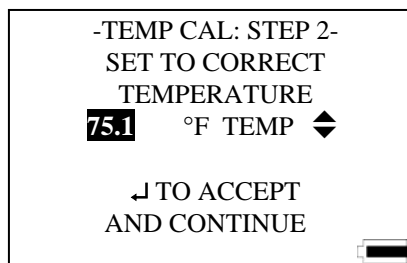


Figure 4–16: Temperature Calibration Screen

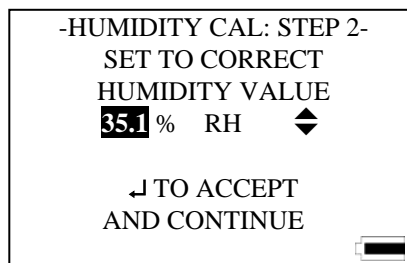


Figure 4–17: Humidity Calibration Screen

Note: *If the two readings are the same, there is no need to proceed with the calibration. Press the ⬆ key to terminate the calibration procedure.*

5. Q-TRAK Plus monitor will check to see if the measured parameter is stable. The screen displays the parameter in real time to show any fluctuations.
6. At the successful conclusion of the calibration, the screen will highlight "CAL COMPLETE". Press the ↵ key to continue.

If an error is detected during the calibration process, an error message will be displayed. The previous calibration values are kept. Press the ⬆ or the ↵ key to return to the User Calibration Menu.

Restore Factory Calibration

On very rare instances, it may be necessary to restore the calibration of the instrument to the original factory settings. This should only be used when absolutely necessary.

1. To restore the factory calibration, select **RESTORE DEFAULTS** in the Calibration Select page by using the ▲ or ▼ key and press the ↵ key.

2. The following warning message appears on the display. Press the ▼ key to continue or the ↵ key to abort (Figure 4-18).

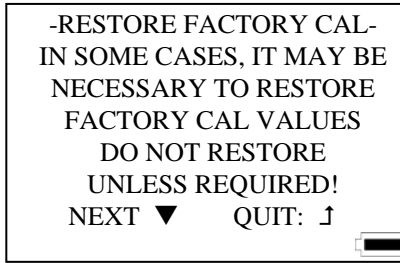


Figure 4–18: Restore Defaults Screen

3. Another menu will display a selection of parameters in which to restore the factory calibration. Use the ▲ or ▼ key to select the desired parameter and press the ↵ key to continue or ↶ to abort (Figure 4-19).

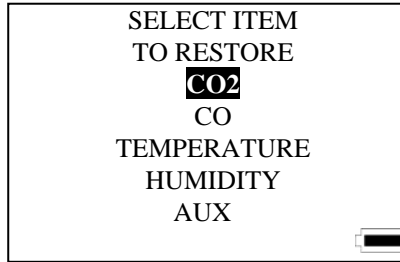


Figure 4–19: Select Item to Restore Screen

4. The display will indicate that the factory calibration of the desired parameter has been restored. A reminder that a user calibration should be performed is also shown. Press either the ↵ or ↶ key to return to the Setup menu.

Storage Precautions

When storing the Q-TRAK Plus monitor for more than 30 days, remove the batteries. This prevents damage due to battery leakage.

This instrument must be stored in a location where the temperature remains between –20 and 60°C (-4 and 140°F) and the relative humidity is between 15% and 90%.

Chapter 5

Auxiliary Sensors

Auxiliary sensors are available for the Q-TRAK™ Plus that enhance the functionality of the instrument. If you purchased an auxiliary sensor to measure another parameter, you may attach the sensor at any time during the Survey mode and the Q-TRAK Plus monitor will display the values instantly. The auxiliary sensor port is located at the top of the instrument.

To attach an auxiliary sensor to the instrument:

1. Grasp the connector on the auxiliary sensor.
2. Align the black release button with the back of the instrument.
3. Press the connector into place.

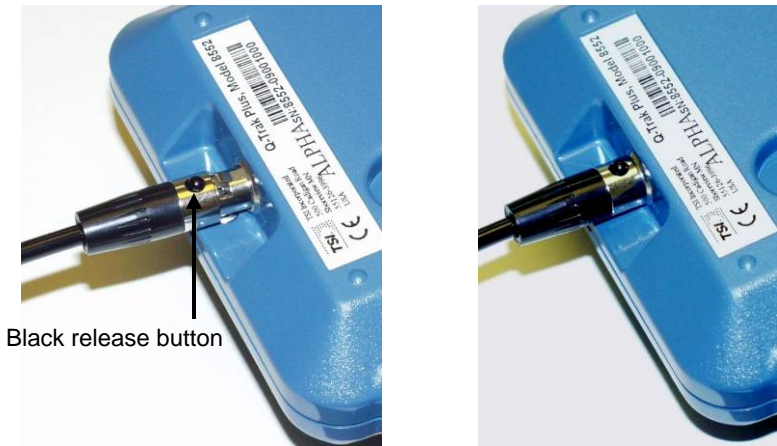


Figure 5-1: Attaching an Auxiliary Sensor

To detach an auxiliary sensor from the instrument:

1. Grasp the connector on the auxiliary sensor.
2. Press the black release button.
3. Pull the connector away from the instrument.

Model 8590 Auxiliary Temperature Sensor Accessory

The Model 8590 Auxiliary Temperature Sensor accessory allows you to make and record air temperature measurements. The Auxiliary Temperature Sensor accessory can be used to conduct temperature sampling and to log a

second temperature measurement. All data acquired with this accessory can be evaluated using TRAKPRO Data Analysis Software.

Model 8592 Air Velocity Probe (AVP) Accessory

The Model 8592 Air Velocity Probe (AVP) accessory allows you to make and record air velocity and flow rate measurements. The AVP can readily be used to conduct velocity sampling and to calculate air flow rate using average velocity and your input duct dimensions. All data acquired can be evaluated using TRAKPRO™ Data Analysis Software. A picture of the AVP is shown in Figure 5-2.

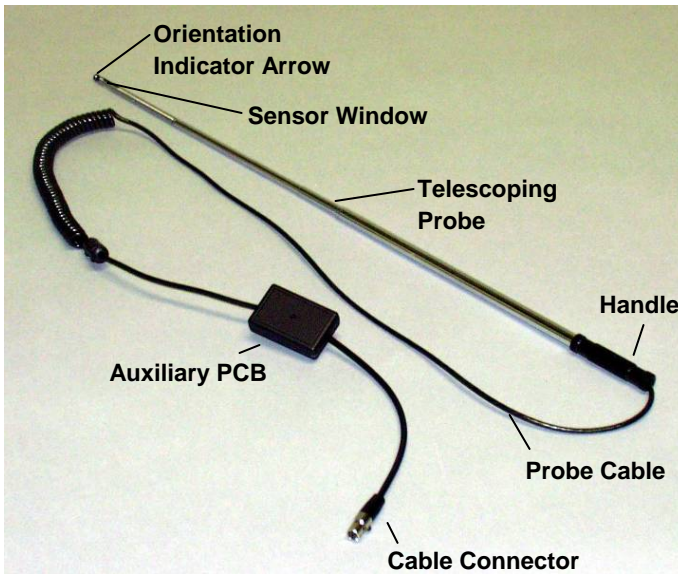


Figure 5-2: Model 8592 Air Velocity Probe Accessory

The AVP can be attached to the Q-TRAK Plus at anytime and will immediately display a real-time air velocity reading as an additional parameter along with the others normally shown on the Q-TRAK Plus.

Basic Applications

The AVP adds new functionality to the Q-TRAK Plus IAQ Monitor. The Q-TRAK Plus user can collect velocity-based measurements and conduct a greater variety of studies. Some applications are:

- HVAC duct velocity/flow rate measurements
- Air movement (comfort) in occupied zones
- Volumetric air flow in occupied zones
- Fume hood face velocity testing

- Clean room studies
- Draft measurements
- Wind tunnel testing
- Filter velocity checks

Upgrading Your Q-TRAK™ Plus IAQ Monitor and TRAKPRO™ Data Analysis Software

Past users of Q-TRAK Plus IAQ Monitor instruments will have to upgrade their instrument to be compatible with the Model 8592 Air Velocity Probe accessory. Additionally, for users of TRAKPRO Data Analysis Software, a new revision must be downloaded from the TSI website.

TSI provides a simple, automated procedure for you to easily perform these upgrades. These upgrades can readily be done in the field and do not require returning your instrument to TSI. When your instrument is returned to TSI for annual calibration or service, TSI will upgrade the firmware for you.



Caution

- Instrument firmware and TRAKPRO upgrades are necessary for compatibility with the Model 8592 Air Velocity Probe accessory.
- TSI recommends uploading all logged data from the Q-TRAK Plus instrument to TRAKPRO for permanent storage **before** upgrading the instrument firmware! Not doing so could result in the loss of logged data.

A product information CD is included with the purchase of a Model 8592 Air Velocity Probe accessory. Briefly, the steps to upgrade the firmware of your Q-TRAK Plus instrument are:

- Connect the Q-TRAK serial cable to both the instrument and your computer.
- Insert the product CD into your computer's CD disk drive.
- Select the "Upgrade Q-TRAK Plus Firmware" menu option.
- Click **Start** to commence the upgrade process.
- When the upgrade process is completed, click **Close** to exit.

The first step in the upgrade procedure is to connect the Q-TRAK serial cable to your instrument and your computer just as you would when using TRAKPRO software.

After inserting the product CD into your computer's CD disk drive, the CD will automatically run and its main menu will be displayed. From the CD's main menu, click once on the "Upgrade Q-TRAK Plus Firmware" menu option. The Q-TRAK Plus Flash Memory Programmer will be started and its menu will be displayed as shown in Figure 5-3.



Figure 5-3. Q-TRAK Plus Flash Memory Programmer Menu—Upon Starting

From this menu, click once on the **Start** button to begin the firmware upgrade process. During this upgrade process, a new version of firmware will be written into the instrument and a status bar will be shown to illustrate progress. This process will last about 7 minutes.

Once the upgrade process has successfully completed, the Q-TRAK Plus Flash Memory Programmer menu will be displayed as shown in Figure 5-4. From here, click once on the **Close** button to terminate the program. Your instrument is now ready to communicate with the Model 8592 Air Velocity Probe accessory.

If you use TRAKPRO Data Analysis Software, you will need to upgrade to a new revision (3.41 or newer). This TRAKPRO upgrade can be done from the product CD main menu or by visiting www.tsi.com.

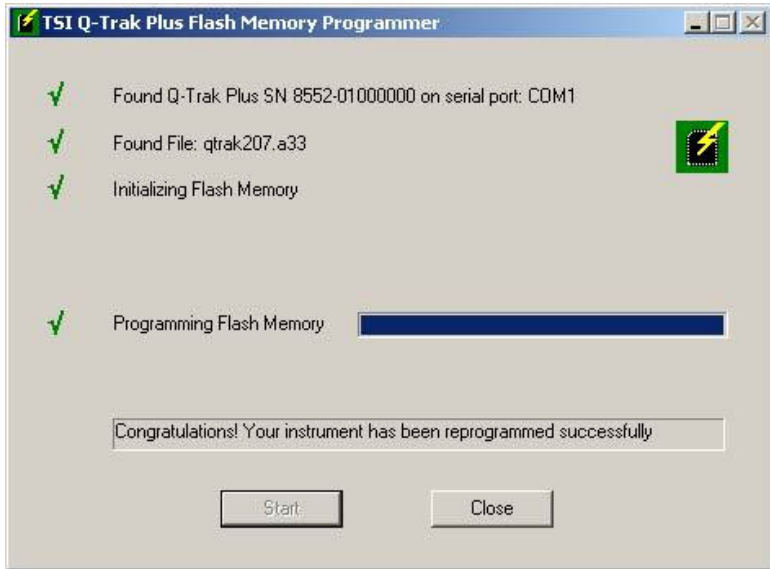


Figure 5-4: Q-TRAK Plus Flash Memory Programmer Menu—Upon Completion

Using the Telescoping Probe

To extend the probe, grasp the handle in one hand while gently pulling on the probe tip with your other hand. Be aware that the AVP cable slides through the telescoping probe as it is extended or retracted.

To retract the probe, grasp the handle and push the probe tip toward the handle. The rest of the probe sections can then be collapsed using a finger or the palm of your hand. Be sure not to block or hold the cable at the handle since the cable should freely pass through the handle while the probe is collapsed.

The thermistor bead velocity sensor is located in the sensor window of the telescoping probe. When using the probe, be sure that the last section of the probe is fully extended exposing the entire sensor window.

Measuring Air Velocity

When the AVP is connected to the Q-TRAK Plus, velocity measurements will automatically be displayed along with the standard Q-TRAK Plus parameters. The velocity measurement units are user-selectable between feet per minute (fpm) and meters per second (m/s), and between actual and standard units as illustrated in Table 5-1. To select the velocity measurement units, highlight the velocity reading

with the ▲ or ▼ (up/down arrow) key and then change the units displayed using the ◀ or ▶ (left/right arrow) key.

Table 5-1: Velocity Measurement Units

Velocity Measurement Units	Actual Velocity Units	Standard Velocity Units
Feet per minute	fpm	sfp
Meters per second	m/s	sm/s

Measurements are made by holding the probe so the sensor window is positioned in the desired measurement location with the sensor window perpendicular to the air flow stream. Be sure the sensor window is fully exposed and the orientation indicator arrow on the probe tip is pointing downstream. Hold the probe as still as possible while the measurement is taken.



C a u t i o n
When positioning the probe for a measurement, be certain the orientation indicator arrow on the probe tip is pointing downstream in the direction of the air flow.

Measuring Air Flow Rate or Average Velocity

Volumetric flow rate can be estimated based on an average velocity measurement across a known area such as a duct. You can input the cross-sectional dimensions for round, square, or rectangular ducts and flow rate will be displayed in cfm, m³/h or L/s accordingly. The measurement units can be changed by simply highlighting the flow displayed with the ▲ or ▼ key and then changing the units displayed using the ◀ or ▶ key.

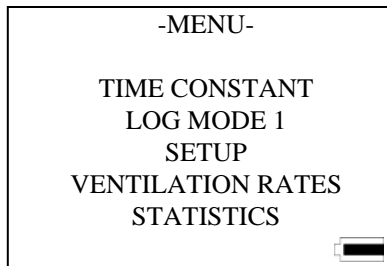
Table 5-2: Flow Rate Measurement Units

Flow Rate Measurement Units	Actual Flow Rate Units	Standard Flow Rate Units
Cubic feet per minute	cfm	scfm
Cubic meters per hour	m ³ /h	sm ³ /h
Liters per second	L/s	sL/s

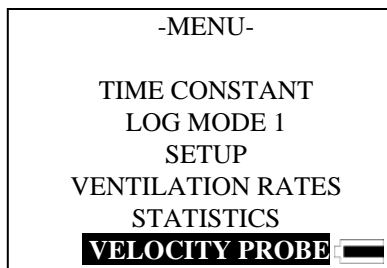
Other applications where average velocity calculations are important include wind tunnel testing, across a filter face and testing fume hood face velocities. In addition to calculating the average velocity from a series of sample points, the minimum and maximum velocities will also be displayed identifying areas that may require corrective action.

Q-TRAK Plus LCD Display During AVP Operation

The following figures show the screens/pages displayed on the Q-TRAK Plus LCD during operation with the AVP connected to the instrument.



**Figure 5-5: Default Menu of the Q-TRAK Plus
(no accessory probe attached)**



**Figure 5-6: Default Menu of the Q-TRAK Plus
(with AVP attached)**

You may highlight **VELOCITY PROBE** using the ▲ or ▼ key. Pressing the ↵ (enter) key will select the **VELOCITY PROBE** option and display the **VELOCITY MENU** shown in Figure 5-7.

From the velocity menu, you can proceed with a velocity averaging measurement, such as a fume hood face velocity measurement, or you can proceed with a volumetric flow rate measurement, such as a supply duct traverse measurement.

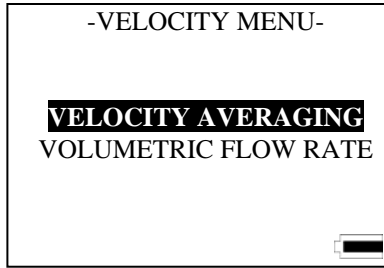


Figure 5-7: Velocity Menu Options

Measuring Average Velocity

VELOCITY AVERAGING may be selected by using the ▲ or ▼ key and pressing the ↵ key will display the **VELOCITY AVERAGING** menu.

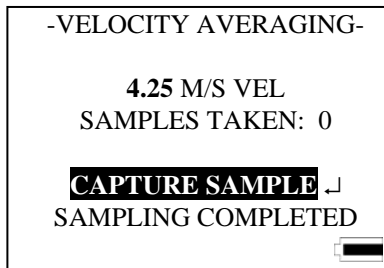


Figure 5-8: Velocity Averaging Menu

With **CAPTURE SAMPLE** highlighted, as shown in Figure 5-8, a sample is acquired using the ↵ key. When all of the desired samples have been taken, use the ▼ key to select **SAMPLING COMPLETED** and press the ↵ key to terminate sampling.

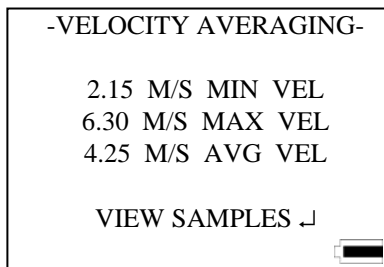


Figure 5-9: Average Velocity Statistics Page

Statistics for the sample set will then be displayed as shown in Figure 5-9. Pressing the ↵ (escape) key will return to the main menu.

Individual sample points can be reviewed by pressing the \downarrow key to select **VIEW SAMPLES**.

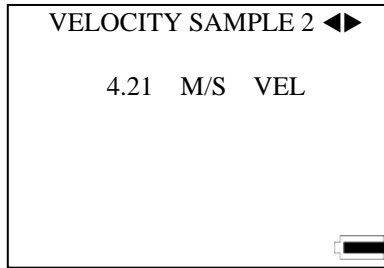


Figure 5-10: Reviewing Individual Samples from the Velocity Sample Set

Using the \leftarrow or \rightarrow key allows you to view individual samples from the velocity sample set. The \leftarrow key will display a previous or lower-numbered sample and the \rightarrow key will display the next or higher-numbered sample. The sample set is displayed as a continuous loop. When the last sample is reached, pressing the \rightarrow key will take you back to the first sample. The maximum number of samples is 99. Pressing the \uparrow key will return you to average velocity statistics page.

Measuring Volumetric Flow Rate

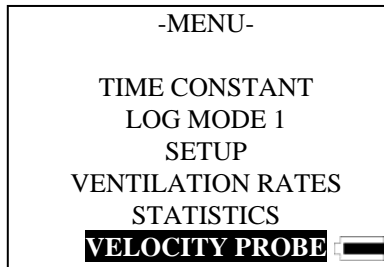


Figure 5-11: Display Menu when the AVP is Attached to the Q-TRAK Plus

From the main menu, may highlight **VELOCITY PROBE** using the \blacktriangle or \blacktriangledown key. Pressing the \downarrow key will select the **VELOCITY PROBE** option and display the **VELOCITY MENU** shown in Figure 5-12.

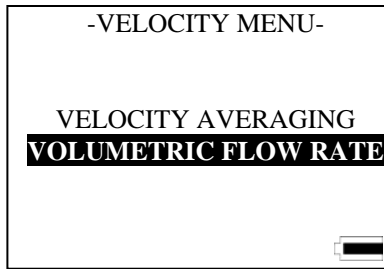


Figure 5-12: Velocity Menu Options

Select **VOLUMETRIC FLOW RATE** using the ▲ or ▼ key and press the ↵ key to display the **VOLUMETRIC FLOW RATE** menu shown in Figure 5-12.

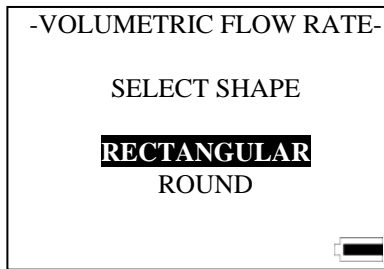


Figure 5-13: Selecting the Duct Shape

Highlight the shape of the duct using the ▲ or ▼ key and press the ↵ key to select.

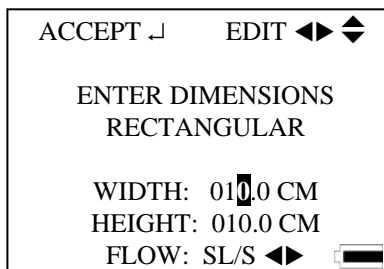


Figure 5-14: Entering Rectangular Duct Dimensions

For square or rectangular ducts, use the ◀ or ▶ key to move to a specific digit and use the ▲ or ▼ key to increment or decrement the digit, accordingly. Press the ↵ key when you've entered the correct width dimension.

Repeat these steps to enter the height dimension. When both dimensions are set correctly, press the enter key [↵].

The minimum dimension that can be entered is 4 inches (10 cm) and the maximum is 100 inches (300 cm). Dimensions can be entered in increments of 0.1 inches or 0.1 cm. When velocity measurements are in metric units (m/s), then metric units (cm) are used for duct dimensions and you can select between m^3/h and L/s for flow rate units. This selection is made by using the ◀ or ▶ key.

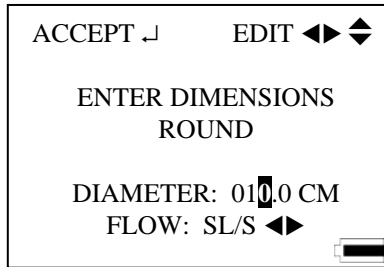


Figure 5-15: Entering Round Duct Dimensions

The dimensioning procedure for round ducts is similar except only the duct diameter needs to be entered as shown in Figure 5-15. Follow a similar key sequence to enter the diameter dimension and flow rate units.

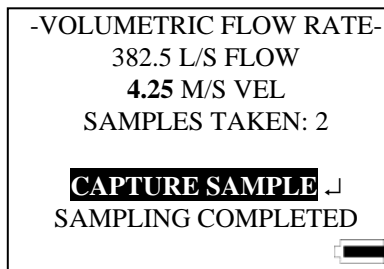


Figure 5-16: Sample Capturing Display

A duct traverse measurement can now be conducted from which an average velocity and flow rate will be calculated. Each velocity sample is captured by pressing the ↵ key while **CAPTURE SAMPLE** is highlighted. The word **SAMPLING** will be blinking while the measurement is being acquired. Be careful to keep the probe motionless in the same position while the measurement is being acquired. After the measurement is complete, **CAPTURE SAMPLE** will be displayed and the instrument is ready for the next sample. Up to 99 sample points may

be taken to comprise a sample set. The measured velocity and a calculated volumetric flow rate will be displayed for each sample taken. When you have completed acquiring all traverse sample points, use the ▼ key to highlight **SAMPLING COMPLETE** and press the ↵ key to complete the measurement.

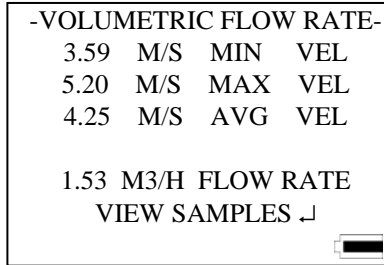


Figure 5-17: Volumetric Flow Rate Measurement Statistics Page

The minimum, average, and maximum velocities of the sample set, along with the calculated volumetric flow rate, will be displayed as shown in Figure 5-17. Individual sample points can be reviewed by pressing the ↵ key to select **VIEW SAMPLES**.

Using the ◀ or ▶ key allows you to step through the velocity sample set by. The ◀ key will display a previous or lower-numbered sample and the ▶ key will display the next or higher-numbered sample. The sample set is displayed as a continuous loop. When the last sample is reached, pressing the ▶ key will take you back to the first sample. The maximum number of samples is 99. Pressing the ↑ key will return you to the Volumetric Flow Rate statistics page.

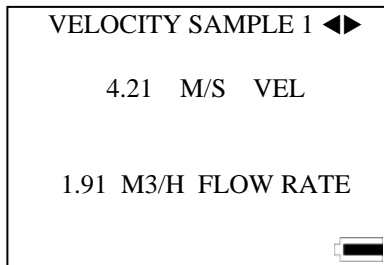


Figure 5-18: Sample #1 Of The Velocity Sample Set

Maintenance

Periodically inspect the AVP sensor window to ensure that it is clean. Dust and oil deposits on the sensor will affect measurement accuracy.

The telescoping probe should also be kept clean. Dirt or oil accumulation will affect the ability to extend and retract the probe. Use a soft cloth dampened with water to remove accumulation of unwanted material. Dry the probe with a gentle stream of air or allow to air dry. If oil or grease is present, a small amount of high-grade isopropyl alcohol may be applied to clean the AVP.



Caution

Be sure the probe is disconnected from the Q-TRAK Plus before cleaning so the AVP is not powered. Do **not** use strong solvents or high-pressure air to clean the probe or sensor—permanent damage could result.

Calibration

For the highest degree of accuracy, TSI recommends that instruments be returned to the factory annually for calibration. For a nominal fee, the probe will be checked and recalibrated to original factory specifications and returned to you with a new National Institute of Standards and Technology (NIST) calibration certificate. To have your AVP recalibrated, please follow TSI's Returned Material Authorization (RMA) procedure on our web site at <http://rma.tsi.com>.

Special Display Messages

In extreme cases, temperature or velocity conditions may exceed the operating specifications of the AVP potentially inhibiting the AVP from providing an accurate measurement. If the temperature at the sensor exceeds the maximum operating limit, the Q-TRAK Plus display will read **TEMP HI**. If temperature is below the minimum operating range, the instrument display will read **TEMP LO**. If the air velocity exceeds the upper range of the specification, the Q-TRAK Plus display will read **VEL HI**. Under such conditions, the measurement accuracy may be compromised and the AVP might be damaged.

Storage

It is recommended that the Air Velocity Probe accessory be stored unattached from the Q-TRAK Plus IAQ Monitor when not in use.

Chapter 6

Troubleshooting

The table below lists the symptoms, possible causes, and recommended solutions for the Model 8552/8554 Q-TRAK™ Plus IAQ Monitor.

Symptom	Possible Cause	Corrective Action
No display	Unit not switched on. Low or dead batteries. Dirty battery contacts.	Switch unit on. Replace the batteries or plug in the AC adapter. Clean the battery contacts by rubbing a rubber eraser on each contact.
LO BAT message appears	Low battery charge. Incorrect AC adapter. Low AC line voltage. Dirty battery contacts.	Replace batteries or use AC adapter. Replace with the correct AC adapter. Correct the AC line voltage; use batteries. Clean the battery contacts.
0% MEM displays	Memory is full.	Download the logged and single point memory to a PC using TRAKPRO software if desired. Clear memory.
Humidity reading near zero or not believable	Probe exposed to intense light.	Shade the probe while taking samples.
No keypad response	Display/Lockout switch in lockout position.	Slide lockout switch to normal position.
FACTORY SERVICE reminder is displayed	Instrument is near the end of the annual calibration period.	Press the ↓ key to continue. For optimum performance, TSI recommends annual factory servicing.
"CO CAL"	The CO sensor requires calibration.	See CO sensor specifications; approximately page 121 (CO negative readings).
"CO2 FLT"	There is a fault in the CO ₂ sensor.	Factory service is required to correct this fault condition.

Symptom	Possible Cause	Corrective Action
"TEMP FLT"	There is a fault in the temperature sensor.	Factory service is required to correct this fault.
"HUMID FLT"	There is a fault in the humidity sensor.	Factory service is required to correct this fault.

Appendix A

Specifications

Specifications are subject to change without notice.

CO₂

Sensor type	Non-Dispersive Infrared (NDIR)
Range	0 to 5000 ppm
Accuracy	±(3% of reading + 50 ppm) at 25°C (Add uncertainty of ±0.36% of reading per °C [±0.2% of reading per °F] for change in temperature.)
Resolution	1 ppm

Temperature Sensor

Type	Thermistor
Range	0 to 50°C (32 to 122°F)
Accuracy	±0.6°C (1.0°F)
Resolution	0.1°C (0.1°F)
Response time	30 seconds (90% of final value, air velocity at 2 m/s)
Display units	°C or °F (user selectable)

Humidity

Sensor type	Thin-film capacitive
Range	5 to 95% RH
Accuracy	±3% RH (includes ±1% hysteresis.)
Resolution	0.1% RH
Response time	20 seconds (for 63% of final value)

CO Sensor

Sensor type	Electro-chemical
Range	0 to 500 ppm
Accuracy	±3% of reading or 3 ppm whichever is greater [add ±0.5%/°C (0.28%/°F) away from calibration temperature]
Resolution	1 ppm
Response time	<60 seconds to 90% of final value.

Power Requirements

Batteries	Four AA-size alkaline or rechargeable
<i>or</i>	
AC adapter	6 VDC nominal, 300 mA [Q-TRAK Plus monitor mates with 5.5 mm OD x 2.1 mm ID plug, center pin positive(+)]
Approximate battery life	Up through 20 hours (alkaline).

Physical

External dimensions.....	107 mm x 183 mm x 38 mm (4.2 in. x 7.2 in x 1.7 in.)
Probe length	31.2 mm (12.3 in.)
Probe diameter	1.8 cm (0.75 in.)
Weight	0.59 kg (1.3 pounds) [with batteries]
Display	128 x 64 Graphics display module with backlight.

Maintenance Schedule

Factory calibration	Annually
User calibration.....	As needed

Serial Interface

Type	RS-232
Baud rate	9600
Data bits	8
Stop bits	1
Handshaking	None
Data format	ASCII

Model 8592 Air Velocity Probe

Velocity

Range.....0 to 4000 fpm (0 to 20 m/s)
Accuracy.....5% of reading or ± 5 fpm (± 0.025 m/s),
whichever is greater.

Temperature Range

Operating Range.....5 to 45°C (41 to 113°F)
Storage Range.....-20 to 60°C (-4 to 140°F)

Volumetric Flow Rate

Range.....up to 275,000 cfm
up to 467,000 m³/h
up to 130,000 L/s

Duct Size

Range.....4 to 100 in. in 0.1-in. increments
10 to 300 cm in 0.1-cm increments

Averaging Capability

LimitUp to 99 sample points

Probe Dimensions

Probe tip diameter.....0.25 in. (0.6 cm)
Probe base diameter.....0.39 in. (1.0 cm)
Probe length collapsed.....11.5 in. (29 cm)
Probe length extended43 in. (109 cm)

Cable Length

Cable length relaxed56 in. (142 cm)
Cable length extended100 in. (254 cm)

Data Logging

Data points.....48,000 (approx. 33 days of logging at
1 minute intervals).

Appendix B

Standard Velocity vs. Actual Velocity Measurements

Thermal air velocity sensors are sensitive to changes in both air density and air velocity. Thermal anemometers, therefore, typically indicate velocities with reference to a set of standard conditions. For TSI instruments, standard conditions are defined as 70°F (21.1°C) and 14.7 psia (101.4 kPa). Other manufacturers may use a different set of standard conditions.

Standard velocity is the velocity the air would be moving if temperature and pressure were at these standard conditions. It is usually the most useful measure of air flow because it defines the heat carrying capacity of the air.

Actual velocity is the velocity at which a microscopic particle of dust would be traveling if it were in the air stream with zero acceleration.

In some instances, actual air velocity may be of interest rather than standard air velocity. To obtain the actual velocity, multiply the standard velocity by the density correction factor:

$$\text{Actual Velocity} = (\text{Standard Velocity}) \frac{(460 + T)(14.7)}{(460 + 70)(P)}$$

where T is ambient temperature in °F and P is the ambient pressure in psia.

The conversion in metric units is:

$$\text{Actual Velocity} = (\text{Standard Velocity}) \frac{(273 + T_m)(101.4)}{(273 + 21.1)(P_m)}$$

where T_m is the ambient temperature in °C and P_m is the ambient pressure in kPa.



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