

OWNER'S MANUAL

CompuFlow 8652 Temperature and Humidity Meter



ALNOR[®]

TSI Incorporated

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Knowing that inoperative or defective instruments are as detrimental to TSI as they are to our customers, our service policy is designed to give prompt attention to any problems. If any malfunction is discovered, please contact your nearest sales office or representative, or call Customer Service department at (800) 861-7513 (USA) and (1) 651-490-2889 (International).

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SECTION 1

General Description

The Model 8652 measures temperature and relative humidity and calculates dew point and wet bulb. It also calculates the percentage of outside (make up) air in a ventilation system, using temperature measurements. The instrument has the ability to data log, determine statistics and recall individual data points. The Model 8652 will retain data even after it is turned off.

The 8652 ships in a soft-sided carrying case that holds the meter and probe, a probe stand, a battery eliminator, CompuDAT software disk, and a computer interface cable. There is space in the case for the 8522 MicroPrinter and charger. The instrument ships with batteries (which are not installed), a calibration sheet, and this Owner's Manual.

SECTION 2

Safety

When using the 8652 to check for temperature or humidity values, make certain that you can safely raise and hold the instrument while making measurements. Be especially careful when working on a ladder.

Observe all necessary precautions so that the unit does not become caught in moving machinery or touch any exposed electrical wiring.

DANGER:

Use with corrosive or other dangerous or explosive gas mixtures is not recommended.

WARNING!

Do **not** expose the sensing probe to excessive heat—it can damage the sensors and probe.

SECTION 3

Setting-Up

Supplying Power to the Model 8652

The Model 8652 can be powered in one of two ways: four size AA batteries or the optional AC adapter.

Installing the Batteries

Insert four AA batteries as indicated by the diagram located on the inside of the battery compartment. The Model 8652 is designed to operate only with alkaline batteries, which are included. At 15% battery life remaining, the battery indicator will show that the batteries need to be changed.

Using the Optional AC Adapter

The optional AC adapter allows you to power the Model 8652 from an AC outlet. When using the AC adapter, the batteries (if installed) will be bypassed. The AC adapter is **NOT** a battery charger.

Start up Sequence for the Model 8652

When the instrument is turned on, all segments of the display will light up and then the meter goes through a start-up sequence.

Battery Percentage

This shows the remaining amount of battery power.

Log Percentage

This shows how much of the datalogging memory is still available.

Baud Rate

The Model 8652 has a DEFAULT baud rate of 1200, which allows it to communicate with the optional portable Micro-Printer 8522. It has a variable baud rate used when downloading. By increasing the baud rate, the data will download faster.

The instrument baud rate is displayed during the initial power up sequence. To change the baud rate, press and hold

either ▲ or ▼ key during power-up sequence while baud rate is displayed. Release the key when the Model 8652 beeps twice. Use the ▲ or ▼ keys to scroll through the available values of 1200, 2400, 4800, 9600 and 19,200. Press ENTER to set the value that is displayed.

Setting the Real-Time Clock

The Model 8652 has an internal clock that keeps track of the time (the format is HH.MM where HH is the hour in 24-hour format, and MM is minutes) and the date. It is very important to set the time and date correctly, otherwise date and time stamping of recorded data will not be correct.

To set the time and date, press and hold either ▲ or ▼ key during the power-up sequence when the time is displayed. Release the keys when the Model 8652 beeps twice. You will have an opportunity to view and/or change the minutes (rnin), hours, year, month and date in

sequence. Use ▲ or ▼ key to change any settings. Use the ENTER key to store each setting and advance to the next one.

Barometric Pressure

The default barometric pressure is 29.92. To change this, press and hold either ▲ or ▼ keys during the power-up sequence when the pressure is displayed. Release the keys when the Model 8652 beeps twice. Use ▲ or ▼ key to change any settings. Press ENTER to store the new value.

The instrument then displays current conditions. **To skip the start-up sequence**, press and hold the ENTER key at any point of the start-up sequence, until the meter beeps.

SECTION 4

Detailed Operation

Keypad Functions

When pressing the keys on the front panel, the Model 8652 will beep to confirm the function. If you press a key and it does not beep, then the instrument does not allow that function during the selected mode.

ON/OFF Key

Press the ON/OFF key to turn the instrument on and off. When the instrument is first turned on, it goes through a preprogrammed power-up sequence that includes an internal self-check (when all displayable items are shown). The Model 8652 begins by displaying percentage of battery life remaining (accurate for alkaline batteries only), the percentage of memory available, baud rate, time (HH.MM) and entered barometric pressure. At this point, the Model 8652 will start measuring temperature and % relative humidity.

If a problem is detected, the display will show “CAL” to indicate that it should be returned for service and/or calibration.

***Note:** To skip the start-up display, press ENTER at any time during the power-up sequence.*

TEMP Key

The meter will always display temperature readings from the permanent sensor on the lower line of the display. When you wish to take an external temperature reading using an RTD probe, plug any three-pronged RTD probe into the right side. Then, press the **TEMP** key to view the temperature from the resistive temperature detector (RTD). The letters “Prb” will display on the top line of the display and the actual temperature from the RTD on the bottom line.

To return to reading temperatures from the permanent probe, press the **TEMP** key again.

***Note:** If the external RTD probe becomes unplugged while in “Prb” mode, the display will read “over.” If the RTD probe is not plugged in and the TEMP key is pressed, nothing will happen.*

HUMID Key

Press HUMID to toggle between %RH or dew point displayed on the top line of the display.

WETBULB Key

Press WETBULB to display the wet bulb measurement on the top line of the display.

READ/ENTER Key

This is a dual function key. It reads measurement samples and it can be used to accept a value or condition or to return to regular measuring mode.

Press READ to take a sample reading; the instrument takes a measurement over five seconds. When the display is flashing SAMPLE, it counts down the five-

second sample time: five, four, three, two. Then the display shows **COUNT** and a number. This is the number of individual readings in this test ID. All measurements are stored in memory.

***Note:** Be certain to press **NEXT TEST** key to save readings into a different test ID.*

TIME LOG Key

To set up the instrument so it automatically takes measurements, use the **TIME LOG** key. This allows you to program a logging time and interval, and the meter will read and store measurements that can be viewed later.

Press the **TIME LOG** key. Use the ▲ or ▼ keys to select “On”. Press the **ENTER** key.

“LOG” will light up on the display and the logging interval is shown. Use the ▲ or ▼ keys to scroll through the log interval choices. The choices are: 5, 10,

15, 20, and 30 seconds (**SEC**), and 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 15, 20, 25, 30, and 60 minutes (**rnin**). Press the **ENTER** key to accept your choice.

Next, you will choose the number of readings that you want the instrument to take. The choices are “**COnt**” or 1 to 9999. Use the **▲** or **▼** keys to scroll through the choices, and press **ENTER** to accept your choice. If “**COnt**” is chosen, the instrument will sample continuously until it is either stopped manually, runs out of memory, or the batteries run out. If a number between 1 and 9999 is chosen, the instrument will take that number of samples and then stop storing readings.

The instrument will then return to a normal measuring mode.

Press **ENTER** to start the automatic time log. **LOG** will flash on the display while this function is running. You need to press **ENTER** to stop the logging function if it was set for “**COnt**”. You may

also press **ENTER** at any time during the logging function to cancel a preset number of samples.

The log mode remains programmed until you go into **TIME LOG** and turn this feature “**OFF**”. Simply press **ENTER** to start another time log test.

NEXT TEST Key

Press **NEXT TEST** to advance to the next test ID. If the current test ID does not have anything stored, it will not advance to the next test ID.

The Model 8652 will automatically increment the test ID number under the following conditions:

- turning off the Model 8652 (if there is stored data)
- setting any data logging sample
- taking a %OA measurement after a normal sample
- taking a normal sample after a %OA measurement.

%OA (Percent Outside Air) Key

The percentage of outside air can be calculated using temperature measurements using the following equation:

$$\%OA = (T_R - T_S) / (T_R - T_O) \times 100\%$$

where %OA = Percentage of outside air

T_R = Temperature of return air

T_S = Temperature of supply air

T_O = Temperature of outside air

IMPORTANT:

Readings should be taken at the Air Handling Unit only, since there may be components in the system that change the temperature that are not evident upon initial examination.

Calculating Outside Air measurements by taking readings at the supply air to a room will not give the correct answer.

Reheat coils and chiller coils will change the temperature of the readings and give incorrect answers.

The general procedure is to take a reading in each of three modes: return air, outside air, and supply air. Pressing

ENTER while in %OA mode will store all three samples and then give you the calculated value on the display. You may use the ▲ or ▼ keys to move from mode to mode. You may press the NEXT TEST key at any time to exit back to normal sampling.

Details on the procedure are as follows:

Press the %OA key once to begin. To choose a measurement mode (OA, SUPPLY, RETURN), use the ▲ or ▼ keys followed by the ENTER key.

In **return air** mode, “RETURN” will appear on the display. The current temperature value will show on the bottom line of the display. The top line of the display will show either dashes (if this is the first time using %OA function or if the memory has been cleared) or it will show the last value stored for return air. Press READ/ENTER once the temperature has stabilized.

The stored measurement will display on the top line. This is the reading that will be used to calculate percentage of outside air.

If the measurement is not acceptable or the temperature is not yet stable, wait a minute and then take another reading to overwrite the value on the top line.

Once the top line value is acceptable, press the ▲ or ▼ keys to move the icon to either Supply or %OA, whichever reading you are prepared to make next.

Repeat the procedure with both a Supply measurement and an Outside Air measurement.

Remember, the top line measurement is what will be used in the calculation. Once all three readings are stored, press the ▲ or ▼ keys to advance to %OA.

“OA%” will appear on the display along with the % outside air value. To put this %OA value *and the values from the*

three other modes into memory, press the READ/ENTER key.

Note: “Err” will display if not enough information is available or a negative % value is calculated.

To make changes to one of the other three readings without putting these values to memory yet, press the ▲ or ▼ keys to review the values and press READ/ENTER to overwrite the value.

To exit this procedure completely without putting any values to memory, press NEXT TEST.

To take another % outside air measurement, make sure you pressed READ/ENTER to put the values to memory. Then use the ▲ or ▼ keys to review the measurements and take new samples for supply and return. The stored Outside Air reading can be used

in all percentage calculations, unless you input a new value.

BP Key

To change the stored barometric pressure, press **BP** and use the **▲** or **▼** keys to change the value. Press **ENTER** to return to normal measuring mode.

RECALL Key

The **RECALL** key lets you review data from a particular test ID.

Press the **RECALL** key. The most current test ID number will show on the display. Press **ENTER** to review measurements in this test ID, or use the **▲** or **▼** keys to choose another test ID to review. If dashes appear in the top line of the display, there is no stored data in that particular test ID.

Use up arrow to view average, total number of samples (count), minimum reading, maximum reading, and individual readings for the selected test ID. The

samples will be displayed in the order that they were taken.

To view a different test ID, you need to press **RECALL** again.

The display will always show temperature measurements. To review other measurements, press the desired measurement button. For example, if you wish to see humidity measurements, press **HUMID**. Press **HUMID** again to see dew point readings. For the external RTD, press the **TEMP** key. If there is no data for that measurement type “-----” will be displayed. Press another measurement key to view more data or press **ENTER** to return to measuring mode.

***Note:** To view return air, supply air or outside air data individually, you must download to computer or print out the values. %OA is reviewable on-screen.*

Arrow Keys (▲ ▼)

The two arrow keys are used to scroll through and select values as needed for

Model 8652 functions. They are also used while in field calibration mode.

On the Model 8652, pressing either ▲ or ▼ key on the start-up sequence while baud rate, time or barometric pressure is displayed will allow you to change them. Use the ▲ or ▼ key to adjust the value, and press ENTER to accept.

DEL Key

The Model 8652 lets you clear the last sample stored or the entire contents of memory.

To clear only the last sample, hold the DEL key and the display will begin a countdown from 3 to 0. Release the key *before* 0 is displayed. The display will beep twice and flash “CLEAR SAMPLE.”

To clear all memory, press and hold the DEL key and the display will begin a countdown from 3 to 0. Release the key

while 0 is displayed. The display will beep twice and flash “CLEAR LOG.”

Note: If you release the key after 0 is displayed, it will not beep, and nothing will be deleted.

Printing Data Using the Optional 8522 MicroPrinter

If the optional 8522 MicroPrinter is connected, what is viewed on-screen will be on the paper printout.

Note: In order to print, the baud rate on the Model 8652 must be set to the same as the printer. The default is 1200.

The data will print in a format such as 12,345.67. If you desire, the Model 8652 can print in a format such as 12.345,67 by switching DIP switch #8 ON (see *DIP Switch Settings* in Chapter 8).

Downloading Data to a Computer

“COMPUDAT” is a windows-based program from TSI designed to download the data stored in the memory of the Model

8652 to a computer. This data includes the test ID, measurement reading, unit of measure, and logging interval. This data is date and time stamped. In addition, the statistics for each test ID are provided. The file containing the downloaded data is sorted and tab delimited to allow it to be imported into a spreadsheet program for further data analysis.

To load COMPUDAT on your computer, use the following procedure, also found on the disk:

For Windows 3.1: Select File, Run, and type "A:\setup.exe"

For Windows 95 or higher: Select Start, Run, and type "A:\setup.exe"

Once you open the program, it is self-directing and provides all the necessary instructions for downloading data.

To download data from the Model 8652, connect the supplied computer interface cable to the Model 8652 and to a computer

serial port. Any serial port from COM1 to COM4 can be used.

Connecting the Optional 8522 Micro-Printer

To connect the 8522 MicroPrinter printer to the Model 8652, locate the Printer Interface Cable (supplied with the optional printer) and connect the 9-pin end labeled “PRINTER” to the printer and the other end to the data port of the Model 8652. The printer must be set to the same baud rate as the Model 8652. See *Baud Rate* section for details on how to change the baud rate. To change the baud rate of the printer, please refer to the operation and service manual for the printer to properly set the printer’s DIP switch settings. 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 Owner’s Manual for the 8522 MicroPrinter.

Connecting to a Computer

Use the Computer Interface Cable provided with the Model 8652 to connect the

instrument to a computer for remote polling or for downloading stored data. Connect the 9-pin end labeled “COMPUTER” to the computer COM port and the other end to the data port of the Model 8652. A 9-pin to 25-pin adapter will be required if your computer has a 25-pin serial port connector.

For more information on how to download stored data, see *Downloading Data to a Computer* section in Chapter 4. For polling instructions, see the following *Data Acquisition (Polling)* section.

Data Acquisition (Polling)

The Model 8652 is designed to allow you to perform polling through the use of a computer. To do this, your computer must be connected and in terminal mode. The baud rate for the computer and the Model 8652 must be set to the same value. For details on viewing or changing the baud rate, see *Baud Rate* section in Chapter 3. You must then send an upper case V to the instrument.

You must write your own routine (program) to obtain information at specific intervals from the Model 8652. The meter will only send information when the READ key is pressed or after the computer has sent a “V” command to the Model 8652.

SECTION 5

Maintenance

Probe Tip

Periodically inspect the probe tip to ensure that it is clean. Dust and oil deposits on the sensor may affect the response time of the Model 8652. To remove dust, blow it off with a gentle stream of air. Never use liquid to clean the probe or probe tip.

Cases

If the instrument case or storage case needs cleaning, wipe it off with a soft cloth. Never submerge the Model 8652 in any liquid.

Storage

When storing the Model 8652 for more than a month, TSI recommends removing the batteries. This prevents possible damage due to battery leakage.

SECTION 6

Service and Calibration

Please return your Product Registration Card immediately. This allows us to send service reminders, special offers, and important information about your product.

Before sending your instrument for calibration or repair, you should call Customer Service. The service department will provide you with the cost of service or calibration, Return Material Authorization (RMA) number, and shipping instructions.

Please have the following information available when you call:

- Owner's name, address, and phone number
- Billing address, if different and applicable
- Instrument name and model
- Serial number
- Date of purchase
- Where purchased

TSI recommends that you keep a “calibration log” and keep all records of service on your instrument.

Factory Calibration

To maintain a high degree of accuracy in your measurements, TSI recommends that you return your instrument to the factory for annual calibration. For a nominal fee, we will calibrate the unit and return it to you with a NIST (US National Institute of Standards and Technology) traceable certificate. This “annual checkup” assures you of consistently accurate readings; it is especially important in applications where

strict calibration records must be maintained.

Send the instrument to TSI prepaid. Securely package your instrument in a strong container surrounded by at least 2 inches (5 cm) of suitable shock-absorbing material. Include a purchase order that clearly shows the instrument model number and serial number, a contact name, phone, fax number, and RMA number. Mark the outside of your shipping container with the RMA number. This will expedite processing of your instrument when we receive it.

Field Calibration

Temperature and humidity calibrations may be adjusted in the field. The temperature adjustment can add or subtract a number of degrees. The range is $\pm 9.99^{\circ}\text{F}$ ($\pm 5.55^{\circ}\text{C}$). Calibration can be done in either $^{\circ}\text{F}$ or $^{\circ}\text{C}$ mode. Humidity adjustment adds or subtracts a constant percentage. The range is $\pm 12.0\%$ relative humidity. The procedure for field adjustment is as follows:

Turn off the instrument, flip DIP switch #7 to “ON.” Turn the Model 8652 on again.

On the Model 8652, press and hold the measurement key for the parameter you want to calibrate to enter calibration mode. The display will begin a countdown from 5 to 0. Release the key when 0 is displayed. The top line of the display will show the adjustment number and the bottom line will show the actual reading value. Use the ▲ and ▼ keys to change the adjustment number and press **READ** key to accept. The meter returns to the measurement mode when the **READ** key is pressed. You must press and hold the next parameter you want to adjust to access it. When finished, turn the instrument off and flip DIP switch #7 to “off.”

To enter the calibration mode for the RTD, make sure the RTD is plugged in. Press the **TEMP** key until “Prb” shows on the display, then press and hold the **TEMP** key. Repeat the procedure described above to adjust the parameter.

SECTION 7

Troubleshooting

Table 7-1 lists the symptoms, possible causes, and recommended solutions for common problems encountered with the Model 8652. If your symptom is not listed, or if none of the corrective actions solve your problem, please contact TSI.

Table 7-1: Troubleshooting the Model 8652

| Symptom | Possible Causes | Corrective Action |
|----------------------------|---|---|
| No display | Unit not switched on | Switch on the unit. |
| | Low or dead batteries Dirty battery contacts | Replace the batteries or plug in the AC adapter. Clean the battery contacts. |
| Battery symbol is blinking | Batteries are low, 15% or less life remaining | Replace batteries. |

| Symptom | Possible Causes | Corrective Action |
|-----------------------------------|--|---|
| Display reads "LO" | Wrong AC adapter | Replace with the correct AC adapter. |
| | Low AC line voltage | Correct the AC line voltage or use batteries. |
| | Dirty battery contacts | Clean the battery contacts. |
| Display reads "CAL" | The Model 8652 has detected an internal fault | Return to factory for service. |
| Display reads "OVER" | A parameter value is too high. | Use an alternate method to make measurement. |
| | RTD became unplugged while reading RTD temperature. | Plug in the RTD |
| Temp. initially reads high or low | Temperature sensor is still adjusting to temperature | Allow sufficient time for the temperature to stabilize. |

| Symptom | Possible Causes | Corrective Action |
|--------------------------|--|--|
| Display reads "LOG FULL" | You are trying to enter more readings than memory can handle | Read or record the average; clear the sample register and proceed. |
| Display flashes "Libatt" | Low lithium battery power | Return to TSI for replacement. |

SECTION 8

DIP Switch Settings

To access the DIP switches, remove the batteries from the battery compartment. On the inside of the battery compartment, there is a window with eight DIP switches. The table below shows the functions for each switch.

Caution

Make certain that power is turned off before changing DIP switch settings.

Table 8-1: DIP Switch Settings

| Switch | OFF | ON |
|--------|------------------------------------|------------------------------------|
| 1-3 | Must be OFF | ----- |
| 4 | Not assigned | ----- |
| 5 | °F | °C |
| 6 | Buzzer OFF | Buzzer ON |
| 7 | Normal Mode | Calibrate Mode |
| 8 | American Date Format and 12,345.67 | European Date Format and 12.345,67 |

The ON position is away from the batteries and OFF is towards the batteries. Always leave DIP switch #1-4 in the OFF position.

Specifications

Specifications are subject to change without notice.

Temperature:

| | |
|-------------|-------------------------|
| Range: | 32 to 140°F (0 to 60°C) |
| Accuracy: | ±1.0°F (± 0.6°C) |
| Resolution: | 0.1°F (0.1°C) |

Secondary Temperature Probe (optional):

| | |
|-------------------------|-----------------------------|
| Range: | -40 to 248°F (-40 to 120°C) |
| Accuracy ¹ : | ±1.0°F (±0.6°C) |
| Resolution: | 0.1°F (0.1°C) |
| Sensor Type: | RTD |

Relative Humidity:

| | |
|-------------------------|----------------------|
| Range: | 5% to 95% RH |
| Accuracy ² : | ±3.0% RH |
| Resolution: | 0.1% RH |
| Sensor Type: | Thin-film capacitive |

Dew Point:

| | |
|--------------|--------------------------|
| Range: | 5 to 120°F (-15 to 49°C) |
| Resolution : | 0.1°F (0.1°C) |

Wet Bulb:

| | |
|-------------|-------------------------|
| Range: | 40 to 140°F (5 to 60°C) |
| Resolution: | 0.1°F (0.1°C) |

% Outside Air:

| | |
|-------------|-----------|
| Range: | 0 to 100% |
| Resolution: | 0.1% |

Logging Capability:

Up to 14,000 measurements
in 1000 test IDs

| | |
|---------------------------------|---|
| Intervals: | 5,6,7,8,9,10,15,20,25,30 sec. 1,2,3,4,5,6,7,8,9,10,15, 20,25,30,60 min. |
| Meter Dimensions: | 3.5 in. x 6.6 in. x 1.6 in. (89 mm x 168 mm x 41 mm) |
| Weight (with batteries): | 1.16 lb. (0.53 kg) |
| Probe length: | 11.5 in. (175 mm) |
| Probe tip diameter: | 0.75 in. (19 mm) |
| Display: | 2-line, 4-digit LCD |
| Operating Range: | 40 to 158°F (5 to 70°C) |
| Storage Range: | -4 to 158°F (-20 to 70°C) |
| Power Requirements: | Four AA-size batteries (included) or AC adapter (optional) |
| Printer Interface Type: | Serial, 1200 baud |

¹ For range of 23 to 203°F (-5 to 95°C)

² At 77°F (25°C). Add uncertainty of $\pm 0.03\%/^{\circ}\text{F}$
($\pm 0.05\%/^{\circ}\text{C}$) away from calibrated temperature

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June 2004
Printed in USA
Part No. 116-159-864, Rev. 4
(1980419c)
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