

OWNER'S MANUAL

CompuFlow[®] 8610

CO₂ Meter



ALNOR[®]

TSI Incorporated

LIMITATION OF WARRANTY AND LIABILITY

Seller warrants the goods sold hereunder, under normal use and service as described in the operator's manual, shall be free from defects in workmanship and material for (24) months, or the length of time specified in the operator's manual, from the date of shipment to the customer. This warranty period is inclusive of any statutory warranty. This limited warranty is subject to the following exclusions:

- a. Hot-wire or hot-film sensors used with research anemometers, and certain other components when indicated in specifications, are warranted for 90 days from the date of shipment.
- b. Parts repaired or replaced as a result of repair services are warranted to be free from defects in workmanship and material, under normal use, for 90 days from the date of shipment.
- c. Seller does not provide any warranty on finished goods manufactured by others or on any fuses, batteries or other consumable materials. Only the original manufacturer's warranty applies.
- d. Unless specifically authorized in a separate writing by Seller, Seller makes no warranty with respect to, and shall have no liability in connection with, goods which are incorporated into other products or equipment, or which are modified by any person other than Seller.

The foregoing is IN LIEU OF all other warranties and is subject to the LIMITATIONS stated herein. **NO OTHER EXPRESS OR IMPLIED WARRANTY OF FITNESS FOR PARTICULAR PURPOSE OR MERCHANTABILITY IS MADE.**

TO THE EXTENT PERMITTED BY LAW, THE EXCLUSIVE REMEDY OF THE USER OR BUYER, AND THE LIMIT OF SELLER'S LIABILITY FOR ANY AND ALL LOSSES, INJURIES, OR DAMAGES CONCERNING THE GOODS (INCLUDING CLAIMS BASED ON CONTRACT, NEGLIGENCE, TORT, STRICT LIABILITY OR OTHERWISE) SHALL BE THE RETURN OF GOODS TO SELLER AND THE REFUND OF THE PURCHASE PRICE, OR, AT THE OPTION OF SELLER, THE REPAIR OR REPLACEMENT OF THE GOODS. IN NO EVENT SHALL SELLER BE LIABLE FOR ANY SPECIAL, CONSEQUENTIAL OR INCIDENTAL DAMAGES. SELLER SHALL NOT BE RESPONSIBLE FOR INSTALLATION, DISMANTLING OR REINSTALLATION COSTS OR CHARGES. No Action, regardless of form, may be brought against Seller more than 12 months after a cause of action has accrued. The goods returned under warranty to Seller's factory shall be at Buyer's risk of loss, and will be returned, if at all, at Seller's risk of loss.

Buyer and all users are deemed to have accepted this LIMITATION OF WARRANTY AND LIABILITY, which contains the complete and exclusive limited warranty of Seller. This LIMITATION OF WARRANTY AND LIABILITY may not be amended, modified or its terms waived, except by writing signed by an Officer of Seller.

Service Policy

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).

Table of Contents

General Description	2
Theory of Operation: NDIR Sensor.....	2
Safety	3
Setting-Up the Model 8610.....	4
Operation of the Model 8610	5
Maintenance of the Model 8610.....	8
Service Information.....	8
Troubleshooting of the Model 8610.....	13
Internal DIP Switch Settings	14

SECTION 1

General Description

The CompuFlow® Model 8610 is a hand-held meter to measure Carbon Dioxide (CO₂), displayed in units of parts per million (ppm). An NDIR sensor in the top end of the meter measures gas content by diffusion through sensing holes.

The 8610 ships in a pouch that provides a small amount of protection to the display and the sensing holes in the top of the instrument case. The instrument ships with batteries (which are not installed), a calibration sheet, and this Owner's Manual.

A field calibration kit is available from TSI (part #634-860-086, 1000 ppm CO₂, or part # 634-860-186, 5000 ppm CO₂).

SECTION 2

Theory of Operation: NDIR Sensor

The 8610 measures carbon dioxide concentration by relying on one of the natural properties of CO₂ molecules: CO₂ mole-

cules absorb light at a specific wavelength of 4.26 μm . This wavelength is in the infrared (IR) range. High concentrations of CO_2 molecules absorb more light than low concentrations. This technique is called non-dispersive infrared (NDIR) detection.

SECTION 3

Safety

When using the 8610 to check for CO_2 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.

SECTION 4

Setting-Up the Model 8610

Supplying Power

The 8610 can be powered in one of two ways: four AA-size 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 8610 is designed to operate only with alkaline batteries.

When 15% battery life is remaining, the battery indicator will blink, indicating the batteries need to be changed. At 0%, "LO" will display and the meter will shut off within 10 seconds.

Using the Optional AC Adapter

The optional AC adapter allows you to power the Model 8610 from a wall outlet. When using the AC adapter, the batteries (if installed) will be bypassed. The AC adapter is NOT a battery charger.

SECTION 5

Operation of the Model 8610

*Note: Do **not** hold the instrument close to your face. Humans exhale CO₂ and this will affect the accuracy of the readings.*

When pressing the keys on the keypad, the Model 8610 will beep to confirm the function. If you press a key and the Model 8610 does not beep, the Model 8610 does not allow that function during the selected mode. (See Section 9 for information on disabling this feature through an internal DIP switch.)

ON/OFF Key

Press the ON/OFF key to turn the Model 8610 on and off. When the instrument is first turned on, it goes through a preprogrammed power-up sequence that includes an internal self-check.

First, all displayable LCD segments will appear. If a problem is detected, the display will show "CAL" to indicate that it should be returned for servicing and/or

calibration. When the Model 8610 completes the internal self-check, it will display the approximate percentage of battery life remaining.

Note: The sensor needs up to 10 minutes to stabilize in still air before displayed readings can be considered accurate. Moving the instrument may decrease this stabilization time.

READ Key

Carbon dioxide concentrations will be displayed in parts per million (ppm). The 8610 can be left in a room to monitor general conditions, but it is important to ensure that the sensing holes at the top of the meter are not covered or in a downward position.

Press the **READ** key once to start taking a CO₂ sample; press it again to end the sample. The minimum sample time is five seconds, even if the second press occurs after two, three, or four seconds. **SAMPLE** will flash on the display while the instrument takes a measurement.

The display updates every second and each reading is the average of five samples.

(▲) Key

The instrument only displays CO₂. The ▲ on this key is used during the field verification process.

RECALL (▼) Key

Press the RECALL key repeatedly to display: minimum value (MIN), maximum value (MAX), average value (AVG), and number of seconds sampled (COUNT). Press the READ key to return to normal measuring mode.

The instrument does not store readings. The information viewed in the recall mode is for the sample reading just taken. Once a new sample starts or the instrument is turned off, all previous data is lost.

The ▼ is used during the field calibration process.

SECTION 6

Maintenance of the Model 8610

The Model 8610 requires very little maintenance to keep it performing well.

Case

If the instrument case or storage case needs cleaning, wipe it off with a soft, damp cloth. Never submerge the 8610 in any liquid or allow any liquid to enter the sensing holes.

Storage

When storing the Model 8610 for more than a month, TSI recommends removing the batteries. This prevents possible damage due to battery leakage.

SECTION 7

Service Information

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 Verification

Field verification of your CO₂ instrument is recommended monthly. You need a gas tank and regulator. To purchase this accessory kit from TSI, use part number

634-860-086 for 1000 ppm CO₂ or part number 634-860-186 for 5000 ppm CO₂.

1. Turn the instrument off. Under the batteries, move DIP switch # 7 to ON. Turn the instrument back on.
2. Press and hold the READ key to begin the calibration procedure. The display will begin a countdown from 5 to 0. Release the key when the display reads 0. If the key is released too soon or too late, the instrument will go back to sampling in real-time. "ZerO" will appear on the display if the instrument is in calibration mode.
3. Install the regulator on the zero calibration gas tank and connect tubing from the regulator to the inlet fitting on the top of the Model 8610. The regulator has a fixed flow rate of 0.3 lpm. Do **not** use a flow rate lower than 0.25 lpm or higher than 1.0 lpm.
4. Turn on gas flow.
5. Press and release the READ key to begin a zero reading. The Model 8610 begins a 60-second countdown during the zero reading. The actual zero reading is

taken in the last 10 seconds. When the countdown is completed, the display indicates “SPAN” and the span concentration.

6. Install the regulator on the span calibration cylinder and connect tubing from the regulator to the inlet fitting on the top of the Model 8610.
7. Use ▲ and ▼ to adjust the concentration displayed on the Model 8610 to match the concentration on the span gas cylinder.
8. Press and release the READ key to take a span gas reading. The Model 8610 starts a 60-second countdown. When the countdown reaches zero, the instrument returns to the normal measurement mode.
9. With the gas still connected, observe the reading on the display. It should indicate the span gas concentration. If not, repeat this procedure.
10. If the displayed reading is accurate, remove the regulator and tubing. The calibration is now complete.

11. Before taking measurements, turn the instrument off and move DIP switch #7 back to OFF.

SECTION 8

Troubleshooting of the Model 8610

This table lists the symptoms, possible causes, and recommended solutions for the Model 8610.

Symptom	Possible Causes	Corrective Action(s)
No display	Unit not switched on	Switch on the unit
	Low or dead batteries	Replace the batteries
	Dirty battery contacts	Clean the battery contacts
	Batteries installed incorrectly	Refer to battery illustration inside battery cover
BAT is blinking	Dirty battery contacts Batteries are	Clean the battery contacts

Symptom	Possible Causes	Corrective Action(s)
	low	Replace the batteries
Cal err	Error in field calibration	Perform calibration again
Display reads "LO"	Batteries are low	Replace the batteries

Note: If your symptoms are not remedied by the suggested corrective action, call TSI.

SECTION 9

Internal 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.

DIP Switch	OFF	ON
1-3	Must be OFF	-----
4	not assigned	not assigned
5	not assigned	not assigned
6	Beep is turned OFF	Beep is turned ON
7	Normal mode	Field Verification mode
8	not assigned	not assigned

- The ON position is away from the batteries and OFF is towards the batteries.
- Switch 1 is towards the top of the case and Switch 8 is nearest the bottom.

Specifications

(subject to change without notice)

CO₂ Sensor type:

Dual wavelength detector with non-dispersive infrared (NDIR) sensor

Range: 0 to 5000 ppm

Accuracy ±3% of reading or ±50 ppm, whichever is greater^{1, 2}

Resolution 1 ppm

Response time <10 minutes in still air

Operating Temperature Range:

41 to 158°F (5 to 70°C)

External Meter Dimensions:

3.5 in. x 6.6 in. x 1.6 in.
(89 mm x 168 mm x 41 mm)

Display: LCD, 4 digits, 0.4 in. (10-mm) high

Power requirements:

Four (4) AA-size alkaline batteries

Battery Life: Minimum 10 hours using alkaline batteries

¹ Add ±0.2 % of reading per °F (±0.36% of reading per °C) away from calibration temperature

² Under standard barometric pressure of 29.92 in Hg (406.8 inches H₂O) [101.4 kPa].

ALNOR®

TSI Incorporated

TSI Incorporated
Alnor Products
500 Cardigan Road
Shoreview, MN 55126 USA
Toll Free (800) 861-7513
Telephone (651) 490-2889
Fax (651) 490-3824
www.alnor.com
customerservice@alnor.com

June 2004
Printed in USA
Part No. 116-159-861, rev. 5
(1980396d)
© Copyright 2002–2004
TSI Incorporated