

Model 8560 INSPECTAIR™ CO₂ Meter

Operation and Service Manual

1980265, Revision B
June 2006



Model 8560

INSPECTAIR™ CO₂ Meter

**Operation and Service
Manual**

June 2006

P/N 1980265 Rev. B

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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 TSI's Customer Service department at (800) 874-2811 (USA) or (001 651) 490-2811 (International).



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Chapter 1

Unpacking and Parts Identification

Carefully unpack the INSPECTAIR CO₂ Meter 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.

Unpacking the INSPECTAIR

Figure 1-1
Model 8560 INSPECTAIR CO₂ Meter

Quantity	Item Description	Part/Model
1	INSPECTAIR CO ₂ Meter	8560
1	Carrying Case	1319114
4	AA Alkaline Batteries	1208013
1	AC Adapter (optional) 115 V, NEMA-5	2613033
1	CO ₂ Calibration Collar	1082252
1	Splash Guard	1381034
1	INSPECTAIR CO ₂ Meter Operation and Service Manual	1980265
1	Certificate of Calibration	-

Parts Identification for the INSPECTAIR

Figures 1-2 and 1-3 identifies the parts of the INSPECTAIR CO₂ Meter. Please become familiar with these components before proceeding.

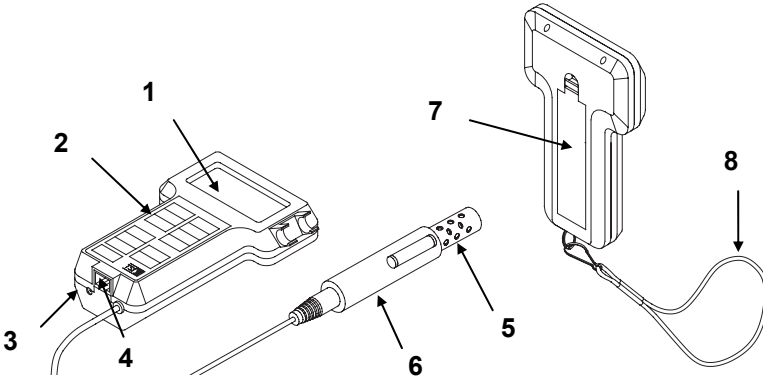


Figure 1-2: INSPECTAIR

- | | |
|--------------------------|---------------------------------------|
| 1. Display | 5. Location of CO ₂ Sensor |
| 2. Keypad | 6. Probe Handle |
| 3. External Power Socket | 7. Battery Access Cover |
| 4. RS-232 Printer Port | 8. Wrist Strap |

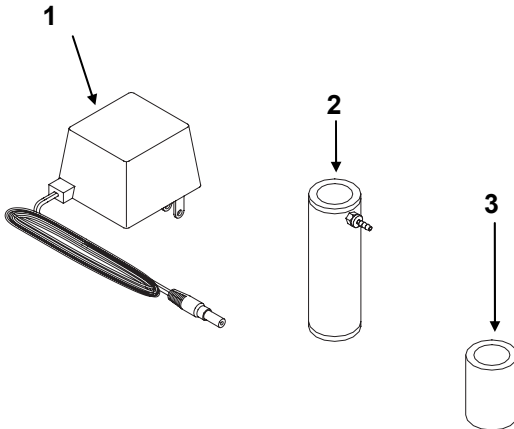


Figure 1-3: INSPECTAIR Accessories

- | | |
|---------------------------------------|---|
| 1. AC Adapter (optional) | 3. Splash Guard |
| 2. CO ₂ Calibration Collar | 4. Optional Portable Printer
(not shown) |

Chapter 2

Setting-Up

Supplying Power to the INSPECTAIR

The INSPECTAIR CO₂ Meter must be powered in one of two ways: four size AA batteries or the optional AC Adapter.

Installing the Batteries

Insert four size AA batteries as indicated by the diagram located on the inside of the battery compartment. TSI ships the INSPECTAIR with alkaline batteries. NiCd rechargeable batteries may also be used.

Using the AC Adapter

The AC Adapter allows you to power the INSPECTAIR 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 NiCd batteries.

Connecting the Optional Portable Printer

To connect the portable printer to the INSPECTAIR, 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 INSPECTAIR 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 Portable Printer Manual.*


Chapter 3

Operation

Overview

The Model 8560 INSPECTAIR CO₂ Meter measures CO₂ concentrations from 0% to 5% (50,000 ppm). Carbon dioxide concentrations can be displayed in percent (%) or parts per million (ppm) by selection of a dip switch. To change the displayed units, refer to Appendix B, “[Internal DIP Switch Settings](#).”

Place the end of the probe at the location you want to take measurements. The sensor part of the probe (small diameter section of probe) must be fully exposed.


	CAUTION
	Do not hold the probe close to your breathing zone. Humans exhale CO ₂ and this may influence the readings.

Keypad Functions

When pressing the keys on the front panel, the INSPECTAIR will beep to confirm the function. If you press a key and the INSPECTAIR does not beep, then the INSPECTAIR does not allow that function during the selected mode. To disable the beep, please refer to Appendix B, “[Internal DIP Switch Settings](#).”

ON/OFF Key

Use the ON/OFF key to turn the INSPECTAIR 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 items will appear for a few seconds. If a problem is detected, the display will show the message “SERVICE” along with a number to indicate that the INSPECTAIR requires servicing. Refer to Chapter 5, “[Troubleshooting](#),” for information regarding service numbers. If the “SERVICE” message appears, the INSPECTAIR will pause until any key is pressed.

When the INSPECTAIR completes its internal self-check, it will display the approximate percentage of battery life remaining. The INSPECTAIR will display the battery symbol  when the battery voltage becomes very low. After the battery symbol first appears, the INSPECTAIR will run for approximately 60 minutes before displaying the message “LO” (for a few

seconds) and then automatically turn off. This feature is accurate for alkaline batteries only.

The percentage of battery life remaining will not be accurate for NiCd batteries. The battery symbol will appear when battery voltage becomes low, but the INSPECTAIR will run considerably less than 60 minutes before displaying the message “LO” and turning off.

ALARM Key

Momentarily press and release the ALARM key to view alarm level one. Momentarily press the ALARM key again while alarm level one is displayed to view alarm level two. Any time the CO₂ concentrations exceed an alarm level, an “ALARM 1” or “ALARM 2” will appear on the display and an audible alarm will sound.

To change the alarm levels, press and hold the alarm button. The display will begin to count down from 5 to 0. When the count reaches zero, release the alarm button immediately. Alarm level one will appear on the display.

Use the up and down arrows to adjust the alarm level. Setting the alarm to 60000 ppm or 6% will disable the alarm. Press and release the ALARM button again to set alarm level two. Press ALARM again (or any other key) to return to normal operation.

The ability to adjust the alarm levels can be disabled with a DIP switch setting. Refer to Appendix B, [“Internal DIP Switch Settings,”](#) for details.

MUTE Key

Use the MUTE key to silence the audible alarm. The alarm will be silent for five minutes or until a higher alarm level is reached. The audible alarm is re-enabled once the concentration falls below alarm level 1. The alarm may be silenced all the time by setting both alarms to their maximum levels.

SAMPLE Key

Press the SAMPLE key to start/stop data sampling. The word “SAMPLE” will appear in the upper right corner of the display while the INSPECTAIR is taking a sample. The instrument will keep track of statistics including average, minimum, maximum, and elapsed time. When sampling is stopped, the INSPECTAIR will automatically scroll through statistics for the sample that just ended.

TIME CONSTANT Key

Momentarily press and release the TIME CONSTANT key to view the current time constant. To change the time constant, press and hold the key down. The time constant choices will sequence on the display. When the desired value is displayed, immediately release the key.

The time constant is actually an averaging period. The INSPECTAIR display is always updated every second; however, the reading displayed is the average reading over the last time constant period. For example, if the current time constant is set to 10 seconds, the display will show readings averaged over the previous 10 seconds, updated every second. This is also called a 10-second “moving average.”

The available time constant values are 2, 5, 10, 30, and 60 seconds.

STATISTICS Key

Use the **STATISTICS** key to sequentially view the average, minimum and maximum readings as well as the elapsed time of the most recently sampled data. You may view sample statistics while the sample is in-progress; however, one time constant must have elapsed first. Press the **STATISTICS** key once to display the average reading, again to display the minimum reading, again to display the maximum reading, and again to display the elapsed time for that sample. If you press the **STATISTICS** key a fifth time, the INSPECTAIR will switch back into the currently selected measuring mode. You must sequence through all four statistic displays (i.e., press the **STATISTICS** key five times) before the INSPECTAIR will go back into the currently selected measuring mode.

PRINT Key

Use the **PRINT** key to print information on the optional Portable Printer. The information printed will be different depending on what the INSPECTAIR is currently doing.

When the INSPECTAIR is displaying real-time readings, the **PRINT** key will print the current CO₂ concentration. Each time the **PRINT** key is pressed, one set of values will print. The values printed reflect the current time constant, therefore, they are the same as would be displayed.

When the INSPECTAIR is displaying any statistic, pressing the **PRINT** key will cause the current statistic to print. All statistics are printed as a set regardless of which one is currently displayed.

If you press and hold the **PRINT** key during the power-up sequence, and you have the optional portable printer connected, a printout showing certain system information will occur.

↑ and ↓ Keys

The two arrow keys are used to adjust readings when calibrating the INSPECTAIR and to adjust the alarm levels.

CALIBRATE CO₂ Key

Use the CALIBRATE CO₂ key to put the INSPECTAIR into calibration mode. See Chapter 4, "[Calibration and Maintenance](#)," for details on how to calibrate.

Chapter 4

Calibration and Maintenance

The INSPECTAIR requires very little maintenance to keep it performing well.

The INSPECTAIR may be calibrated in the field using the instructions below. Even so, we recommend that you return your INSPECTAIR to TSI for annual recalibration and checkup. For a reasonable fee, we will quickly recalibrate the unit 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.

Calibrating the CO₂ Concentration Measurement

TSI recommends calibrating the INSPECTAIR CO₂ measurement monthly to help ensure accurate readings. The CO₂ concentration measurement is affected by changes in 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 INSPECTAIR CO₂ measurement for your local conditions or if conditions change.

To calibrate the CO₂ sensor, please follow the procedure below. Brief instructions can also be found on the calibration collar itself. You will need a cylinder of gas with 0 ppm CO₂ 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.

If necessary, you can select between the factory CO₂ calibration and a user calibration. Please refer to Appendix B, “Internal DIP Switch Settings.”

The calibration procedure can be aborted at any time by pressing the CO₂ key.

If an error occurs during the CO₂ calibration procedure, the INSPECTAIR will display the message “ERR”. Press the CO₂ key to abort the calibration. Switching the zero gas with the span gas is an example of a condition that will cause the “ERR” message to come on.

1. Locate the calibration collar and slide it over the sensing probe. Make sure that the collar completely covers the CO₂ diffusion holes. Refer to Figure 4-1.

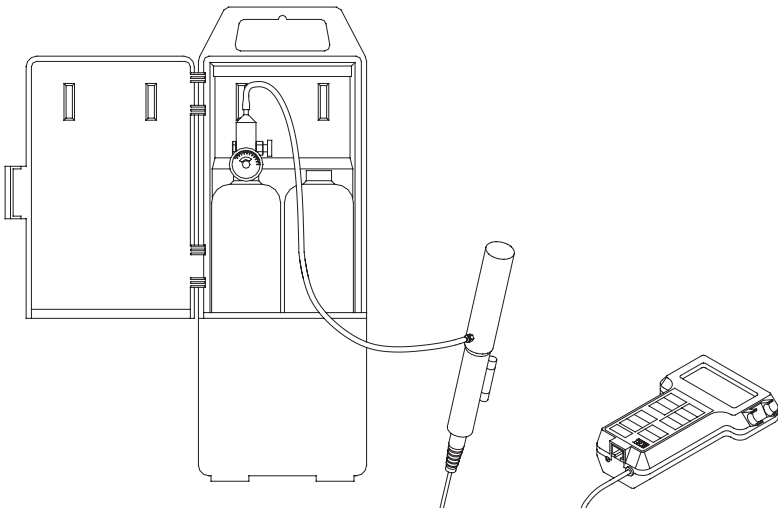


Figure 4-1: CO₂ Calibration

2. Install the regulator onto the zero calibration gas cylinder and connect tubing from the cylinder to the fitting marked “GAS IN” and turn the gas on. Make sure the cylinder is not empty.
3. To put the INSPECTAIR into CO₂ calibration mode, press and hold the CALIBRATE CO₂ key. The display will then begin to count down from five to zero. When the count reaches zero, release the CALIBRATE CO₂ key immediately. The words “CALIBRATE ZERO” should appear on the display. If not, try again.

Note: *DIP switch 2 must be set to the “User Calibration” (ON) position or the INSPECTAIR will not go into CO₂ calibration mode. Please refer to Appendix B, “[Internal DIP Switch Settings.](#)”*

4. Press the SAMPLE key to take a zero measurement. The INSPECTAIR will display a 60-second count-down. When the count-down is completed, the display will show the word “CALIBRATE” and the arrow symbols (↑↓) will be blinking. Turn off the regulator and disconnect the zero calibration gas.
5. Install the regulator onto the span calibration gas cylinder and attach a tube from cylinder to the fitting marked “GAS IN.” Make sure the

cylinder is not empty, then turn the gas on. A CO₂ concentration between 5,000 and 50,000 ppm should be used.

6. Use the arrow (↑↓) keys on the INSPECTAIR keypad to adjust the display to match the known span gas concentration. Press and quickly release the arrow key to change the display 1 ppm at a time. Hold the arrow key down to move more quickly. The span gas concentration value (ppm) is marked on the gas container.
7. Press the SAMPLE key to take a span reading. The INSPECTAIR will display a 60-second count-down. When the count-down reaches zero the INSPECTAIR will go into Survey mode.
8. Observe the reading displayed on the INSPECTAIR. It should be very close to the span gas concentration (within specifications: See [Appendix A](#)). If not, repeat the calibration.
9. If the displayed reading is accurate, turn the gas off and remove the calibration collar and regulator. The calibration is now completed.

Storage Precautions

When storing the INSPECTAIR for more than 30 days, you should 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 between 0% and 95%.

Chapter 5

Troubleshooting

The table below lists the symptoms, possible causes and recommended solutions for common problems encountered with the INSPECTAIR.

Symptom	Possible Cause	Corrective Action
No Display.	Unit not switched on.	Switch unit on.
	Low or dead batteries.	Replace the batteries or plug in the AC adapter.
	Dirty battery contacts.	Clean the battery contacts.
Battery symbol is displayed (constant or blinking).	Low battery charge.	Replace batteries or use AC adapter.
	Incorrect AC adapter.	Replace with the correct AC adapter.
	Low AC line Voltage.	Correct the AC line voltage or use batteries.
Cannot enter calibration mode.	Dirty battery contacts.	Clean the battery contacts.
	DIP switch(s) set to factory calibration.	Change DIP switch setting. See Appendix B .
Incorrect function displayed.	Sample is in progress.	Stop sample in progress.
	Two keys have been pressed at the same time.	Press only one key at a time.
“ERR” Displayed during calibration procedure.	A mistake has been made such as switching the zero and span gases.	Press CALIBRATE CO ₂ key to abort calibration. Review instructions and try again.
“SERVICE” and “2” displayed.	Calibration memory error. Internal calibration data corrupted.	Factory service required.
“SERVICE” and “4” displayed.	CO ₂ sensor malfunction.	Factory service required. Press any key to bypass.

Symptom	Possible Cause	Corrective Action
“SERVICE” and “6” displayed.	IR source malfunction.	Factory service required. Press any key to bypass.

Appendix A

Specifications

Specifications are subject to change without notice.
Specifications in parentheses () indicates English equivalents.

CO₂:

Sensor type:..... Non-Dispersive Infrared (NDIR)
Range: 0-5% (0-50,000 ppm)
Accuracy: $\pm 3\%$ of reading ± 200 ppm at 25°C [add $\pm 0.36\%$ of reading per °C away from calibration temperature ($\pm 0.2\%$ of reading per °F)]
Resolution: 0.001% (10 ppm)
Response time: 20 seconds (for 63% of final value for 500 ppm step change in still air)

INSTRUMENT TEMPERATURE RANGE:

Operating range: 0 to 45 °C (32 to 113 °F)
Storage range: -20 to 60 °C (-4 to 140 °F)

TIME CONSTANT:

Values: 2, 5, 10, 30, or 60 seconds

POWER REQUIREMENTS:

Batteries: Four AA-size Alkaline or NiCd
AC adapter: 7 VDC nominal, 300 ma, [INSPECTAIR mates with 5.5 mm OD x 2.1 mm ID plug, center pin positive(+)]
Approx. battery life: 13.5 hours (Alkaline), 4.75 hours (NiCd)

PHYSICAL:

External dimensions: 76 mm x 168 mm x 38 mm (3.0 in x 6.6 in x 1.5 in)
Weight: 0.59 kg (1.3 pounds, with batteries)
Display: 4-digit LCD, 15 mm (0.6 in) digit height

MAINTENANCE SCHEDULE:

Factory calibration: Annually
User calibration: As needed


PRINTER INTERFACE:

Type: RS-232
BAUD rate: 1200

Appendix B

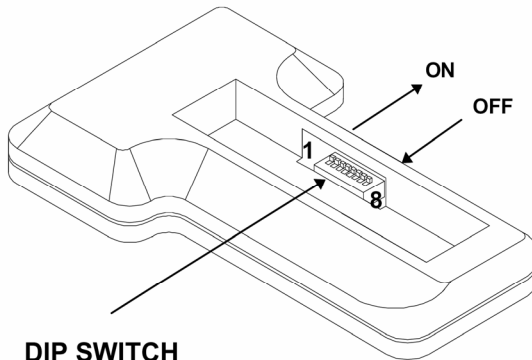
Internal Dip Switch Settings

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. Please refer to Figure B-1 for switch locations.

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

Switch	OFF	ON
1	Reserved	Reserved
2	Factory CO ₂ Cal.	User CO₂ Cal.*
3	Units: ppm CO ₂	Units: % CO₂
4	Setting Alarm-Disabled	Setting Alarm-Enabled
5	Beep Disabled	Beep Enabled
6	Reserved	Reserved
7	Reserved	Reserved
8	Reserved	Reserved

- * As shipped the user calibration is identical to the factory calibration
- Factory default settings are indicated with **BOLD** type.
- The ON position is away from the batteries and OFF is towards the batteries.
- Switch 1 is towards the display and switch 8 is nearest to the data port.



DIP SWITCH
Figure B-1: DIP Switch Location



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