

***Model 8730/8731***

***Q-CHECK™ CO<sub>2</sub> Meter***

***Operation and Service  
Manual***

*August 2000  
P/N 1980199 Rev. D*



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# Chapter 1

## Unpacking and Parts Identification

---

Carefully unpack the Q-CHECK CO<sub>2</sub> 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.

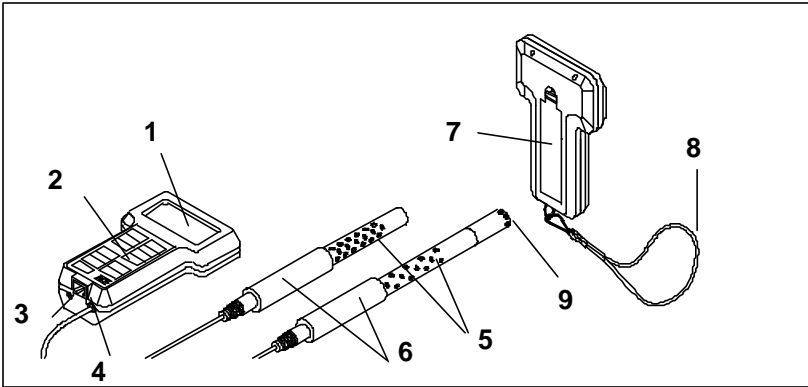
### Unpacking the Q-CHECK

**Figure 1 - 1**  
**Model 8730/8731 Q-CHECK CO<sub>2</sub> Meter**

Quantity	Item Description	Part/Model
1	Q-CHECK CO <sub>2</sub> Meter	8730/8731
1	Carrying Case	1319114
4	AA Alkaline Batteries	1206013
1	AC Adapter (optional) 115 V, NEMA-5 230 V, Eur., CEE 7/16 230 V, Great Britain 240 V, Australian	2613033 2613078 800169 2613105
1	CO <sub>2</sub> Calibration Collar	801058
1	CO Calibration Adapter (Model 8731 only)	801076
1	CO Sensor (installed in instrument, Model 8731 only)	801075
1	Q-CHECK CO <sub>2</sub> Meter Operation and Service Manual	1980199
1	Certificate of Calibration	-

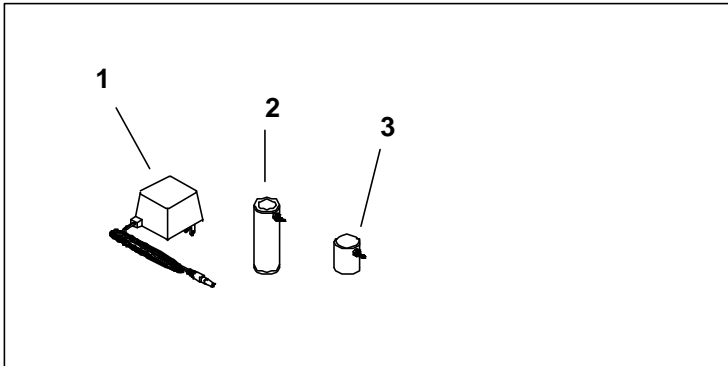
## Parts Identification for the Q-CHECK

Figures 1 - 2 and 1 - 3 identify the parts of the Q-CHECK CO<sub>2</sub> Meter. Please become familiar with these components before proceeding.



**Figure 1 - 2: Q-CHECK**

- |                                       |   |
|---------------------------------------|---|
| 1. Display                            | 6. Probe Handle                               |
| 2. Keypad                             | 7. Battery Access Cover                       |
| 3. External Power Socket              | 8. Wrist Strap                                |
| 4. RS-232 Printer Port                | 9. Location of CO Sensor<br>(Model 8731 only) |
| 5. Location of CO <sub>2</sub> Sensor |   |



**Figure 1 - 3: Q-CHECK Accessories**

- |                                       |  |
|---------------------------------------|--|
| 1. AC Adapter (optional)              | 3. CO Calibration adapter<br>(Model 8731 only) |
| 2. CO <sub>2</sub> Calibration Collar |  |



## Chapter 2

### Setting-Up

---

#### **Supplying Power to the Q-CHECK**

The Q-CHECK CO<sub>2</sub> 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 Q-CHECK with alkaline batteries. NiCd rechargeable batteries may also be used.

#### **Using the AC Adapter**

The AC Adapter allows you to power the Q-CHECK 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 Model 8925 Portable Printer**

To connect the Model 8925 printer to the Q-CHECK, locate the Printer Interface cable (supplied with optional printer) and connect the 9-pin end labeled "PRINTER" to the printer and the other end to the data port on the Q-CHECK. Always turn the Q-CHECK on BEFORE 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 8925 Portable Printer Operation and Service Manual*.



# Chapter 3

## Operation

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### Overview


The Model 8730 Q-CHECK CO<sub>2</sub> Meter measures CO<sub>2</sub> concentration. The Model 8731 Q-CHECK measures CO<sub>2</sub> and CO concentration. Both parameters are measured simultaneously in a single probe.

### Keypad Functions

When pressing the keys on the front panel, the Q-CHECK will beep to confirm the function. If you press a key and the Q-CHECK does not beep, then the Q-CHECK 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 Q-CHECK 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 Q-CHECK requires servicing. Refer to Chapter 5: Troubleshooting for information regarding service numbers. If the “SERVICE” message appears, the Q-CHECK will pause until any key is pressed.

When the Q-CHECK completes its internal self-check, it will display the approximate percentage of battery life remaining. The Q-CHECK will display the battery symbol  when the battery voltage becomes very low. After the battery symbol appears, the Q-CHECK will run for approximately 60 minutes before displaying the message “LO” (for a few seconds) and then automatically turning 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 Q-CHECK will run considerably less than 60 minutes before displaying the message “LO” and turning off.

### CO<sub>2</sub> Key

Press the CO<sub>2</sub> key to display CO<sub>2</sub> readings. The Model 8730 Q-CHECK always displays CO<sub>2</sub> readings. Carbon dioxide concentration readings will be displayed in units of parts per million (ppm). Place the sensor in the

location where you want to take the measurement. The probe must be fully exposed because the CO<sub>2</sub> sensor is located between the probe tip and the handle, not at the tip.

**CAUTION:** Do not hold the probe close to your breathing zone. Humans exhale CO<sub>2</sub> and this will influence the readings.

### **CO Key (Model 8731 Only)**

Press the CO key to display CO readings. Carbon monoxide concentration readings will be displayed in units of parts per million (ppm). The CO sensor is located at the tip of the probe.

### **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 Q-CHECK is taking a sample. The instrument will keep track of statistics including average, minimum, maximum, and elapsed time. When sampling is stopped, the Q-CHECK 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 available 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 Q-CHECK 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."

As configured at the factory, 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 Q-CHECK 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 **Q-CHECK** will go back into the currently selected measuring mode. The Model 8731 measures CO and CO<sub>2</sub> simultaneously. The display shows only the data for the current measurement mode. The measurement mode may be changed at any time to view statistics for the other measurement.

### **PRINT Key**

Use the **PRINT** key to print information on the optional Model 8925 Portable Printer. The information printed will be different depending on what the **Q-CHECK** is currently doing.

When the **Q-CHECK** is displaying real-time readings, the **PRINT** key will cause all parameters being measured to be printed. 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 **Q-CHECK** 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 Model 8925 printer connected, a printout showing certain system information will occur.

### **↑ and ↓ Keys**

The two arrow keys are used to adjust readings when calibrating the **Q-CHECK**



## Chapter 4

### **Calibration and Maintenance**

---

The Q-CHECK requires very little maintenance to keep it performing well.

The Q-CHECK may be calibrated in the field using the instructions below. Even so, we recommend that you return your Q-CHECK to TSI for annual recalibration. 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. This “annual checkup” helps ensure that the Q-CHECK is always in good operating condition.

#### **Calibrating the CO<sub>2</sub> Concentration Measurement**

TSI recommends calibrating the Q-CHECK CO<sub>2</sub> measurement monthly to help ensure accurate readings. The CO<sub>2</sub> 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 Q-CHECK CO<sub>2</sub> measurement for your local conditions or if conditions change.

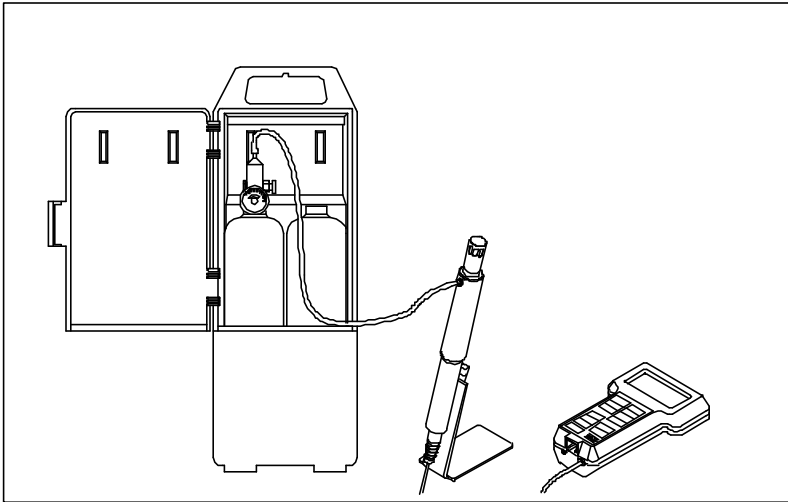
To calibrate the CO<sub>2</sub> sensor, please follow the procedure below. Brief instructions can also be found on the calibration collar itself. You will need a cylinder of gas with 0 ppm CO<sub>2</sub> for the zero calibration and a cylinder of gas with a known concentration of CO<sub>2</sub> for the span calibration. Contact your local TSI distributor for available CO<sub>2</sub> calibration kits.

If necessary, you can select between the factory CO<sub>2</sub> 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 CO<sub>2</sub> key.

If an error occurs during the CO<sub>2</sub> calibration procedure, the Q-CHECK will display the message “ERR”. Press the CO<sub>2</sub> 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 CO<sub>2</sub> diffusion holes. Refer to Figure 4 - 1.



**Figure 4 - 1: CO<sub>2</sub> 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 Q-CHECK into CO<sub>2</sub> calibration mode, press and hold the CO<sub>2</sub> key. The display will then begin to count down from five to zero. When the count reaches zero, release the CO<sub>2</sub> 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 Q-CHECK will not go into CO<sub>2</sub> calibration mode. Please refer to Appendix B: Internal DIP Switch Settings.

4. Press the SAMPLE key to take a zero measurement. The Q-CHECK will display a 60-second count-down. When the count-down is completed, the display will show the word "CALIBRATE 1" 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 CO<sub>2</sub> concentration of between 900 and 5000 ppm should be used.

6. Use the arrow (↑↓) keys on the Q-CHECK keypad to adjust the display to match the known span gas concentration. Press quickly and 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 Q-CHECK will display a 60-second count-down. When the count-down reaches zero the Q-CHECK will go into Survey mode.
8. Observe the reading displayed on the Q-CHECK. 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.

### **Calibrating the CO Concentration Measurement (Model 8731 only)**

TSI recommends calibrating the Q-CHECK 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-CHECK CO measurement for your local conditions or if conditions change.

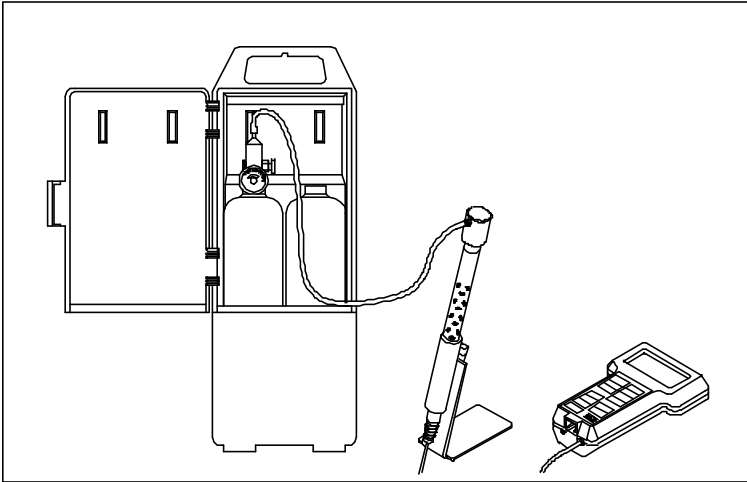
To calibrate the CO sensor, follow the procedure below. You will need a cylinder of pure air for the zero calibration and a cylinder of gas with a known concentration of CO for the span calibration. A CO concentration between 30 ppm and 200 ppm is recommended. Contact your local TSI distributor for available CO calibration kits.

Note: Calibration with CO gas should always be done in a well ventilated area.

If necessary, you can select between the factory CO 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 CO or CO<sub>2</sub> key.

If an error occurs during the CO calibration procedure, the Q-CHECK will display the message “ERR”. Press the CO or CO<sub>2</sub> 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.



**Figure 4 - 2: CO Calibration**

1. Locate the calibration adapter and slide it over the sensing probe. Make sure that the adapter completely covers the CO diffusion holes at the tip of the probe.
2. Install the regulator onto the zero calibration gas cylinder and connect tubing from the cylinder to the inlet of the calibration adapter and turn the gas on. Make sure the cylinder is not empty.
3. To put the Q-CHECK into CO calibration mode, first put the instrument into Survey mode, and then press and hold the CO key. The display will then begin to count down from five to zero. When the count reaches zero, release the CO key immediately. The words “CALIBRATE ZERO” should appear on the display. If not, try again.

Note: DIP switch 7 must be set to the “User Calibration” (ON) position or the Q-CHECK will not go into CO calibration mode. Please refer to Appendix B: Internal DIP Switch Settings.

4. Press the **SAMPLE** key to take a zero measurement. The Q-CHECK will display a 90-second count-down. When the count-down is completed, the display will show the word “CALIBRATE 1” 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 inlet fitting of the calibration adapter. Make sure the cylinder is not empty, then turn the gas on.
6. Use the arrow (↑↓) keys on the Q-CHECK keypad to adjust the display to match the known span gas concentration. Press quickly and 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) should be marked on the gas container.
7. Press the **SAMPLE** key to take a span reading. The Q-CHECK will display a 90-second count-down. When the count-down reaches zero the Q-CHECK will go into Survey mode.
8. Observe the reading displayed on the Q-CHECK . 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 adapter. The calibration is now completed.

### **Replacing the CO Sensor**

The Electro-chemical CO sensor will need to be replaced approximately once a year. Conditions that may indicate a sensor needs to be replaced are: 1) the sensor will not hold calibration. 2) the response is very unstable. Caution must be taken when operating at very low or high temperatures. Exposing the sensor to sub-freezing temperatures can cause permanent damage to the sensor. Exposing the sensor to high temperature for long periods of time can cause the sensor to dry out which will shorten the sensor life. The sensor has a built in filter to eliminate interfering gasses. This filter will last the life of the sensor under normal background gas levels. To replace the sensor follow the procedure below.

**Warning:** The CO sensor contains a corrosive material. Avoid contact with eyes and skin.

1. Unscrew cap from end of probe.

2. Remove the old sensor by gently pulling it straight off the end of the probe. Do NOT twist the sensor as this will damage the connector.
3. Tear open foil pouch and remove new sensor. Inspect new sensor for visible signs of damage or leakage.
4. Line up notch on sensor with connector and gently push sensor onto the connector.
5. Replace sensor cap.
6. Turn the Q-CHECK on and leave on for approximately 30 minutes to allow the sensor to stabilize. After the stabilization period calibrate the sensor by following the procedure above.

### **Storage Precautions**

When storing the Q-CHECK 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 15% and 90%.

# Chapter 5

## Troubleshooting

---

The table below list the symptoms, possible causes and recommended solutions for common problems encountered with the Q-CHECK.

<b>Symptom</b>	<b>Possible Cause</b>	<b>Corrective Action</b>
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 CO <sub>2</sub> or CO 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 <sub>2</sub> sensor malfunction.	Factory service required. Press any key to bypass.
“SERVICE”	IR source malfunction.	Factory service required. Press

<b>Symptom</b>	<b>Possible Cause</b>	<b>Corrective Action</b>
and “6” displayed.		any key to bypass.
“SERVICE” and “8” displayed.	CO signal out of range or CO sensor malfunction.	<ol style="list-style-type: none"> <li>1. Recalibrate CO sensor.</li> <li>2. Replace and recalibrate CO sensor.</li> <li>3. Factory service required.</li> </ol> Press any key to bypass.

# Appendix A

## Specifications

---

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

### **CO<sub>2</sub>:**

Sensor type:	Non-Dispersive Infrared (NDIR)
Range:	0-5000 ppm
Accuracy:	±3% of reading ± 50 ppm at 25°C (add ±0.36% of reading per °C away from calibration temperature (±0.2% of reading per °F))
Resolution:	1 ppm
Response time:	20 seconds (for 63% of final value for 500 ppm step change in still air)

### **CO (Model 8731 only):**

Sensor type:	Electro-chemical
Range:	0 - 500 ppm
Accuracy:	± 3% of reading or 4 ppm whichever is greater (add ±0.5% of reading per °C away from calibration temp (±0.28% of reading per °F))
Resolution:	1 ppm
Repeatability:	± 2% of reading
Response time:	< 60 seconds to 90% of final value

### **INSTRUMENT TEMPERATURE RANGE:**

Operating range:	5 to 45 °C (41 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, (Q-CHECK 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)
Probe length:	Model 8731: 16.1 cm (6.34 in.) Model 8730: 11.7 cm (4.60 in.)
Probe diameter:	1.9 cm (0.75 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.

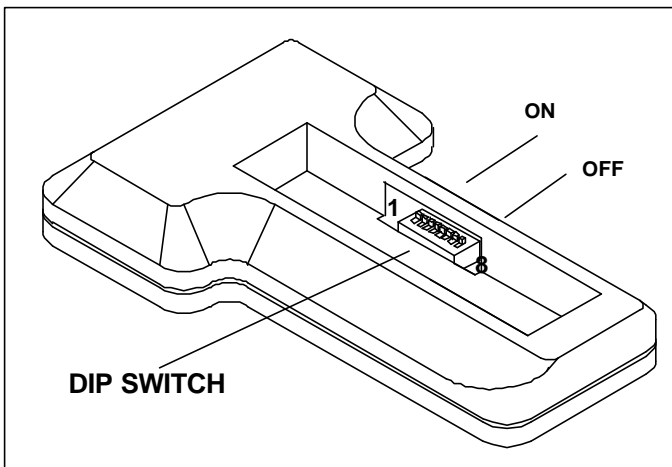
Switch	OFF	ON
1	Reserved	<b>Reserved</b>
2	Factory CO <sub>2</sub> Cal.	<b>User CO<sub>2</sub> Cal.*</b>
3	Reserved	<b>Reserved</b>
4	Reserved	<b>Reserved</b>
5	Beep Disabled	<b>Beep Enabled</b>
6	Reserved	<b>Reserved</b>
7	Factory CO Cal.	<b>User CO Cal.*</b>
8	Reserved	<b>Reserved</b>

\* 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.



**Figure B - 1: DIP Switch Location**