Display

Listed below are the modes of operation visible on the display.

WARM-UP - When the power button is pressed, the monitor enters a 1 minute warm-up indicated by the word **WARM-UP** in the upper left corner.

ON LINE - Indicates when a PC is communicating to the sensor via the RJ45 port in the rear of the monitor.

Normal Operating Mode - After warm-up the sensor will stabilize and display current conditions.

Adjustment Modes

Pressing the mode button scrolls through the adjustment modes. Below are the adjustment modes in sequence. Once the desired mode is displayed, press Enter to make adjustments. Press Enter again to save and leave the adjustment mode.

ELEVATION - Used to compensate for elevation changes.

CALIBRATION - Used when calibrating.

TEMPERATURE - For Temperature calibration

CO2 and ppm - To Manually input CO_2 levels for the CFM ventilation rate features.

CALIBRATION IN PROGRESS - Displays during calibration

Outdoor Concentration - Used to measure and save outside concentration for the cfm/person calculation.

LOW BATT - Displays when the power source is low.

Start-Up

Battery Operation - For portable use, the monitor operates on 4 AA batteries. Expected battery life is as follows:
Non-Alkaline - Up to 50 hours
Rechargeable - Up to 60 Hours
Industrial Alkaline-Up to 70 Hours

Battery Installation - Remove the battery cover by pressing the pressure clip (located on the bottom) and pull upward. Follow the diagram imprinted on plastic for proper installation and replace battery cover.

LOW BATT flashes when there is less than 30 minutes of battery life. At this point the batteries should be replaced or the AC adapter should be used as a substitute. If operation continues, the unit will become inoperable and only the **LOW BATT** will be blink on the LCD display.

AC Power - The sensor is shipped with a 6V DC 500mA AC/DC adapter. To use the adapter, connect the plug into the back of the unit and plug the transformer into any standard wall outlet.

NOTE Use the supplied adapter. Using the wrong adapter may cause damage to the unit. If power is lost during operation, battery operation will not function as a back up.

Operation

Power-Up

1. Press the **Power** Button and a 2 second delay will occur before the display becomes visible.

2. 10 seconds will elapse before displaying current CO_2 readings

3. "**WARM-UP**" will display for approximately 1 minute. During this time, adjustments can not be made to the sensor.

Elevation Correction
The sensor is shipped with the elevation setting set at "zero" or sea level. The sensor, like any other gas measuring device is affected by altitude changes. If you are at an altitude greater than 500 feet, an adjustment should be made to assure maximum sensor accuracy. The altitude correction is very small for changes of 500 to 1000 ft (e.g. 10-15 ppm/500 ft increment). Once the elevation correction is set it will be stored and saced in the monitor memory. To change the default setting using Elevation Correction follow the steps below.

1. While in Normal Mode press the **Mode** button once. **ELEVATION** will begin blinking.

2. Press **Enter**.

3. Press **Mode** to toggle the elevation reading between feet (ft) & meters (m).

4. Use the **Up/Down** button to adjust the altitude. The altitude can be adjusted in increments of 500(ft) or 100(m). Once the correct altitude is set, press **Enter** to save the setting and return to normal mode.

Temperature or CFM/Person – The lower display will cycle through the the following units when the **Up/Down** button is pressed: Temp°F, Temp°C, ftm (or CFM), turn lower display off.

Stand-alone Monitoring - Once Elevation correction has been made (as described in the steps above), the sensor will begin to accurately display current room conditions.

Using an External Datalogger - Voltage outputs for both CO_2 and temperature are available via an RJ-45 jack on the rear of the unit.

Ventilation Rate Indicator (ftm)

Overview - Display the ventilation rate by pressing the up/down button until a reading showing ftm (which stands for cubic-feet-per minute) is visible. This value represents how much outside air is being introduced on a CFM per person basis in the space. Current codes/standards generally require 15 to 20 CFM/Person to be delivered to most spaces to ensure acceptable indoor air quality. Lower CFM/Person values indicate low levels of ventilation and potentially poor air quality. Higher levels will indicate excessive ventilation and potential excessive energy usage. Accurate interpretation of the ventilation rate indicator requires a measurement be taken 2 to 3 hours after occupancy has stabilized in a space or at a peak in daily CO_2 concentrations. In other conditions the indicator

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TIF8600
Carbon Dioxide and Temperature Monitor
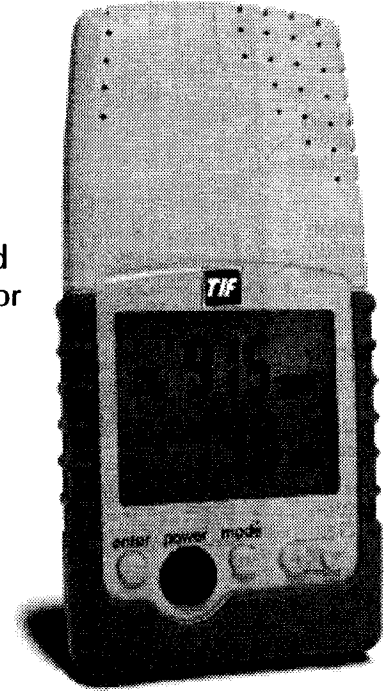
The TIF8600 is an easy-to-use hand-held CO_2/Temperature monitor. The unit provides stable, highly accurate readings due to our patented dual beam NDIR technology. Equipped with a 0-4V output, the unit is perfect for long-term monitoring/recording.

The unit features a large, easy-to-read display with a push-button interface which allows for easy calibration, quick adjustments for altitude correction, and simple toggling between °C and °F temperature readings. A new feature of the sensor now includes the ability to calculate and display the cfm/person ventilation rate in a space based on the inside/outside CO_2 concentration.

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may tend to over estimate ventilation rates. The calculation of ventilation rates also assumes an office type of activity level (sitting, some walking and other low level activity). If activity levels are higher the sensor will also underestimate the ventilation rate.

The TIF8600 calculates the outside air ventilation rate to a space based on the inside/outside CO_2 differential readings. The sensor is factory set to assume an outside level of 400 ppm, which should be close to the outside concentration in most areas. The outside level of CO_2 can also be changed by measuring outside levels or by manually adjusting the monitor.

Adjusting the Outside CO2 Concentration

1. Take the TIF8600 outside, power up and wait for CO_2 levels to stabilize (should take approximately 5 minutes).

2. Save the outside concentration by holding the **Enter** button on the sensor for 5 seconds.

3. This value is used to calculate the ventilation rate based on the differential of the measured outside value and into measured inside concentration.
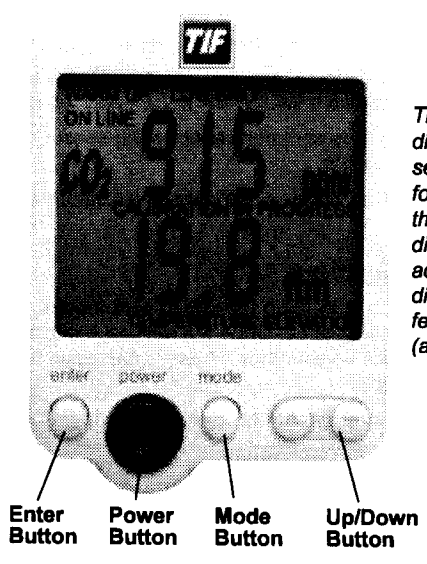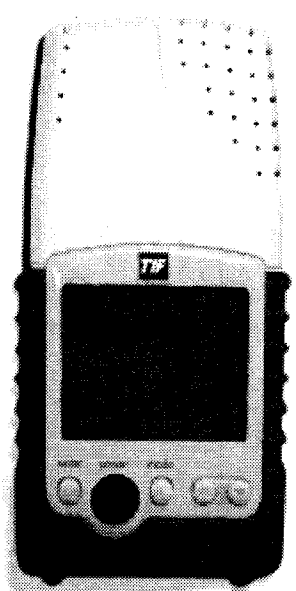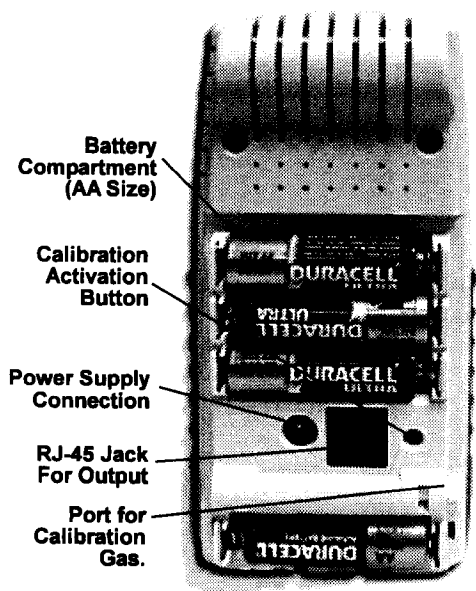
Manual Input of Outside Concentration
The monitor assumes that the activity level (and related CO_2 production) in the space is similar to that of a office environment (1.2 MET) and is factory set at 400 PPM. To adjust the factory setting (for the internal cfm/person calculation) or to verify the current setting, use the following procedure.

1. Press the mode button until **CO2 and ppm** flash.

2. Press the enter button and the current outside value will display.

3. Use the **Up/Down** button to increase/decrease the CO_2 value.

4. Press enter to save and store the value in the monitor.

Calibration (CO2)

IMPORTANT - The sensor has been factory calibrated and should need calibration once every 12 months using either a zero concentration gas or a gas with a specified concentration of CO_2. For the most accurate field calibration we recommend calibrating this sensor with a calibration kit available from the factory.

Any sensor drift usually occurs at the zero reference point. The manual calibration process allows the user to perform a one point calibration based on ambient levels or by flowing a gas of a known concentration through the sensor. This process will adjust the zero offset of the sensor and will provide an accurate calibration. If a two point calibration is required the Calibration kit or CO2View™ software should be used. For manual calibration, follow the steps below.

Battery Compartment (AA Size)

Calibration Activation Button

Power Supply Connection

RJ-45 Jack For Output

Port for Calibration Gas.

Enter Button Power Button Mode Button Up/Down Button

This drawing shows the display portion of the sensor. The drawing is for reference to identify the location of the different modes and adjustment features. The display won't display all features simultaneously (as shown).

1. The calibration procedure will last approximately 15 minutes. Before performing the calibration procedure, remove the battery cover to access the calibration activation switch. Connect the supplied AC adapter to the back of the sensor or ensure new batteries are installed.

2. Power up the sensor and wait for the Warm-up to end.

3. Next verify the Elevation correction has been set. Refer to the steps in Elevation Correction for procedure.

4. If you are calibrating to ambient conditions make sure the sensor is displaying a stable reading - avoid breathing in the area of the monitor. If you are flowing gas to the calibration port of the sensor, allow the gas to flow for at least 10 minutes before initiating calibration.

5. Press the **Mode** button twice. The Calibration mode will begin blinking.

5. Press Enter.

6. Use the Up/Down button to adjust reading to the current ambient conditions or concentration of the gas being used. Pressing the button once will change the readings in increments of 10 ppm. To increase the speed, press and hold the button.

NOTE - For best accuracy, a reference or known concentration of CO_2 should be used when adjusting the reading. Bottled nitrogen can be used to provide a zero concentration gas.

7. Next, on the backside of the unit locate the push button switch (under the battery cover, in the small round hole to the right of the connector jack), use a small pointed object to depress and hold the switch for 5 seconds. CALIBRATION will begin to blink.

8. Press Enter.

9. **Calibration In Progress** will begin to blink. At this point the unit will program itself based on the CO_2 value that was input in Step 6. The calibration process will take approximately 5 minutes.

When Calibration is complete, the display will return to the steady Calibration mode. Press Enter to return to the normal operation mode.

Temperature Adjustment

Use this procedure to adjust the temperature output when you wish to have the temperature output match a reference sensor. The accuracy of a field adjustment is dependent upon the stability of the environment is which the procedure is performed, and upon the accuracy of the reference sensor.

1. Connect the supplied AC adapter to the back of the sensor. If you do not have the AC adapter, new batteries should be used.

2. Power up the sensor and place in a stable environment, free of drafts or temperature changes. Wait 30 minutes for the unit to fully equilibrate with the environment. Do not hold the unit in your hand during this period. Press the mode button until the blinking word TEMPERATURE appears.

4. Press Enter. Both the word TEMPERATURE and the numeric temperature display will begin blinking in unison.

5. Use the Up/Down button to adjust the temperature reading to match the reference.

6. Press Enter. The temperature offset is immediately adjusted, the blinking stops, and the unit is now in normal operating mode.

Specifications

Method
Dual Beam Absorption Infrared™
Sample Method
Diffusion or flow through (50 - 100 ml/min)
Warranty
18 months parts and labor

Performance

CO2 Channel
Measurement Range
0-4,000 PPM voltage output / 0-10,000 PPM display
Resolution
± 1 ppm

Accuracy
±50 ppm or ±5% of reading (up to 1.5% or 15,000 ppm), whichever is greater
Repeatability
±20 ppm
Temperature Dependence
±0.1% of reading per °C or ±2 ppm per °C, whichever is greater, referenced to 25°C
Pressure Dependence:
0.13% of reading per mm Hg
(Corrected via user input for elevation)
Annual Drift
± 20 ppm typical
Response Time
<60 seconds for 90% of step change
Warm-Up Time
<60 seconds at 22°C
Operating Conditions
32-122°F (0-50°C)
0-95% RH, non-condensing
Storage Temperatures
-40 to 140°F (-40 to 60°C)
Calibration Interval
12 months, offset adjustment using single gas at 0-1000 ppm CO_2.
Full factory calibration available

Temperature Channel
Temperature Range
Voltage output 32 to 104°F (0 to 40°C)
Display 32 to 122°F (0 to 50°C)
Display Resolution
0.1°F (0.1°C)
Display Options
°F, °C, or Off. Set with panel button.
Accuracy
±2°F (±1°C)
Response Time
20-30 minutes (case must equilibrate with environment)
Calibration Interval
12 months, offset adjustment using temperature standard at 50 to 86°F (10 to 30°C). Full factory calibration available

Output - Analog
CO2
0-4 VDC, 1mV/ppm (4,000 ppm max)
Temperature
0-4 VDC linear, 32-104°F (0-40°C)
Output Impedance
100 Ohms
Wiring Connection
Via RJ-45 (accessory RS-232 cable 2070 or 2071)

Output - Digital
Wiring Connection
Via RJ-45 to DB9 serial port cable
Display
LCD with independent CO_2/ temperature readings (panel buttons set elevation, °F/°C, calibration functions)

Power Supply
Battery Type
Four AA batteries, not included
Battery Operation
70+ hours (alkaline)
External
6 VDC from external AC/DC adapter, included
Power Requirements
100 mA Peak, 20 mA average from 6V
Certification
FCC Class 15 Part B

All specifications and instructions subject to change without notice. This product is covered by one or more of the following patents:
5,650,624 / 5,721,430 / 5,444,249 / 5,747,808 / 5,834,777 / 5,163,332 / 5,340,986 / 5,502,308 / 6,344,798 / 6,023,069 / 5,370,114 / 5,601,079 / 5,691,704 / 5,767,776 / 5,966,077 / 6,107,925 / 5,798,700 / 5,945,924 / 5,592,147 / 6,255,653 / 6,250,133 / 6,285,290