Indoor Air Quality Meter

1010a

Rev. 3.x & Above Meters

The Value Leader™

Contents

1. Introduction

Thank you for purchasing TPI brand products. The TPI 1010a Indoor Air Quality (IAQ) Meter is a state of the art, easy to use tester designed to provide you with the necessary measurements to monitor and make adjustments to air handling devices. The instrument is ruggedly constructed and comes with a 3 Year unit and 2 Year sensor Guarantee.

2. General Overview

The 1010a IAQ meter uses state of the art sensors to measure humidity, carbon monoxide (CO), carbon dioxide (CO2), and temperature. The CO and CO2 sensors in your meter will need to be replaced periodically and calibration is recommended once every year.

The CO sensor is electrochemical and this type of sensor is always active once installed in the unit. Therefore the time the unit is off and not being used must be taken into account when determining sensor life. The sensors in your analyzer are warranted for two years. This warranty does not cover sensors damaged through misuse of the meter.

You should keep battery power applied to your sensors at all times.

The following guidelines will help prevent damage to your sensors:

Always store your unit in a place where the temperature does not get down to or below freezing.
Always maintain battery power to the sensors. When the batteries get low replace them as soon as possible.
Never allow foreign objects or material to enter the sensor holes, damage to the sensor may result.
Never over saturate your sensors by performing tests on equipment with gas levels beyond the capability of you analyzer.

General Overview (Continued)

This manual will guide you through the functions of the TPI 1010a which will give you many years of reliable service.

Your TPI 1010a Indoor Air Quality meter comes complete with the following standard accessories:

- TPI 1010a Instrument
- Protective Rubber Boot (A800)
- Soft Carrying Case (A921)
- USB Cable & Software (A803)
- Instruction Manual

Your TPI 1010a Indoor Air Quality meter has the following optional accessories available:

- Power adapter / Battery eliminator (A804)
- Infrared Printer (A740)
- Magnetic strap kit to hang meter (A127)
- Boot hook to hang meter (A103)
- Replacement Software only (A802)
- Replacement USB cable only (A801)

( ) Denotes part number

A804 Battery Eliminator Specifications:

Input: 100 ~ 240VAC @ 47 ~ 63Hz
Output: 5VDC @ 2A
Center pin positive

Fitted with two pin European style plug. Comes with USA pin adapter.

3. Front View

Sensor Locations: Places where the CO, CO2, and Humidity sensors are located and protected.

Display : Large 4 Parameter Backlit LCD Display.

Protective Rubber Boot: Provides protection to meter housing.

Keypad: Selects all available functions

USB Port Location for connection of USB cable for PC communication.

Power Adapter Socket: Location to connect optional power adapter.

Infrared Window: Used to print test results to optional infrared printer.

3.1 Soft Keys

On / Off key - Used to turn the IAQ meter on or off. Press to turn on, press and hold to turn off.

Up Arrow key - Used to select and change parameters. Also used to cycle through dew point and wet bulb temperatures from the main display.

Left Arrow key - Used to select and change parameters.

Right Arrow key - Used to select and change parameters.

Down Arrow key - Used to select and change parameters.

Enter key - Used to activate % outside air mode. Also used to accept parameter changes.

Mode key - Used to activate and deactivate data logging mode. Press and hold to activate or deactivate logging.

Backlight key - Used to turn the display backlight on and off.

T/C key - Used to switch the bottom display between temperature / humidity and time display modes. Also used to perform ambient air CO2 reset.

Unit key - Used switch the bottom temperature display between Fahrenheit and Celsius modes.

3.2 Back View

Hanger Hole:	Use to hang instrument for hands free operation. Can be used with A127 magnetic strap kit or A103 hook.
Tilt Stand:	Use to stand instrument on a table.
Batter Cover Screw:	Loosen this screw and open cover to access batteries.

4. Operation

4.1 Turning On & Off / Performing a Test / Main Display

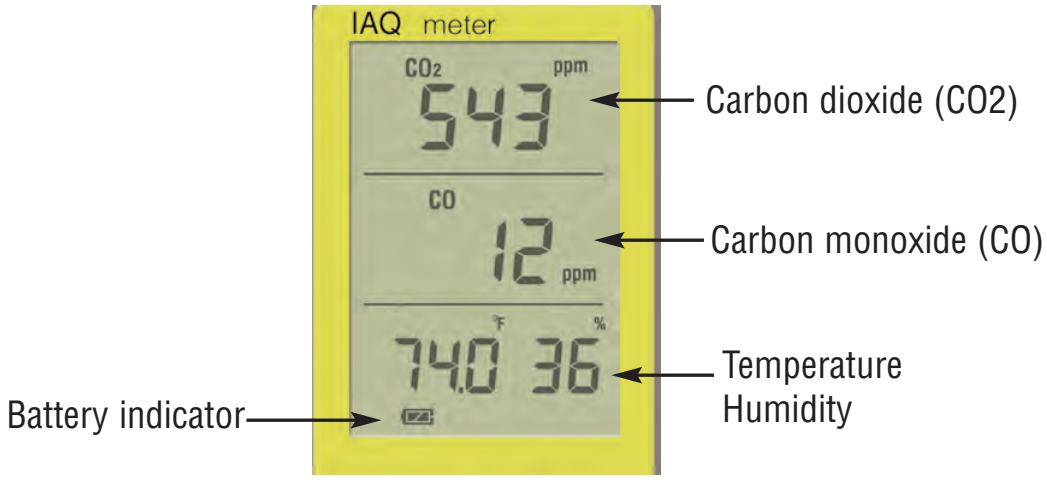
Always: - Turn the 1010a on outside of the area to be tested. Make sure the unit is in fresh air (no carbon monoxide present) prior to turning on. This will allow the CO sensor to set to zero properly.

Press the key and the 1010a will begin a 30 second countdown. During this time the 1010a performs a self diagnostic and sets the CO sensor to zero. Once the countdown ends the 1010a will display CO2, CO, Temperature, and Humidity. ***NOTE:*** *If the CO2 sensor seems to read out of specification perform the Ambient CO2 Sensor Reset as described in section 4.9.*

Enter the area to be tested, the measured values will be displayed.

Carbon dioxide (CO2) in parts per million (ppm) is displayed at the top, carbon monoxide (CO) in parts per million (ppm) is displayed in the middle, temperature in °F or °C (selectable), and humidity in percent are displayed at the bottom of the main display.

The battery indicator is located at the bottom left of the display. When the batteries become low they must be replaced to maintain proper operation.



To turn the 1010a off, press and hold the key down until the 1010a turns off.

If 30ppm or more CO is measured the 1010a will beep and the display will flash red as a warning. This alarm point is adjustable. Additional functions can be activated during testing. Please see next sections.

4.2 Selecting Temperature Units

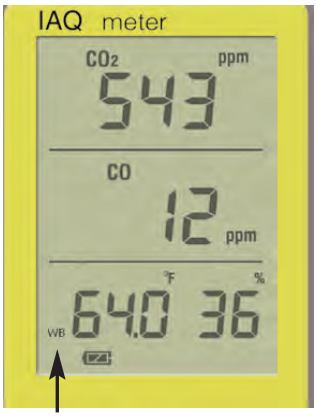
Pressing the Unit key switches the temperature display between °F and °C.

4.3 Ambient / Dew Point / Wet Bulb Temperature Display

Repeatedly pressing the ^ key from the main display cycles through dew point temperature, wet bulb temperature, and ambient temperature displays.

Ambient Temperature

Dew Point Temperature Indicated by "DP" in the display



Wet Bulb Temperature Indicated by "WB" in the display

4.4 Temperature / Clock Display Modes

Pressing the T/C key from the main display cycles between temperature and clock display. To set the clock please refer to section 4.6.

4.5 Activating the Backlight

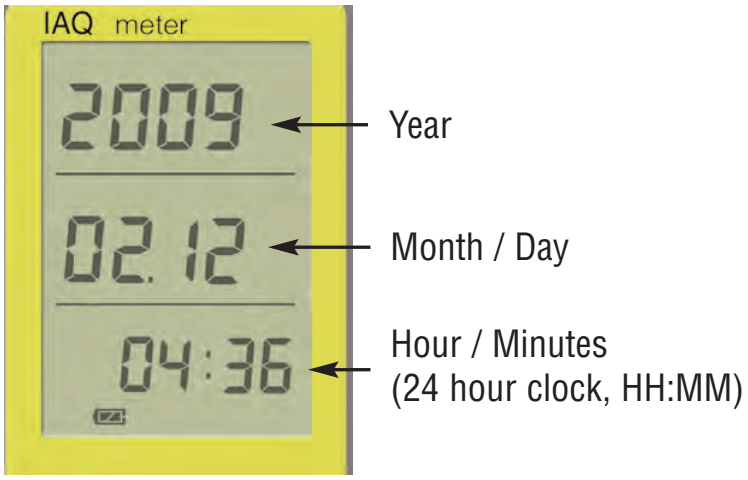
Pressing the ☼ key turns the display backlight on and off. Power consumption is much higher when the backlight is activated. The backlight will automatically turn off 30 seconds after it is activated. To conserve battery life the backlight should only be used when necessary.

4.6 Printing Measurements (Requires A740 Printer)

Align the infrared window of the A740 printer with the infrared window of the 1010a located on the upper right side of the meter. Keep the printer in clear line of sight approximately 6 to 8 inches away from the 1010a. Press and hold the ☼ key for approximately 2 to 3 seconds and the 1010a will send test data to the printer.

4.7 Setting Date and Time

1) Starting with the 1010a turned off, press and hold down the MODE key then press and hold down the key until two beeps are heard and the time / date screen is displayed.



2) Using the Arrow keys, set the year. Once the year is set, press Enter
3) Using the Arrow keys, set the month. Once the month is set, press Enter
4) Using the Arrow keys, set the day. Once the day is set, press Enter
5) Using the Arrow keys, set the hour. Once the hour is set press Enter
6) Using the Arrow keys set the minutes. Once minutes is set, press Enter

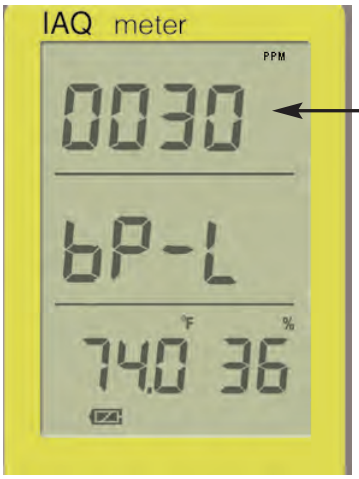
The 1010a will return to normal operation.

4.8 Setting CO Alarm Level

The 1010a is equipped with an audible and visual alarm for carbon monoxide. The alarm level is factory set at 30ppm. When CO above this level is measured, the 1010a will beep and the display will flash red.

The alarm level is adjustable and can be set from 10ppm to 500ppm.

1) With the 1010a turned on, press and hold down the < and > keys until the CO alarm screen is displayed.



CO alarm level in ppm

Using the Arrow keys set the alarm point to the desired level. The < > keys select the digit and the ^ v keys increase or decrease the value. Once the desired alarm point is set, press the Enter key to return to normal operation.

4.9 Ambient Air CO2 Reset

The CO2 sensor can be reset at ambient level as needed. This can be performed if the CO2 reading seems to be too high or low or just to ensure your 1010A is operating properly. Note: This does not take the place of a full factory calibration which is recommended once per year.

1. Take the 1010A outside in ambient air. Allow the CO2 reading to stabilize. Make sure you are not breathing into the sensor area.

2. Press and hold the T/C key until the 1010A beeps and the display resets to 400ppm CO2 (+/- 75ppm). ***IMPORTANT: DO NOT PERFORM THIS PROCEDURE INDOORS. IF THIS HAPPENS BY ACCIDENT, PERFORM THE PROCEDURE AS INSTRUCTED ABOVE TO RESET THE CO2 READING.***

5. Calculating % Outside Air

HVAC systems use a combination of outside air, supply air, and return air to maintain consistent and comfortable air quality. The 1010a can calculate outside air either by measuring temperature or by measuring CO2.

The formula used to calculate % outside air is:

$$\% \text{ Outside Air} = \frac{\text{Return Air - Supply Air}}{\text{Return Air - Outside Air}} \times 100\%$$

Percent outside air can be calculated using either temperature or carbon dioxide.

5.1 % Outside Air (Temperature)

To activate % outside air mode, press the Enter key about 2 seconds until “t-0” is displayed in the middle display area.

1) Place the sensor of the 1010a perpendicular to the “Return” air flow. When the reading stabilizes press the Enter key and capture the return air temperature, "t-1" is displayed.

2) Place the sensor of the 1010a perpendicular to the “Supply” air flow. When the reading stabilizes press the Enter key and capture the supply air temperature, "t-2" is displayed.

3) Place the sensor of the 1010a perpendicular to the “Outside” air flow. When the reading stabilizes press the Enter key and capture the outside air temperature, "t-3" is displayed.

4) Press the Enter key, "t =" will be displayed and the calculated percent outside air will be displayed at the top of the display.

5) If you want to perform this measurement again, press the Enter key once and return to step 1.

6) To exit and return to normal operation, press and hold the Enter key until “C-0” is displayed. Press and hold the Enter key until a beep is heard and the 1010a returns to normal operation.

5.2 % Outside Air (Carbon Dioxide)

To activate % outside air mode, press the Enter key about 2 seconds until “t-0” is displayed in the middle display area. Press and hold the Enter key until “C-0” is displayed.

1) Place the sensor of the 1010a perpendicular to the “Return” air flow. When the reading stabilizes press the Enter key and capture the return air temperature, "C-1" is displayed.

2) Place the sensor of the 1010a perpendicular to the “Supply” air flow. When the reading stabilizes press the Enter key and capture the supply air temperature, "C-2" is displayed.

3) Place the sensor of the 1010a perpendicular to the “Outside” air flow. When the reading stabilizes press the Enter key and capture the outside air temperature, "C-3" is displayed.

4) Press the Enter key, "C =" will be displayed and the calculated percent outside air will be displayed at the top of the display.

5) If you want to perform this measurement again, press the Enter key once and return to step 1.

6) To exit and return to normal operation, press and hold the Enter key until a beep is heard and the 1010a returns to normal operation.

6. Data Logging

To activate data logging press and hold down the MODE key until the logging setup screen is displayed. Once the logging function is activated all preciously logged data is written over.

1) INT is displayed at the top to indicate the 1010a is waiting for the logging interval to be set. The logging interval tells the 1010a how often to sample. For example, a logging interval of 10 seconds (00:10) means the 1010a will log a reading every 10 seconds. The bottom indicates the current logging interval in minutes and seconds (MM:SS) or hours and minutes (HH:MM). Flashing "SEC" in the display indicates the last two digits are seconds and a flashing "MIN" in the display indicates the last two digits are minutes. In seconds mode the time is adjustable from 1 sec to 59 min 59 sec. In the minutes mode the time is adjustable from 1 min to 23 hr 59 min. Pressing the ∧ ∨ keys switches between the two time modes.

2) Once the time mode is set press the Enter key and time digits will flash. Using the Arrow keys set the interval to the desired level. The < > keys select the digit and the ∧ ∨ keys increase or decrease the value.

3) Once the seconds have been entered, press the Enter key to move to min / hr.

4) Using the Arrow keys set the interval to the desired level. The < > keys select the digit and the ∧ ∨ keys increase or decrease the value.

5) Once the logging interval is set press the Enter key and the 1010a will return to the main display and "LOG" will flash indicating the logging function is active.

6) To deactivate data logging press and hold down the MODE key until "LOG" is no longer flashing.

For data retrieval please see the next section on how to retrieve logged data.

7. Retrieving Logged Data

To retrieve logged data the USB cable and PC software (both supplied) must be used.

Install the PC software on your PC and open it.

Connect the 1010a to the PC using the USB cable.

Click on the connect to PC button in the software window.

The software can be used to retrieve logged data and for real time monitoring.

COM port setting is:

Baud rate: 19200
Parity: None
Data Bits: 8
Stop Bit: 1

8. Technical Specifications

Function	Range	Accuracy
CO2	0 to 5000ppm	50°F~104°F: ±(5% of rdg+75ppm) <50°F, >104°F: ±(10% of rdg+75ppm)
Temperature	-5°F to 140°F -20°C to 60°C	±2°F ±1°C
Dew Point Temperature	-47°F to 135°F -44°C to 57°C	Calculation
Wet Bulb Temperature	3°F to 135°F -16°C to 57°C	Calculation
Relative Humidity	5% to 95%	±2% RH
CO	0 to 500ppm	±3ppm or ±5% of rdg whichever is greater
% Outside Air	0 to 100%	Calculation

Data Logging: Up to 4,000 samples 1 sec to 23hr 59min interval.

Display Type: 3 line with annunciators and backlight

CO Alarm: Audible and visual, selectable level (factory default 30ppm)

Operating Temperature & Humidity
CO and CO2: 14°F to 122°F (-10°C to 50°C)
All Other Function: -4°F to 140°F (-20°C to 60°C)
Humidity 15 ~ 95% non-condensing

Storage Temperature: -4°F to 140°F (-20°C to 60°C)

Power supply
3 AA batteries (1.5V each x 3 = 4.5V total)
Battery Life: 40 hours typical without backlight
Optional AC adapter (battery eliminator) part number A804

Output: Serial output via USB connection
Infrared output to optional A740 printer

9. Maintenance & Troubleshooting

It is recommended that the instrument be calibrated every 12 months. Please see section 9.2 below..

Problem: CO2 reading out of specification
Possible Causes: Sensor needs calibration, T/C key held down indoors
Corrective Action: Perform ambient air reset outlined in section 4.9.
Replace batteries
Send unit to TPI for factory calibration and maintenance.
Problem: CO reading out of specification
Possible Causes: Sensor needs calibration or replacement
Corrective Action: Replace batteries
Send unit to TPI for factory calibration and maintenance.
Problem: Temperature or Humidity reading out of specification
Possible Causes: Sensor needs calibration or replacement
Corrective Action: Replace batteries
Send unit to TPI for factory calibration and maintenance.

9.1 Battery Replacement

When the batteries become low they will require replacement.

1. Turn the meter over so the back is facing you.
2. Loosen the screw holding down the battery cover located under the tilt stand.
3. Lift the tilt stand up and remove the battery cover.
4. Replace the batteries (3 x a Alkaline) and install the cover and tighten the screw.

9.2 Service

To obtain warranty and non-warranty performance or maintenance on your analyzer: - Include with the product your name, address, phone number, written description of the problem and proof of purchase date. Carefully package and return to:

TPI / Attn. Repair
9615 SW Allen Blvd. Suite 104
Beaverton, OR 97005

10. Technical Information

% Outside Air - HVAC systems use a combination of outside air, supply air, and return air to maintain consistent and comfortable air quality. The 1010a can calculate outside air either by measuring temperature or by measuring CO2. The formula for % Outside Air is:

$$\% \text{ Outside Air} = \frac{\text{Return Air - Supply Air}}{\text{Return Air - Outside Air}} \times 100\%$$

If too little outdoor air enters a home, pollutants can accumulate to levels that can pose health and comfort concerns. Unless they are built with special mechanical means of ventilation, homes that are designed and constructed to minimize the amount of outdoor air that can 'leak' into and out of the home may have higher pollutant levels than other homes. However, because some weather conditions can drastically reduce the amount of outdoor air that enters a home pollutants can build up even in homes that are normally considered 'leaky'.

Dew Point Temperature - This is the temperature at which condensation begins

Wet Bulb Temperature - This is the lowest temperature evaporating water can reach

Recommended Levels by Agency

Parameter	IDPH[1]	ASHRAE[2]	OSHA PEL[3]	ACGIH TLV[4]
Humidity	20% - 60%	30% - 60%	N/A	N/A
Temperature	68 - 75 (winter) 73 - 79 (summer)	68 - 75 (winter) 73 - 79 (summer)	N/A	N/A
Carbon Dioxide	1,000ppm (<800ppm preferred)	1,000ppm	5,000ppm	5,000ppm
Carbon Monoxide	9ppm	9ppm	50ppm	25ppm

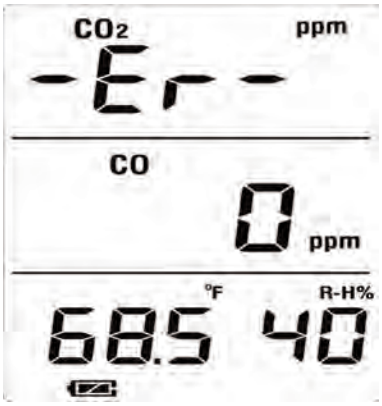
N/A-Not Applicable or Not Established

[1] Illinois Department of Public Health (2009)
[2] American Society of Heating, Refrigerating and Air Conditioning Engineers
[3] Occupational Safety and Health Administration Permissible Exposure Limit -- this level is a time-weighted average and is an enforceable standard that must not be exceeded during any eight-hour work shift of a 40-hour work week.
[4] American Conference of Governmental Industrial Hygienist Threshold Limit Value -- this level is a recommended time-weighted average upper limit exposure concentration for a normal eight to 10-hour workday and a 40-hour work week.

10. Error Codes & Troubleshooting

CO2 Sensor Error

If the CO2 sensor fails to initialize or is faulty the 1010a will display an error code. Try turning the 1010a off and on again. If it displays the error code again the 1010a is in need of service. Please return your instrument to TPI. See section 9.2 for instructions on returning your meter.



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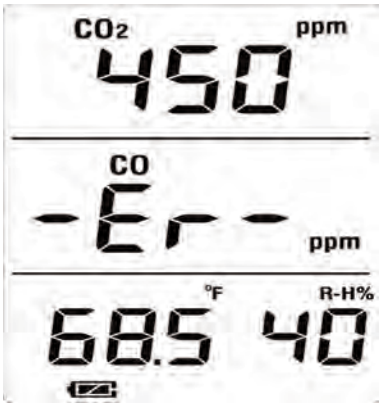
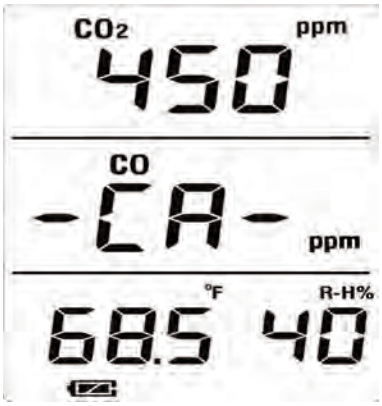


CO Sensor Caibration Due

When the last calibration date of the CO sensor is one year or older the 1010a will display a reminder that calibration is due before returning to normal operation. Please return your instrument to TPI for calibration. See section 9.2 for instructions on returning your meter.



Temperature and/or Humidity Sensor Error

If the temperature and/or humidity sensor fails to initialize or is faulty the 1010a will display an error code. Try turning the 1010a off and on again. If it displays the error code again the 1010a is in need of service. Please return your instrument to TPI. See section 9.2 for instructions on returning your meter.