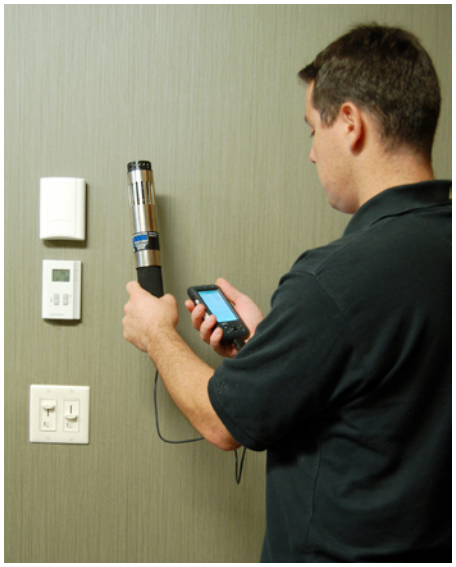
GRAYWOLF SENSING SOLUTIONS
ADVANCED ENVIRONMENTAL INSTRUMENTATION

Ensure that fixed Carbon Dioxide (CO_2) sensors utilized for Demand Control Ventilation (DCV) are providing accurate front-end data:

Verifying calibration in-situ can save big $!

GrayWolf's portable DirectSense & AdvancedSense CO_2 meters allow for simple and quick on-site verification of the accuracy of fixed CO_2 sensor output. Validate newly installed CO_2 sensors and periodically verify that these sensors have not drifted or malfunctioned. Assure correct ventilation as driven by these sensors to avoid the significant financial and carbon footprint issues consequential from over-ventilating, and the occupant productivity and health problems resultant from under-ventilating.

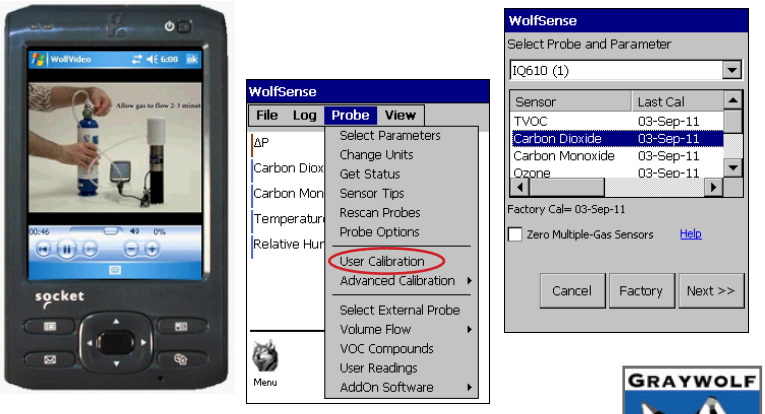


DirectSense PPC with CD-202 CO_2 Probe

Fixed CO_2 sensors are widely used to control the settings of air handling systems and to ensure appropriate outdoor air ventilation to remove occupant generated pollutants. DCV is utilized to avoid excess ventilation, when occupants are not present, which would otherwise result in higher energy costs and unnecessary greenhouse gas emissions. Outdoor "dilution" air will typically remove the building generated pollutants (in lieu of an unusual specific source). However, heating or cooling outdoor air is expensive and is responsible for over 20% of total energy consumption in Europe and North America.

Installation of fixed CO_2 sensors as the front end to increase the dilution air supplied by a building's HVAC system to specific occupied areas makes great strides toward optimizing dilution air requirements. However, such a scheme depends on highly accurate CO_2 sensor response to be effective. The Iowa Energy Center conducted experiments on the accuracy of 15 new DCV CO_2 sensors; many of the sensors had errors greater than 75 ppm and errors greater than 200 ppm were not uncommon [REF 1]. In addition, CO_2 sensors typically exhibit drift over time, even in clean air. And exposures to elevated pollutants from cleaning products, painting, cigarette smoke, combustion processes, etc. can accelerate sensor drift. Dust, insect nests, condensation, physical damage or other factors may also lead to sensor variation or malfunction. Upward drift will result in over-ventilating a space, which wastes energy. Downward drift can result in under-ventilating the space, reducing occupant performance and creating potential negative health effects. A report from Lawrence Livermore National Laboratory tested 90 DCV CO_2 sensors and found highly varied accuracy. At 1010 ppm, 40% of sensors had errors greater than +/-75 ppm and 31% of sensors had errors greater than +/-100 ppm. [REF 2]

It is prudent to periodically check the calibration of fixed sensors to avoid excess energy costs or the cost of reduced productivity. GrayWolf's DirectSense and Advanced Sense instruments incorporate highly accurate and very rapid response CO_2 sensors (stabilizing within 3-4 minutes so that field comparisons are *quick*). Dual point calibration kits (incorporating 350ppm and 1100ppm



Easily verify GrayWolf meter calibration ahead of DCV sensor comparisons

reference gases) are available. GrayWolf's software hand-holds the operator through user calibrations of the GrayWolf CO_2 sensors to verify precise sensor calibration of this test equipment. This enhances confidence ahead of checking the fixed CO_2 sensors. Each DCV sensor may then have its test data snap logged to the GrayWolf instrument, with this user calibration data attached to the data file. Best practice is to check each sensor at 2 different CO_2 concentrations. Check the sensor before occupancy (such as early morning), and then again a few hours after full occupancy (typically late morning or mid to late afternoon). Ahead of occupancy, the CO_2 level will normally be low, likely near 350 to 500ppm which are typical outdoor concentrations. Once CO_2 has built up from the occupants exhaling, levels may typically be more like 700ppm to 1200 ppm; thus the fixed sensor can be checked at 2 values including the very important typical occupancy level. Take into account DCV sensor lag time (if the CO_2 is changing rapidly) as the GrayWolf sensor will typically exhibit faster response than the DCV sensor. If CO_2 levels are still rising (or falling) at the time of your test as would be obvious on the GrayWolf instrument display, you might return awhile later once the CO_2 level has stabilized.

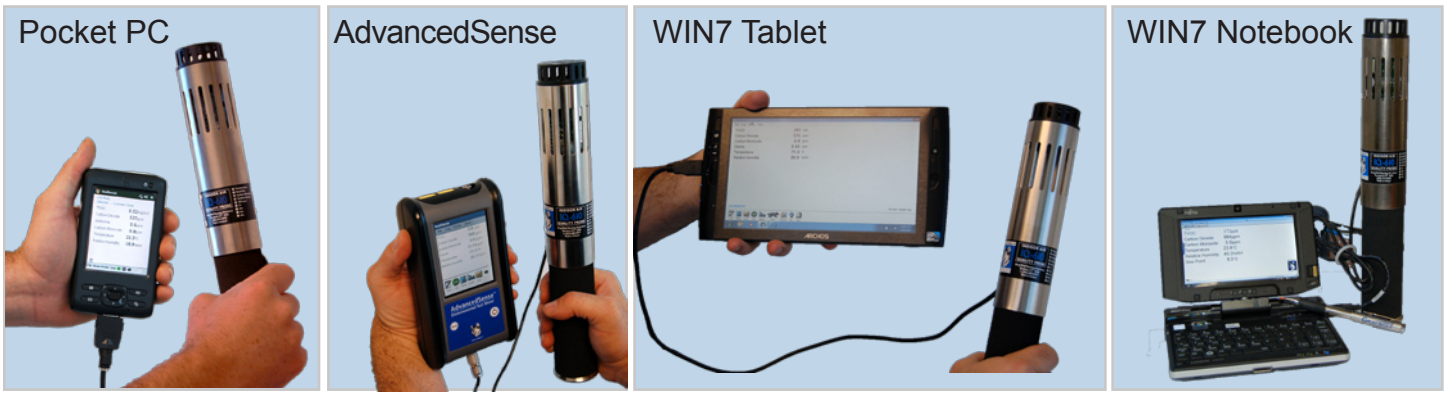
Equipment:

DirectSense PocketPC (PPC) based Meter with CD-202 Carbon Dioxide Probe, WolfSense PPC application software and WolfSense PC data transfer and reporting software.

Note:

Although using a PPC mobile computer with a CD-202 probe is described in this application note, it is possible to perform these same procedures with a WIN XP/7 laptop PC or an AdvancedSense meter connected to any GrayWolf probe that measures CO_2.

Use across multiple platforms:



References:
1. PRODUCT TESTING REPORT; WALL MOUNTED CARBON DIOXIDE (CO2) TRANSMITTERS,
California Energy Commission
Sacramento, CA
Iowa Energy Center
Ames, IA
June 2009

2. CO_2 MONITORING FOR DEMAND CONTROLLED VENTILATION IN
COMMERCIAL BUILDINGS, Environmental Energy Technologies Division
Indoor Environment Department
Lawrence Berkeley National Laboratory
Berkeley, CA
March 2010

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