

Application of A Wireless, Ambient Light Energy Harvesting CO₂, Temperature and Humidity Transmitter as Part of Large Building Retrofit (TR9277-EO)



Overview:

The J G O'Donoghue Building in Edmonton is an enormous, three story, 262,500 square foot office building operated by the Province of Alberta. A \$32 m retrofit project of the building was completed in 2018 to meet the Alberta Go-Green program that incentivizes buildings to rely on renewable energy. The project was a full renovation that included the addition of solar power, tenant improvements and installation of new HVAC, electrical and plumbing systems to meet sustainability objectives.

Included as part of the retrofit was the installation of 117 AirTest TR9277-EO wireless, zero energy, CO₂, temperature and humidity transmitters that are powered solely by an on-board photovoltaic panel that harvests indoor ambient light. If desired, a button battery can also be used to provide 5 years of power. These devices were installed in all meeting rooms in the building and are used to provide energy efficient Demand Controlled Ventilation (DCV) that allows the modulation of delivery of fresh outside air to the space based on the number of people in the space exhaling CO₂.

CO₂ DCV is widely recognized as a method of reducing energy costs while ensuring good indoor air quality and is a regular part of energy efficiency building upgrades. It is often also required by code in new construction. Wireless technology is often preferred in retrofit applications like this to avoid the cost of running wires.

Installation Details

The building control system selected for the project is made by Delta Controls and installed by ESC Automation in Edmonton. A key component offered as part of the Delta system is an inexpensive, add-on wireless gateway called the CON-ENOC which supports a wide range of devices that communicates using the low-energy, EnOcean® wireless protocol, including the AirTest TR9277-EO. The gateway can receive signals from up to 32 actual EnOcean® communicating devices which then translates the information via an RS485 connection to the widely used BACnet™ wired communication protocol. Many other HVAC manufactures offer similar EnOcean® gateways.



Shane MacPherson, a Controls Technician at ESC, was responsible for the CO₂ installation. According to Shane, “ This was the first installation our branch has undertaken using this AirTest TR9277-EO wireless transmitter, and I was unsure how difficult this would be. Thankfully, the sensors were fast and easy to install and when it was all was completed, I looked like a hero!”

One important feature of the TR9277-EO is a test mode that allows for measurement of radio signal strength between the gateway and transmitter. In this installation, there were a number of metal interior walls in the building that potentially can be a barrier for radio communication. To meet this challenge, Shane strategically placed the CON-ENOC gateways within 15 meters (50 feet) of the EnOcean® devices in such a way that the radio signal did not have to go through more than two walls. The radio strength test onboard the TR9277-EO then allowed for quick verification and ideal placement in this challenging situation. This test also helped quickly identify that one gateway was not operating properly and had to be changed out. The transmitter also has a light level test that can be used to determine the best location for harvesting indoor light for power.

Even though the TR9277-EO measures temperature and humidity, the temperature measurement and control for the building was performed by another brand of wireless temperature sensor that had a display and manual temperature adjust features as required in the building specifications. AirTest does offer an adjustable temperature transmitter as well as the three parameter TR9277-EO transmitter, but the low energy budget of these ambient light-harvesting devices does not support active displays at this time.

Once all sensors were installed, Shane relied on the “Automated Background Calibration” (ABC) self-calibration feature of the transmitter that will calibrate the sensor to outside air over about a week of operation. This method assumes that inside levels are equal to outside levels (e.g. 400 ppm) once the building has been unoccupied for a few hours. The TR9277-EO CO₂ sensor also has an on-board pressure sensor to correct CO₂ readings for altitude that further increases reading accuracy. If desired, the sensor can also be calibrated in outdoor air before final installation.

While there is not a display on the TR9277-EO, three LEDs on the right side of the photovoltaic panel will flash every 15 seconds to indicate good, marginal, or poor air quality levels based on CO₂. A more exact output of the current measurement can be shown in LED flash sequence by activating the function using the side button.

Summary

The TR9277-EO offered a simple, fast and reliable way of integrating CO₂, temperature and humidity measurement into the Delta Controls system using their CON-ENOC, EnOcean®-to-BACnet™ gateway. This approach reduces total cost of installation in new and retrofit applications by drastically reducing wiring and labor costs. In spaces with high or variable occupancy, CO₂ DCV can start saving energy immediately. Many utilities also offer rebates for CO₂ DCV installations.

Reference:

- **ESC Automation**, 18222 102 Ave, Edmonton AB T5S-1S7, 780 722-0753, www.escautomation.com
- **AirTest** webpage for the TR9277-EO CO₂, Temp and RH transmitter and other EnOcean® products, with data sheets and additional info: www.AirTest.com/enOcean
- Datasheet for the **Delta Controls**, CON-ENOC, EnOcean-to-BACnet® Gateway: www.deltacontrols.com/products/integration/enOcean-controller
- Contact **AirTest**: www.AirTest.com, sales@airtest.com
P: 604 517-3888, TF: 888-855-8880, F: 604 517-3900
- The **EnOcean® Alliance**, “No Wires. No Batteries. No Limits.” : www.enOcean-alliance.org

AirTest TR9277-EO

