1 Communicating with the eosGP via Coolterm

1.1 Setup and Connection

Sensor maintenance can be done through Coolterm, a free software which facilitates communication with serial devices. To install Coolterm, download the appropriate version for your computer from https://freeware.the-meiers.org/ and unzip it in your directory of choice. Once Coolterm is opened, click the options button on the top bar and change the serial settings to **19200-8-2** (see **Figure 1** below). Note that the sensor may be on a COM port other than the default if you have multiple devices connected to your computer.

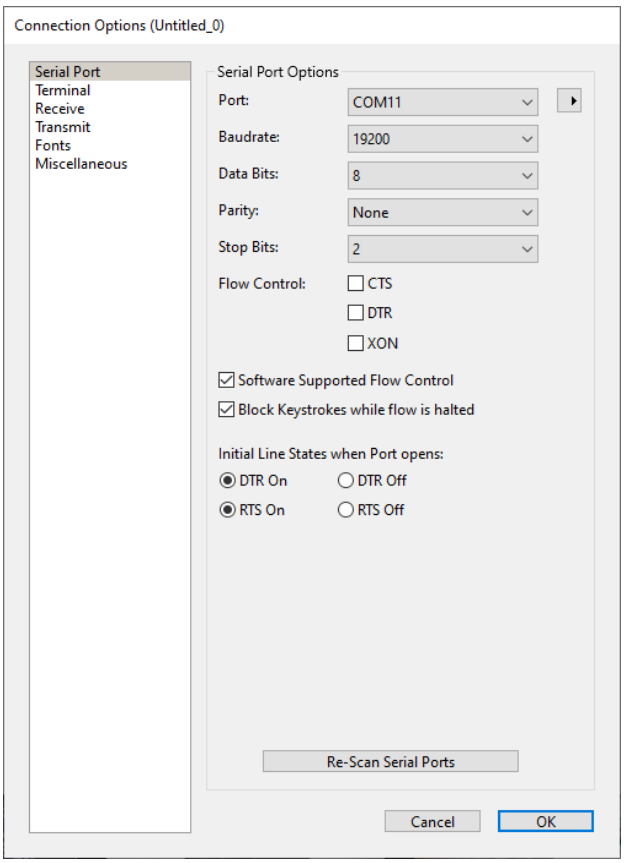

Figure 1 - Coolterm settings window configured to interact with eosGP

Once the options have been set, return to the main window and click “Connect” on the top bar. If your sensor has been pre-configured in STREAMING output mode then data should begin streaming into the main window. This data stream will continue until interrupted by inputting `s <CR>` , which readies the sensor to receive commands. When you are finished with your work, inputting `r <CR>` will return the unit to streaming mode.

1.1.2 Connecting an eosGP that is configured in MODBUS mode

If your sensor has been configured in MODBUS output mode you will need to complete a these steps before you can communicate with your sensor via Coolterm:

1. Plug the USB service cable into your computer before pressing “Connect” on the top bar.

2. Keep the Enter key pressed down and, at the same time, connect the eosGP to the USB service cable (you must send five carriage returns within 0.7 seconds while the eosGP is being powered on to force the eosGP to serial command mode).

3. The terminal should display a string that says “GMP251” or “GMP252”

4. To test the connection enter the **?** command. If the connection failed, disconnect the eosGP from the USB service cable and repeat steps 2 and 3.

5. Put the sensor in run mode using the `smode` command (see **Section 1.2**)

1.2 Changing Output Mode

To change the sensor’s output mode, enter the following lines as shown in **Table 1**, ending each with a carriage return. Note that the parenthetical term is optional. If it is absent, the sensor will return its current value. If it is present, it will change the address. The parenthesis themselves should be omitted. For a sample, see **Figure 2.**

The output options are **run** (begin streaming data as soon as the sensor is powered)**, poll** (return data only when asked via serial)**, modbus** (return data in response to a MODBUS query), and **analog** (stop serial output and convert concentration data to an analog signal which is output in its place).

```
s
smode (mode)
r
```

Table 1 - *Changing output mode*

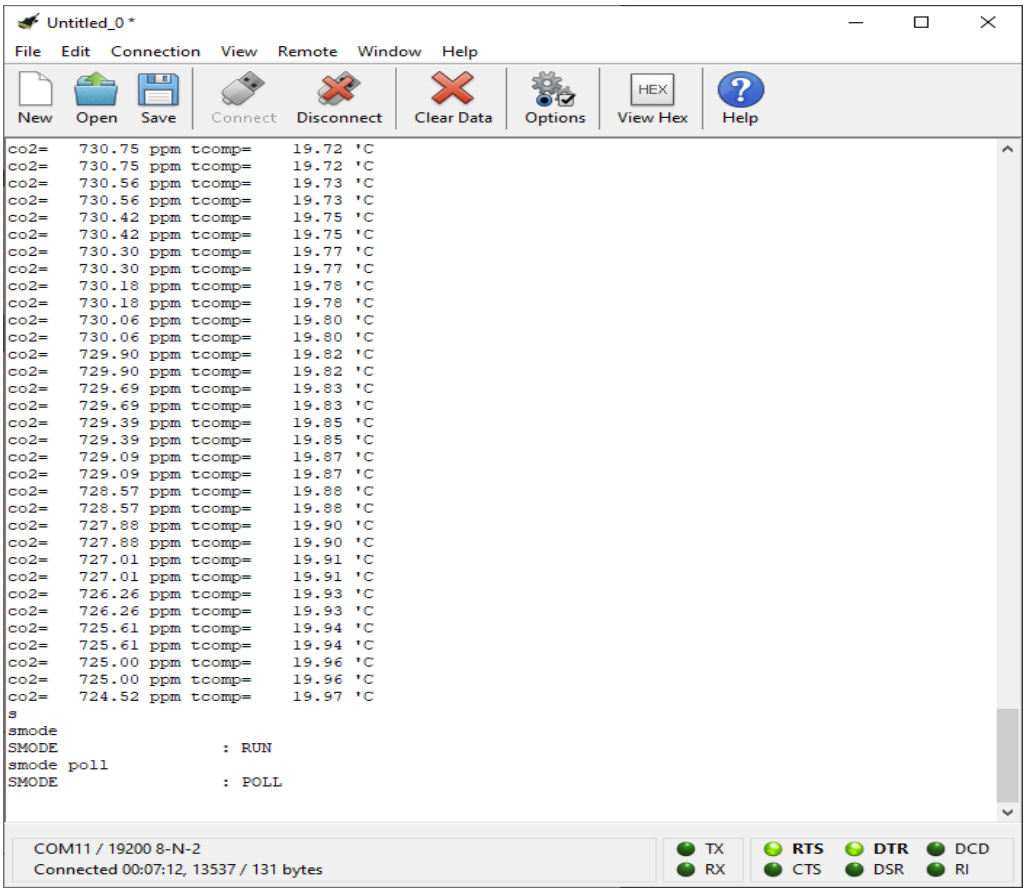

Figure 2- *Viewing the sensor's current output mode and changing it to polling.*

1.3 Setting and Viewing the Modbus Address

To view or set the MODBUS address, enter the following lines as shown in **Table 2**, ending each with a carriage return. Note that the parenthetical term is optional. If it is absent, the sensor will return its current value. If it is present, it will change the address. The parenthesis themselves should be omitted. For a sample, see **Figure 3.**

```
s
addr (###)
r
```

Table 2 - *Setting Modbus Address*

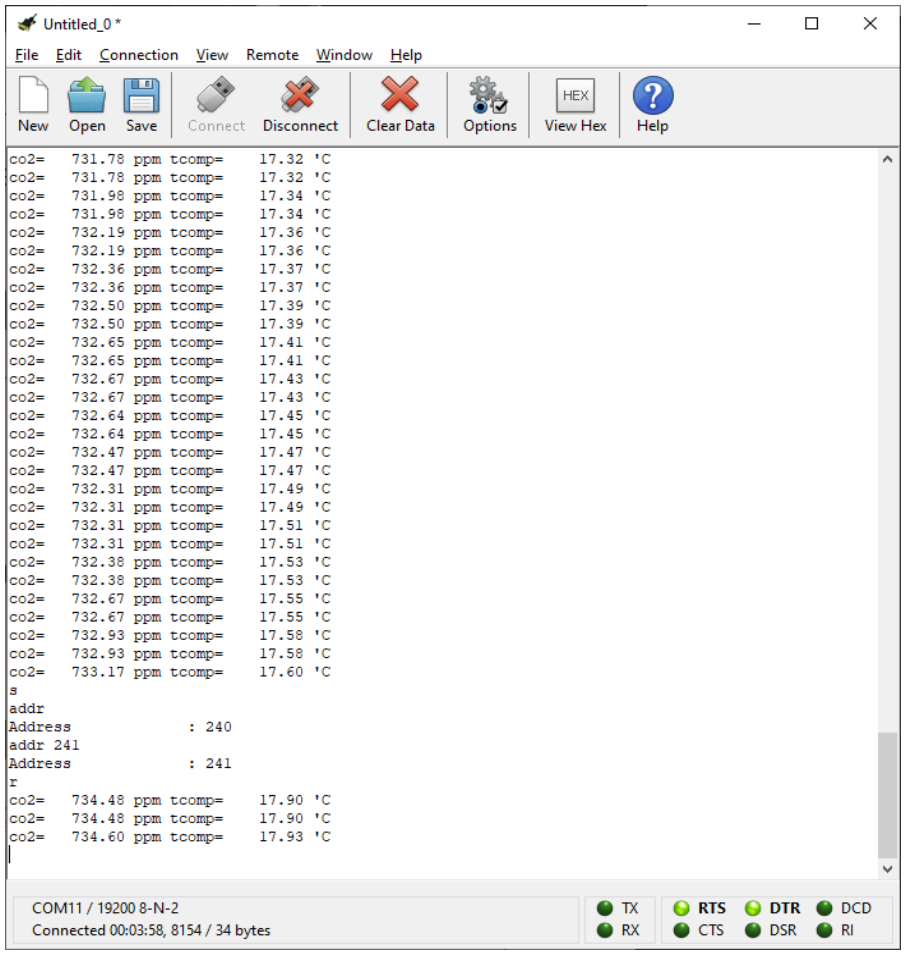

Figure 3 - *Viewing and changing the sensor's MODBUS address*

1.4 Changing Analog Scaling

The Vaisala GMP252 can forgo streaming output in favour of an analog signal, which may be preferred, either for integration with data loggers or for other reasons. The sensor scales the programmed range onto a 0-5V analog signal, and this range can be modified via serial command.

To change analog output range, enter the lines shown in **Table 3**, ending each with a carriage return. Note that the parenthetical term is optional. If it is absent, the sensor will return its current value. If it is present, it will change the address. The parenthesis themselves should be omitted. For a sample, see **Figure 4.**

s **pass 1300** **asel 1 co2** ***(low) (high)*** **r**

Table 3 - *Changing analog scaling*

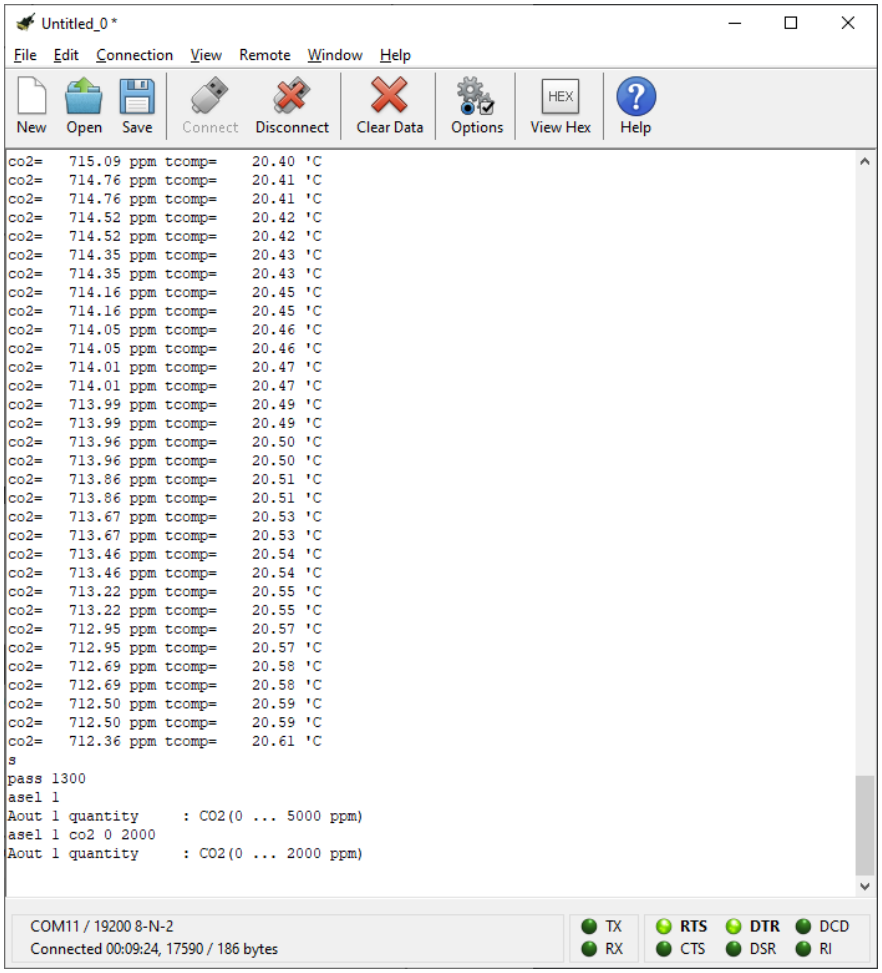

Figure 4 - *Viewing and changing the sensor's analog scaling*

2 Calibration and Maintenance

2.1 Maintenance

We recommend cleaning the eosGP membranes with a gentle tool (such as a soft toothbrush) and a squirt bottle of deionized water. Use the toothbrush to dislodge any mud/sediment and then the squirt bottle to wash it off. A waterpik would also work (but use a low pressure setting). Avoid using solvents as this can damage the membranes material and water resistance.

WARNING

! Do not remove the cap from your eosGP to clean it, as this can compromise the seal on the membrane.

2.2 Sensor Calibration Corrections

2.2.1 Overview

Drift in the eosGP reading over time is a normal behaviour that is usually driven by sensor aging (both from the light source losing brightness and the detector losing sensitivity over time). Depending on the deployment environment, natural drift can happen faster or slower, so it is a good practice to perform a one point calibration against a known standard or atmospheric air (which should be close to 410 ppm during the day) often. When drift occurs, the best practice is to perform a 2-point calibration check on the sensor using known standards. Two-point concentration calibrations require two well characterized gas standards spanning the expected operational range of the sensor. We recommend using 0 ppm and 24,000 ppm to calibrate a 0-30,000 range sensor, or 0 ppm and 160,000ppm to calibrate a 0-200,000 range sensor.

The uploading of calibration corrections can be done through a compatible terminal program such as Coolterm. For more information on how to set up and connect to your sensor in Coolterm, see **Section 5.1**.

2.2.2 One Point Calibration

You may use a reference gas standard to perform a one-point calibration. To do so, you must flush and equilibrate the sensor headspace with the standard. This can be accomplished by running the standard through a flow-through cap screwed directly onto the sensor, or by placing the sensor in a sealed container which is then flushed and maintained with the standard.

After the output CO_2 reading has stabilised, the sensor is ready to be calibrated. To do so, enter the lines shown in **Table 4** into the terminal, following each line with a carriage return.Note that the `cco2 -lo` value should be replaced with the details of your calibration.

```
s
pass 1300
cco2 -lo VAL
cco2 -save
cdate YYYYMMDD
ctext NOTE
r
```

Table 4- *One point calibration*

For an example calibration, see the captured window in **Figure 5.**. In this case, a 500 ppm standard was supplied through a flow-through cap attached directly to the sensor.

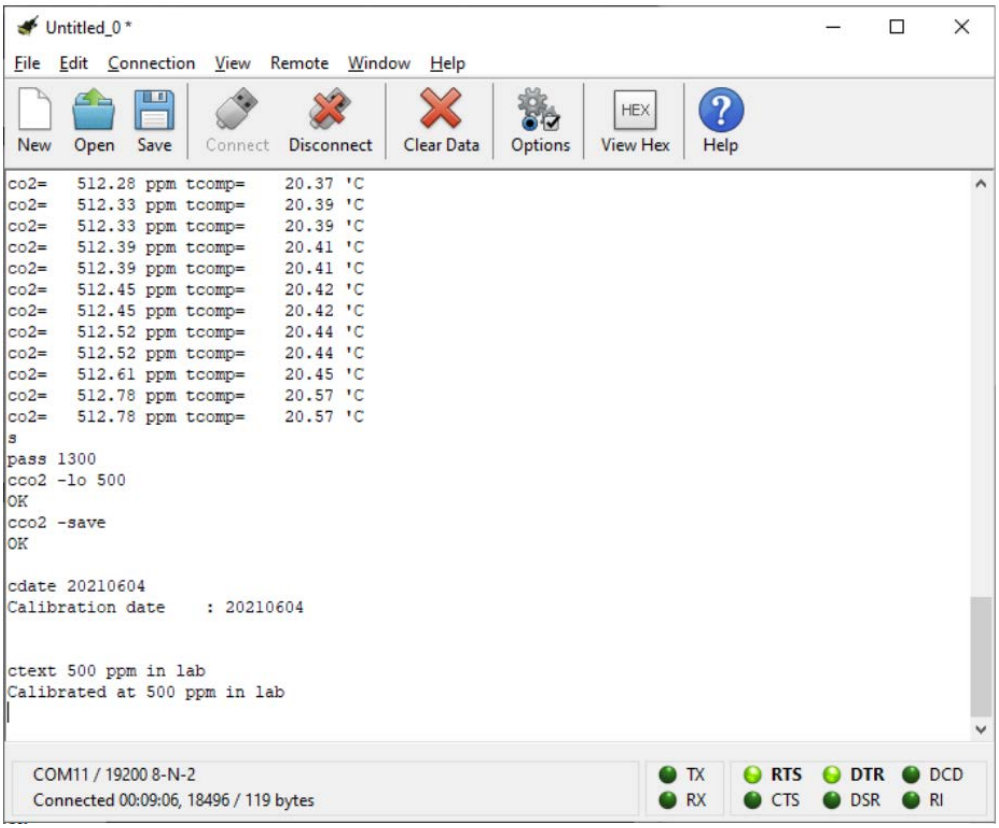

Figure 5 - *Captured Coolterm Window following a 500ppm single-point concentration correction.*

2.2.3 Two Point Calibration

The procedure for a two-point calibration is nearly identical to that of a single point, except that two different standards are flowed through and corrected for in the sensor prior to committing changes.

To calibrate the first point, equilibrate the sensor with your chosen reference gas. When the reading has stabilised, input the lines as shown in **Table 5,** ending each line with a carriage return.

```
s
pass 1300
cco2 -lo VAL
cco2 -save
r
```

Table 5 - *Calibrating the first point*

At this point, data should resume streaming from the sensor. Switch your reference gas standards, such that the higher of the two is now flowing through the sensor. When the reading has stabilised, enter the lines as shown in **Table 6**, ending each with a carriage return. The sensor

```
s
pass 1300
cco2 -hi VAL
cco2 -save
```

calibration is now complete and the sensor is ready for use. For a sample two-point calibration correction 500 ppm and 1000 ppm reference standards , see **Figure 6a** and **b**.

```
cdate YYYYMMDD
ctext NOTE
r
```

Table 6 - *Calibrating the second point*

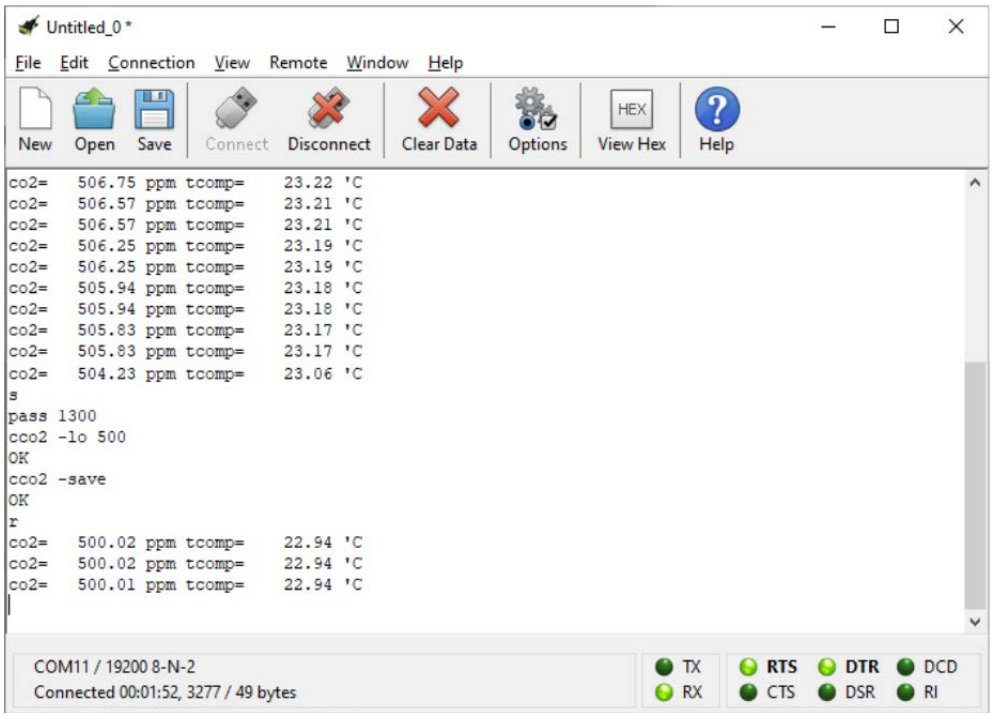

Figure 6a - *Captured streaming output while performing the first point, chosen as 500 ppm, of a two-point calibration correction.*

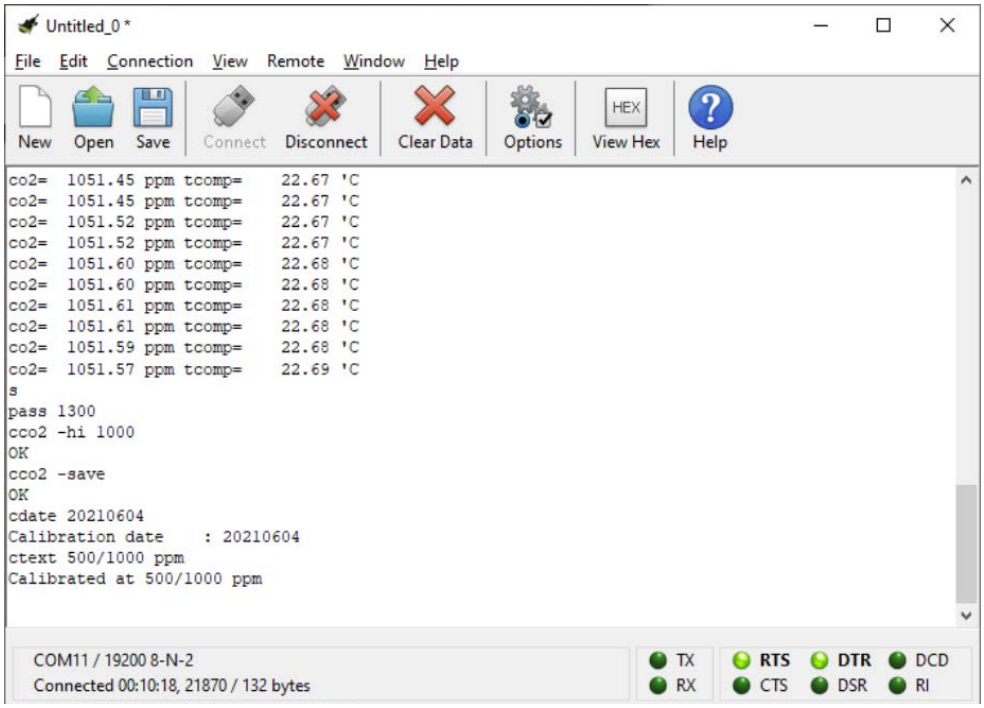

Figure 6b - *Captured streaming output while performing the second point, chosen as 1000 ppm, of a two-point calibration correction.*

2.3 Field Calibration / Offsets

It is not always possible or feasible to remove equipment from the field for calibration correction, nor bring calibration standards to the field. In this situation a basic field calibration can be done, which requires that your eosGP be placed in a well ventilated, zero emissions environment and ideally performed during a period of moderate temperature and pressure for your site. To do this, ensure that the eosGP side and bottom windows are exposed to atmospheric air, through carefully suspending the units above the ground or lying each on their sides on a non-emitting surface. Allow the units to measure in this position for at least 15 minutes.

Once 15 minutes has elapsed, perform a one-point calibration as described in **Section 2.2.2**, using a default value for ambient concentration (e.g. 410 ppm in most open outdoor areas). This will help correct for offset drift in the eosGP CO_2 sensors.