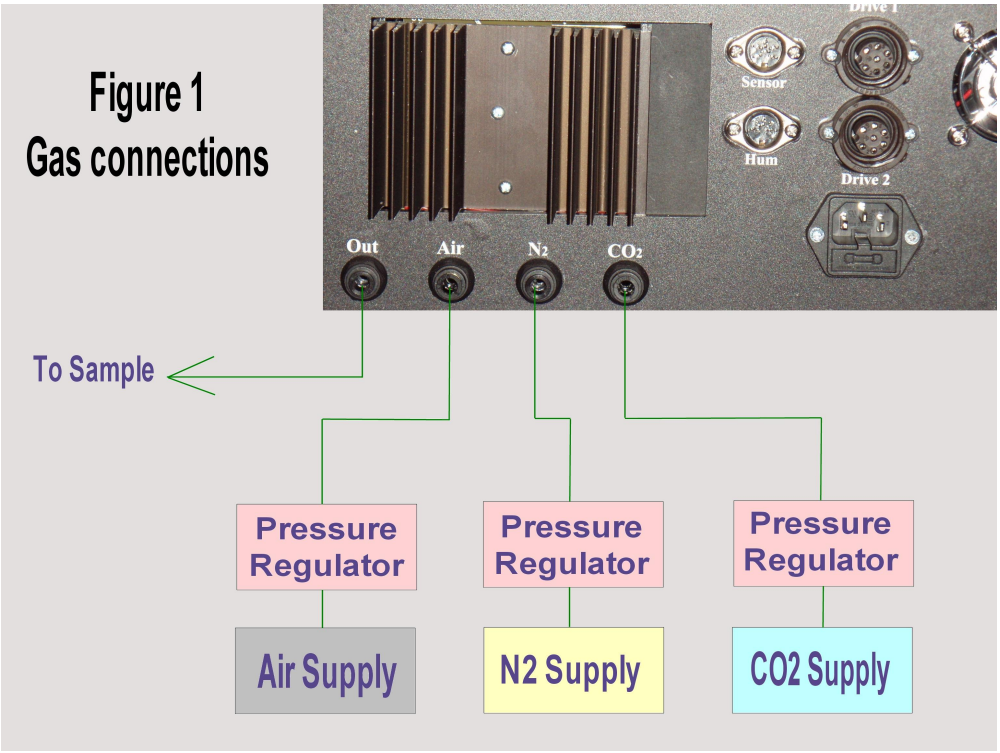
Setup and Use of The CO_2 control of the TCH882-G-COM

Introduction:
To use the CO_2 control of the TCH882-G-COM both a source of CO_2 and a source of dry air or N_2 (if used) are required. Typically, a total flow rate of 100ml/min is best. This is a compromise between proper gas maintenance over the sample and supplying too much gas with a consequent cooling of the sample as well as de-humidification.

The gas supplies to the TCH882-G-COM controller must be via separate pressure regulators.
Typical pressures are around 2-4 psig.

Gasses are connected as indicated in Figure 1 below. The gas from the CO_2 source is connected to the CO_2 inlet. Air is connected to the Air inlet and N_2 (if used) is connected to the N_2 inlet. Behind the CO_2 and N_2 inlets are separate control valves which perform the actual concentration regulation. There is a simple check valve behind the air inlet. The mixed gas exits the controller at the Out connection.



Note: The Valve behind the N_2 inlet will only operate if O_2 control is activated. This requires the O_2 monitoring option to be installed. Its purpose is to set atmospheres for hypoxic studies.

A check valve is one that allows gas to flow in one direction only. It typically requires a pressure of around 4psi to open it in its forward direction. Of course it requires extremely high pressures to open it in the reverse direction. It can be considered as the gas equivalent of a diode. There is no other control on the air inlet thus air is continuously supplied at whatever rate it is set to by the external pressure regulator and any extra flow controller.

The control valve behind the CO_2 inlet is controlled by the on board computer of the TCH882-G-COM. CO_2 concentration is measured by the system during a repeated measurement/control cycle that occurs once every 5 seconds. It is compared to the set point (typically 5%). If the concentration is low, the valve is opened to allow more CO_2 to enter and mix with the air. The time the valve is opened during each measurement cycle is dependent on how far away from the set point the CO_2 concentration is. If the concentration is too high, the valve will not open at all.

Setup:

1. Connect the gas supplies as in Figure 1.
2. Place the end of a tube connected to the Out connection into a bottle of water so that its open end is immersed by about 50mm (not critical).

Hint: If you have the optional humidity controller installed, turn on humidity control and use the bubbles appearing in its reservoir as an indicator.

3. Turn on the TCH882-G-COM and set CO_2 control to ON with a concentration of 20% (maximum allowed). Turn on the air supply and adjust its regulator until bubbles appear

in the water bottle. Adjust the pressure until you can see (typically) 2-6 bubbles per second. Leaving the air pressure regulator at this setting, turn off the air supply.

4. Turn on the CO_2 supply and using its pressure regulator, increase its flow until you can see bubbles appear in the water. Set it to a similar rate to that of the air, less if possible, say, 1-4 bubbles per second.
5. Now turn on the air supply again. You should see around 3-7 bubbles per second.
6. Set the CO_2 concentration set point to your desired value. The TCH882-G-COM will control its concentration from here.

You can expect the system to take up to 3 minutes to start to supply properly controlled gas. This is because the volume of the mixer and the and supply lines to the sample is around 250ml.

Hint:
A setting of around 5 bubbles per second, in water is roughly 100 ml/min gas flow. With a total flow rate of 100 ml/min, you will consume CO_2 at around 5 ml/min (5% concentration). These settings are obtained with pressures of around 4 psig for air and 1-2 psig for CO_2.