



MODEL 902P (0-2000ppm) OPERATING INSTRUCTIONS

GENERAL DESCRIPTION

The Quantek Model 902P is a battery or AC operated, portable oxygen/carbon dioxide analyzer used for the measurement of O₂ and CO₂ in many different applications. The unit is powered by 115 or 240 Vac or an internal NiMH battery (optional), with typically 8 hours of operation before recharging is required.

Components which make up the Model 902 include the case, O₂ and CO₂ sensor, LCD readout, internal sampling pump (optional), two circuit boards, rechargeable battery (optional), battery charger/power module and sampling probe or other inlet fitting. Sample flows through the inlet fitting and tubing and then to the sensors and out to vent. The CO₂ and O₂ concentration is read on the display.

The operating controls and adjustments include power switch, pump switch, span, zero and pump time adjustments. For AC only units, the LOW BATT LED is not present. For units without an internal pump, the PUMP switch and SAMPLE LED are not present.

The expected lifespan of the O₂ sensor is 5 years (+/- 6 months). High oxygen environments (above 90%) may cut six months off the normal span. The CO₂ sensor has a lifespan of 10 years, +/- 2 years.



PRECAUTIONS

Follow these guidelines to prevent damage to the unit:

1. Do not suck liquids into the unit through the sample port.
2. Turn the unit off before plugging/unplugging the charger.
3. Do not immerse in water or spray water on the unit.
4. Do not drop the unit.
5. If storing the unit for more than 2 weeks, remove the fuse to prevent battery discharge, for battery operated units. If the fuse inside the fuse holder blows, there is a spare in the holder.
6. Do not test hot samples. While the analyzer and sensors are rated for a maximum of 50°C, it is recommended that the gas be cooled and conditioned as much as possible to preserve the life of the components.
7. Use only the charger supplied with the analyzer! Do not plug in a 12V DC power supply into the analyzer, for example. The supplied charger contains sophisticated variable voltage controls.

BEFORE YOU SAMPLE – RECOMMENDATIONS

These are general recommendations for your sample:

Flow Rate – Process analyzers generally have a “bypass” installed to vent excess pressure to atmospheric pressure.

Analyzers with a bypass installed – these analyzers will see no pressure effect on the readings until at least 500 cc/min. Even above that, the difference is statistically within the margin of error. The increase in your readings at about 1000 cc/min will be about +1% of the concentration being measured; i.e. 1000ppm CO₂ will read about 1010.

Best Practice – If you are unsure of your flow rate, pass your gas flow through a flow meter before introduction to the analyzer. Use a T-splitter if necessary to vent some of the flow to air, if that is acceptable for your application.

Particulates – our internal filter will remove particulates bigger than 0.45 microns; however, it is best to filter your sample prior to introduction to the analyzer. This is the smallest pore size filter that we currently use, and is sufficient for most applications. You can also add an additional filter onto the inlet of the

analyzer as well, as these are much easier to replace.

Moisture – We recommend that your flow be <95% RH, non condensing. We do offer drierite removal tubes to mitigate the moisture issue. Also, our internal four layer PTFE filter will remove moisture, but this should be depended upon only as a “last resort”.

Temperature – less than 50 degrees C

Other contaminants – Your sample should be free of solvents, and free of dioxides that could react with water to form acidic compounds (such as NO₂ and SO₂).

OPERATION SUMMARY:

1. Press the POWER switch to start unit. The meter reading at this point will not be stable. Let the unit warm up for 30 seconds to 2 minutes.
2. If equipped with the sample pump option, press the PUMP switch. The pump will come on for approximately 4 to 6 seconds and pull room air into the analyzer. The CO₂ reading will take about 2-3 minutes to stabilize. Room air should give a reading of 500 to 1000ppm CO₂. A well ventilated room will be below 600ppm. Outside air will be about 400-425, but nearby photosynthesis can affect this.

The O₂ reading will be 20.7 to 21.2% for room air – you may need to adjust this if your elevation is more than 1000 feet different from ours (~500 feet). Please inject room air before adjusting, as the sensor has a tendency to “sag” when idle, resulting in temporarily low readings (typically 20.2 to 20.8%).

3. For continuous measurement of a sample stream, the sample must be at some positive pressure to force a flow through the analyzer. The flow rate is not critical but must be high enough to give an adequate response time. 50 to 500 cc per minute is ideal, although flow rates of up to 1000 cc/min will not harm the analyzer.

High flow rates can cause thermal instability in the CO₂ sensor, as well as differences in the concentration reading, so it is best to keep the flow rate at a minimum if possible. For higher flow rates a plastic splitter tee can be used to divert most of the flow away from the sample port. A tapered luer fit fitting is provided to which tubing can be attached. The filters provided are also luer fit. It is a good idea to first attach a filter if the sample gas is not filtered to avoid getting dirt in the sensor.

CALIBRATION AND PUMP TIME ADJUSTMENTS

These adjustments are made using the potentiometers located on the back panel of the unit.

CALIBRATION SETTING

Accurate calibration of the O₂ reading can be checked at any time by sampling room air, which should give a reading of 20.9% oxygen, plus or minus 0.2%. A fresh air sample can be introduced using the 5 cc plastic syringe provided. If the reading is off, it can be set by adjusting the O₂ SPAN potentiometer, with the screwdriver supplied with the unit.

Likewise, the CO₂ calibration can be adjusted as required by turning the CO₂ SPAN potentiometer. However, you must first introduce a known concentration of CO₂, using preferably a calibration gas which contains the concentration close to that which you will want to measure later. Room air **can not** be used to set the CO₂ calibration. The CO₂ levels in a room will usually be in the range of 500 to 1000 ppm.

A well ventilated room will be below 600ppm. A stuffy room will be 900 to 1100ppm. Please note that breathing in the vicinity of the

analyzer can cause spikes; exhaled human breath is 5% CO₂.

In general, we strongly recommend against adjusting the CO₂ span. The calibration is adjusted for best accuracy across the curve – for example, if 1000ppm CO₂ reads 980, and you adjust it upward by 1% (so that it reads 1000) you may throw other points a little out of manufacturer specification.

Also, please note that the CO₂ reading will be affected by other background gases – the sensor is calibrated for use with nitrogen. Helium or Argon will produce different readings (please contact us for exact data)

O₂ ZERO SETTING

The zero setting of the O₂ channel is very stable, and will change little even over a period of several months. Although usually not required, The O₂ ZERO reading can be checked by sampling N₂. The zero will read 0.0, plus or minus 0.1% O₂. If the reading is not in this range adjust the O₂ ZERO potentiometer as needed. This adjustment should be done carefully because it will affect all readings, and it must. be done with N₂, or CO₂ in the sensor.

CO₂ ZERO SETTING

The CO₂ zero is not a potentiometer adjustment. It is an auto-zero pushbutton. To make the adjustment, first sample nitrogen (or some other zero gas) which does not contain CO₂ levels, and make sure that the reading is stable.



CAUTION: Make sure that the unit has N₂ flowing through it to disperse the CO₂ which may have adsorbed to the internal surfaces, before actuating the autozero. If high CO₂ samples have previously been checked, it may take 5-10 pump cycles of fresh air (or up to 3 minutes of ardent flushing) to completely clean out the CO₂ sensor before zeroing.

With the nitrogen flowing actively, depress the CO₂ AUTOZERO button with your finger, hold it in for 2-3 seconds and then let it up. Note the CO₂ meter reading, which may initially change to high values after the button is released but then will stabilize near zero.



IMPROPER SETTING OF ZERO

Clearing the internals of the analyzer completely of CO₂ is crucial. Pressing the autozero button with 500ppm CO₂ in the sensor will yield the following erroneous readings:

- 1) 500ppm CO₂ would read 0
- 2) 1000ppm CO₂ would read 666
- 3) 1500ppm CO₂ would read 1333

For a 0-2000ppm analyzer, you can infer that even having 100ppm CO₂ in the sensor when zeroing will create erroneous readings.

INTERNAL BYPASS

An internal bypass has been installed in the sample train to reduce the effect of high flow rates on the readings.

The flow rate of your gas should be kept to 10-1000 cc/min. The analyzer is calibrated using a flow rate of 0.5 SCFH (236 cc/min).

At higher flow rates, the expected pressure effect will cause slightly higher readings, as denoted in this table:

ACTUAL CONCENTRATION		
→	300ppm CO ₂	836ppm CO ₂
FLOW RATE 236 cc/min	LCD reads 300	LCD reads 836
FLOW RATE 472 cc/min	LCD reads 303	LCD reads 840
FLOW RATE 802 cc/min	LCD reads 306	LCD reads 844

While this variance is still within the accuracy spec of the analyzer, for best results, you may want to limit your flow rate to under 250 cc/min.

INTERNAL INLINE DIRT / MOISTURE FILTER

This analyzer contains an internal filter (PTFE, 25mm dia., .45µm pore size) that provides a second barrier of protection (in addition to the filters provided with the accessories).

Particulate matter or moisture can damage the internal sensors if drawn into the instrument.

PRECAUTION: This filter will remove small droplets of moisture, however, continuous sampling of samples containing water or moisture droplets will break through the filter and contaminate the sensors.

If the flow rate of your analyzer seems to have dropped precipitously, and/or the response time of the analyzer is much slower, and/or the pump sounds like it is laboring, then your internal filter may be clogged. Follow these steps to replace it with the spare provided:

- 1) Unplug the analyzer and discharge it by pressing the power button.
- 2) Remove the four screws holding the top cover on.
- 3) The filter will be visible inside – generally as part of the plumbing with a fitting on either side.

(Note: If the filter is clogged, the contamination may or may not be visible upon inspection.)

4) Check the orientation of the moisture filter. It will operate better if the writing on the filter faces the side that the gas comes from, as the most absorbent layer is on the side of the filter with the smaller opening.

5) Install the new filter, ensuring that the fittings are as tight as possible to prevent leakage.

6) Reassemble the analyzer and check to see if the problem is solved.

If the problem is not solved, then your analyzer may have a different problem and we recommend that you send it in for service. Please contact us if you need additional filters.

ANALOG OUTPUTS (optional)

If so equipped, Vdc or 4-20mA analog outputs are located on the rear panel screw terminal. Looking at the back from left to right, the terminals are:

1. O₂ ground
2. O₂ + output
3. CO₂ ground
4. CO₂ + output

The output voltage is nominal at 4 volts for 100% O₂ and 0-1 volts for full scale CO₂, and requires a high impedance connection. The output is not adjustable by the user within the analyzer. Please refer to the calibration certificate for actual voltage data at each concentration.

The analog output adjusts with the oxygen, but not with the CO₂.

For example, if the O₂ sensor has depleted so that it read 20.0% with room air, the analog output will read lower than 1.045V (or 7.34mA if using 4-20mA). If you turn the O₂ span up, the analog output will also go up.

With the CO₂, any changes to the calibration has no effect on the analog output. Therefore you may want to rescale your equipment if you calibrate the CO₂.

If you purchased the instrument with a data logger, and adjusted the CO₂ span, you will want to “rescale” your data logger to accommodate the new values.

NOTE: The full scale voltage for the CO₂ channel can vary depending on the customizations provided. Generally speaking, analyzers purchased with the optional data logger provided are equipped with 0-1Vdc on the CO₂ channel. If you choose not to use the

data logger provided, be sure that your data collection equipment has a fine enough resolution to measure voltage changes of 1mV. The Quantek data logger provided, if purchased, has a resolution of 0.6mV.

EXAMPLE: If you purchased the unit with the optional data logger, and decide to collect the data using acquisition equipment with a resolution of 50mV, be aware that a 0-20% analyzer with 0-1Vdc outputs will only collect step increments of 1% concentration.

For 4-20mA output equipped units, please note that the sensor output is converted from Vdc to mA. The 4-20mA output does not require power.