# MODEL 901 OPERATING INSTRUCTIONS

## GENERAL DESCRIPTION

The Quantek Model 901 is a battery-operated, portable oxygen analyzer used for the measurement of residual oxygen in gas-flushed (CAP/MAP) food packages. The Model 901 is powered by Ni-Cad rechargeable batteries, with typically 8 hours of operation before recharging is required.

The Model 901 design has proven itself in hundreds of installations for food applications such as meats, fresh produce, pasta, nuts, snackfoods, dairy products and coffee. The sensor is unaffected by high levels of background gases such as nitrogen or carbon dioxide. The Model 901 can also be used for applications where the oxygen level is very high (50 to 100%), without overloading the sensor. It is unaffected by trace hydrocarbons or high levels of $CO_2$, which can poison other types of sensors.

Components which make up the Model 901 include the case, oxygen sensor, LCD readout, internal sampling pump, one main circuit board, battery compartment, NiCad rechargeable batteries, battery charger module and sampling probe. The sample probe is tipped with a particulate filter and luer fit syringe needle with side-port holes to prevent plugging. Sample is drawn through the probe and tubing and then to the oxygen sensor when the pump is turned on. The pump is electronically timed to draw in the precise amount of sample required for the analysis, and then turns itself off after the pre-set sampling time, which is adjustable from 1 to 10 seconds. The oxygen concentration is read on the display.

The operating controls and adjustments include power switch, pump switch, span, zero and pump time adjustments.

## PRECAUTIONS

Follow these guidelines to prevent damage to the unit.

1. Do not suck liquids into the unit through the needle.
2. Do not plug the unit into the charger if alkaline batteries are installed.
3. Do not immerse in water or spray water on the unit
4. Do not drop the unit

OPERATION SUMMARY:

1. Insert a particulate filter onto the end of the sample probe and then insert a needle onto the filter.

2. Press the POWER switch to start unit. No warm up is required.

3. Press the PUMP switch. The pump will come on for approximately 4 to 6 seconds and pull room air into the sensor through the syringe needle and filter. Note that the meter reading will decrease slightly when the pump is on. This is normal due to the slight vacuum created in the sensor when the pump is running. Wait approximately 10-12 seconds for the reading to stabilize. Room air should give a reading of 20.7 to 21.1 % oxygen.

4. Pierce the food pack with the syringe needle, preferably through a foam rubber septum (supplied). Depress the PUMP switch and wait for the reading to stabilize (10-12 seconds). Leave the needle in the package until a stable reading has been obtained.

NOTE: It is difficult to get accurate readings when piercing the bag directly with the needle because air will frequently leak in around the hole caused by the needle. This will result in inaccurate high readings. This is prevented by first inserting a foam seal pad onto the package surface and piercing the needle through the foam.

CAUTION: If using alkaline batteries, do not plug the charger into the unit. These batteries can overheat or crack if an extrnal voltage is applied and can melt the battery compartment. The unit is fuse protected to prevent this. If the unit will not operate under battery power alone but does operate with the charger plugged in , the fuse is probably blown.

CALIBRATION SETTING

Accurate SPAN calibration of the unit can be checked at any time by sampling room air, which should give a reading of 20.9% oxygen, plus or minus 0.4%. If the reading is off, it can be set by adjusting the SPAN potentiometer, located on the side of the unit, with the adjusting tool supplied with the unit.

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 filling a plastic bag with nitrogen and then drawing out a sample as described previously. Flush the bag thoroughly first because it is difficult to expell all the air out of it to get a true zero sample. 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. Several turns will be needed to see any movement in the reading, as the adjustment is not very sensitive.This adjustment should be done carefully because it will affect all readings, and it must be done with N2 in the sensor.

Take note that the “electronic zero” of the sensor and electronics is very stable, with typical variance of less than 0.1% O2 over a period of 6 months. If you perform the above test and your reading is high, 0.2 to 0.5, the fault is probably due to an inadequately flushed bag and not the zero adjustment. However, leaks in the system can also cause high readings as described below.

## COMPLETE SYSTEMS TESTING

To insure that the complete unit is working properly requires periodic testing of the unit under controlled conditions. Factors which can affect accuracy include calibration, pump function, electronic functions and leak-tightness of all the parts used for sampling, including the needle, filter, sample probe, tubing, fitting, internal tubing and valve. A simple, periodic test can determine proper operation. With the needle and filter installed, simply perform the zero test described in the previous paragraph and the unit should read zero. With the needle still in the bag, operate the pump several times. The reading should not change.

If there are leaks in any part of the system, the readings can be innaccurate on the high side because of air leaking in. If a leak is suspected, perform this simple test: fill a bag with nitrogen and check the zero reading as before with 2-3 pump cycles. Keep the needle in the bag. Next, compress the bag by hand (with the pump off), which will force more sample through the tubing into the sensor. This should yield the same reading as sampling with the pump, if there are no leaks. With this positive pressure, air cannot leak into the system with any leaks which may be present. If the reading goes lower, it indicates a leak somewhere which should be corrected.

## PUMP TIME

The pump run time can be increased or decreased as needed by adjusting the PUMP TIME potentiomenter on the side of the unit. Be careful not to set the time too high with samples that have limited headspace volume. If the bag appears to be totally evacuated after sampling, re-set the pump time to a smaller value.

## NEEDLE/FILTER REPLACEMENT

The needle and filter should be replaced if they get plugged up and impede the flow. Both have standard luer fittings, as does the probe tip, and are simply pressed on with a twist to provide a leak-free fit. A simple test can determine if either is plugged. This test can be done with one or both attached to the probe tip. When sampling room air, the O2 reading will drop from 20.9 to about 19, and then rise back to 20.9. This is normal due to the slight vacuum created in the sensor when the pump runs. As the filter collects dirt over a period of time, this reading will go progressively lower because the pump is not able to pull sample through the filter at the same flow rate, and creates even more of a vacuum. If the filter or needle is totally plugged, this reading will go as low as 13 or 14, and may stay there because of the check valve in the flow line (internal) which prevents backflow of air into the sensor when the pump shuts off. As a rule, replacement is necessary when this reading is below 17 or 16. The filter

should also be replaced if any part of it is cracked. Air can leak in through the crack and cause errors in the readings.

## SAMPLE PROBE ASSEMBLY

The probe assembly is a one piece assembly and cannot be taken apart. The tubing used is a very narrow bore inert polymer which extends from the flanged end to the tip of the probe assembly. The inert composition prevents O2 adsorption on the internal surface. The internal tubing volume is small to minimize the volume of sample required to flush out the sensor to provide an adequate response time. The tip is a male luer fitting which will accept any luer-hubbed needle or filter. When screwed into the bulkhead fitting, the captive black screw presses the flanged end tightly against a mating piece, also flanged, which connects to the inlet port of the O2 sensor.

The probe assembly should be replaced if any part of it is cracked, or if liquid or other contaminate is visible inside the tubing. Minor kinks in the tubing are generally not a problem, but severe kinks can impede the sample flow or can develop a crack causing leaks. To replace, unscrew the black plastic screw from the fitting on the analyzer case. Inspect the interior of the fitting for any dirt or particles, which might cause a bad seal. Screw in the plastic screw for the new probe. The threads are easily stripped, so make sure that the screw is properly aligned before tightening. Turn until finger tight only. Do not use a tool to tighten, because this can strip the threads.

## BATTERY OPERATION AND RE-CHARGING

The Ni-Cd batteries in the 901 require several charge-discharge cycles before reaching full capacity. During the first 40-50 hours of use, the battery charge will not be optimum but will improve as the unit is used. To properly condition the batteries, it is important during this initial period of use to run the unit in the battery mode until the batteries need to be recharged, as indicated by the LO BATT light.

If left idle for 30 minutes, the unit will shut itself off to conserve power. When the battery is low, the LOW BATT indicator will be lit, indicating that the batteries need to be re-charged. The battery cover can be removed if needed by sliding it toward the bottom of the instrument.

The unit will run 8-10 hours before needing recharging. To re-charge the batteries, plug the external charger module into a standard 115 Vac outlet and connect the plug from the charger to the jack located on the side of the 901. A full charge requires 8-10 hours of charging time. The unit will operate with four alkaline batteries, which are non-rechargeable. However, these frequently leak and can corrode the terminals with long-term use. The unit is designed to operate with the batteries supplied.

Excessive charging can reduce the useful lifetime of Ni-Cad batteries. Unplug the unit from the charger when charging is complete. Do not operate the unit with the charger plugged in all the time. At least every 2-3 days, run the unit on battery power only.

CAUTION: If using alkaline batteries, do not plug the charger into the unit. These batteries can overheat or crack if an extrnal voltage is applied and can melt the battery compartment. The unit is fuse protected to prevent this. If the unit will not operate under battery power alone but does operate with the charger plugged in , the fuse is probably blown.

BATTERY REPLACEMENT & CHARGER

Remove the battery cover by pressing and sliding in the direction of the arrow. The battery clips are designed to hold the batteries fast, and a blunt tool is required to remove the first battery. The batteries used are 4 X AA Ni-Cd rechargeables, 1.2 V 700 mAh. Observe polarity markings when installing new batteries.These batteries are designed to be slow charged over a period of 12-14 hours, with the charger provided. The charger output is 5.8-7.5 Vdc at 70 ma. Do not use a charger with a higher output, because higher currents can ruin the batteries. Also, the jack and plug are of a specific type and size. Ni-Cd batteries designed to accept a quicker charge can also be used, as long as they are AA size, 1.2-1.4 volt, and are of the nickel cadmium type. Do not use other rechargeable types such as lithium. AA alkaline (non-rechargeable) batteries can be used in some situations, but extreme caution must be exercised because plugging the unit into the charger with alkaline batteries installed can cause overheating or even melting of the battery compartment.

The electronics and battery compartment are fuse protected. This fuse is a thermal polyfuse, which heats up and causes the main power circuit to open when excessive current is present. The fuse is located under the circuit board and is not user accessible. If the unit operates with the charger plugged in but not on battery power alone, this fuse is probably tripped. The fuse will reset itself after a period of about 5 minutes if the source of the problem is corrected. The fuse will trip if alkaline batteries are used with the charger plugged in, if the batteries are inserted incorrectly, or if a short circuit is present in the wiring.

## Technical Specifications

**Range:** **0.1 to 100% Oxygen**

**Resolution:** **0.1% Oxygen**

**Sensor:** **Electrochemical Cell, proprietary design**

**Sample Pump:** **Internal, with adjustable timer**

**Sampling assembly:** **Probe with male luer connection for side-port needle, PTFE tubing with captive insertion screw**

**Power Supply:** **Four "AA" rechargeable batteries; auto shut-off after 45 minutes idle. Charger included**

**Battery Life:** **Eight hours before re-charging**

**Size:** **8 x 4 x 1.8 in. (200 x 100 x 40 mm)**

**Weight:** **1 lb. (450 gms)**

***OPERATING SUPPLIES***

1. 9001 Pkg. of 200 foam seal pads
2. 9002 Package of 1000 foam seal pads
3. 9005 Particulate filter, pkg. of 5
4. 9028 Particulate filter, pkg of 25
5. 9003 Side Port Needles, pkg. of 3
6. 9029 Side Port Needles, pkg. of 15
7. 9007 Sample probe assembly
8. 9011 Battery Charger for 901
9. 9008 NiCd batteries, pkg. of 4

## PRECAUTIONS

To avoid possible damage to the sensor, avoid sucking dirt or liquids into the analyzer. We advise that all sampling be done with the particulate filter provided which fits onto the end of the sampling probe. Avoid direct sampling of pressurized gas cylinders. High pressure can cause damage to the sensor. To test the content of a cylinder, flush the sample into a plastic bag and sample from the bag.