An OEM / User Guide for ACD Gas Generators

Electrochemical gas generators from Advanced Calibration **Designs** offer many advantages over other methods of gas sensor calibration. However, just like any technology, better understanding of these generators will make it possible to avoid many simple problems that are sometimes experienced. Below is a detailed explanation of some of the unique technological aspects of the ACD generators.

Back Pressure: Unlike a cylinder of compressed gas which has a large amount of pressure behind it, our generators rely on a pump to push the gas through the source at ambient pressure. If the back pressure is too large, the gas will not exit the source properly, resulting in lowered and/or unstable results. Back pressure can be caused by long tubing lengths, tubing with a very small diameter, or calibration cups/adapters which have a restrictive disc or orifice in them.
These restrictions were often installed in calibration cups/adapters to deal with the pressure from a cylinder, but need to be removed to make the adapter work with our generator. If you are unsure about this proceedure, call the factory for more details.

Electrolyte: Since the ACD sources are mostly liquid based, most of them contain an electrolyte much as electrochemical sensors do. On the ACDGen cells used in the CAL 2000 family of instruments, the electrolyte can be replenished or replaced. The electrolyte in these sources is hygroscopic (absorbs water), so they typically do not need to be replenished (the chlorine dioxide cell is an exception to this). However, in some dry climates the sources can begin to dry out. If the electrolyte level falls too far, the cell will go into a cell failure. Electrolyte can be added through one of the caps on the top of the source. Since only the water portion of the electrolyte evaporates, de-ionized water can be added instead of electrolyte (except for chlorine dioxide, see below). Care must be taken not to overfill the sources, especially if the humidity will increase at a later date (i.e. in the summer).

Chlorine Dioxide Electrolyte: The electrolyte for the chlorine dioxide source becomes unstable over time, and is not hygroscopic (it will evaporate). It must be replaced periodically (depending on use) but at least once every other month if the instrument is used on a regular basis. Old electrolyte should be removed as completely as possible during this process and replaced with new electrolyte. Failure to do this will result in erroneously low readings, or eventually a lack of any gas generation at all. Since chlorine dioxide electrolyte is unstable as a liquid, replacement electrolyte is now shipped as a two part item; one vial of pre-measured de-ionized water and one vial of chlorine dioxide electrolyte in powder form . When ready to be used the water should be poured into the powder and the mixture agitated until all of the powder is dissolved. This will make enough electrolyte for one source refill.

Equilibrium: ACD's gas sources actually begin producing the gas when the instrument is turned on. It is then necessary for the sources' initial volume to become saturated with the gas being generated before a constant output of gas is achieved. If the concentration of gas being generated is changed, a new equilibrium must be reached. When the unit is turned off there is still gas dissolved in the electrolyte. This gas needs to be purged from the system before the unit is fully turned off. Therefore ACD's generators have a stabilization period when the unit is turned on or when the gas concentration is changed, and a purge time when they are being shut down before the generator completely turns off.

Flow Rate: The Cal 2000LT and CAL 2000 instruments are designed with a mass flow controller. They can deliver flow rates from 0.2 LPM to 1.0 LPM. An external pump (such as that found in a portable gas detector) can also be used to pull the air through the Cal 2000LT and CAL 2000 at flow rates from 0.1 to 5.0. The mass flow sensor in these two instruments can read the flow rate of the external pump and change the current accordingly to provide the requested output. As the flow rate increases, the maximum concentration of gas that can be generated decreases on these instruments (more air dilutes the sample). On the Cal 101 and Cal 101 bump units, the flow rate is specified when the instrument is ordered and should not be changed in the field. The flow rate of the generators should be checked periodically to insure proper output. ACD calibrates the flow rates versus NIST traceable flow meters.

Gas Concentration: On the CAL 2000 the gas concentration can be adjusted easily on the instrument. Note that some concentrations may not be available depending on what flow rate is being used. On the Cal 101and Cal 101 bump instruments the gas concentration is controlled by the generating cell installed. To change from 5.0 ppm chlorine to 10.0 ppm chlorine would be done by removing the 5.0 ppm source and replacing it with a 10.0 ppm source. It is important to understand that the concentrations on the 101 family sources are flow dependant. When you order any Cal 101 family of instrumentation, the flow rate is factory set. If the end user changes the flow rate incorrectly, the result will be improper output.

Humidity: Gas from calibration cylinders is 'bone' dry. Moisture in the cylinder would result in the gas being absorbed or reacted with the cylinder material, so it is removed. ACD instruments combine calibration gas with outside air. The CAL 2000 includes an internal charcoal filter but this does not appreciably change the humidity. If our generator is used in a dry climate, it will provide dry calibration gas. If used in a moist, humid climate it will provide moist, humid calibration gas. Note that this is a much truer calibration gas as it provides the same humidity conditions that the sensor being calibrated will see during normal operation. However, some types of sensors are humidity dependent, and our generator may not match a calibration done with a cylinder of dry gas. This does not mean the gas detection instrument, the cylinder or our generator are incorrect. It means that humidity is a factor in the calibration, and for a truer calibration, the ACD generator should be used.

Orientation: The generating sources are designed not to leak in any orientation, but turning the cell upside down (or nearly so) can result in the electrolyte moving away from the electrodes resulting in low cell failure. Whenever possible, use the instrumentation in an upright manner and keep the liquid levels relatively full.

Other Questions: ACD is happy to answer questions about our products. Feel free to contact us, or to visit our website. The ACD website provides information on a variety of issues, and includes helpful items such as downloadable copies of our instrument manuals and material safety data sheets (MSDS).

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