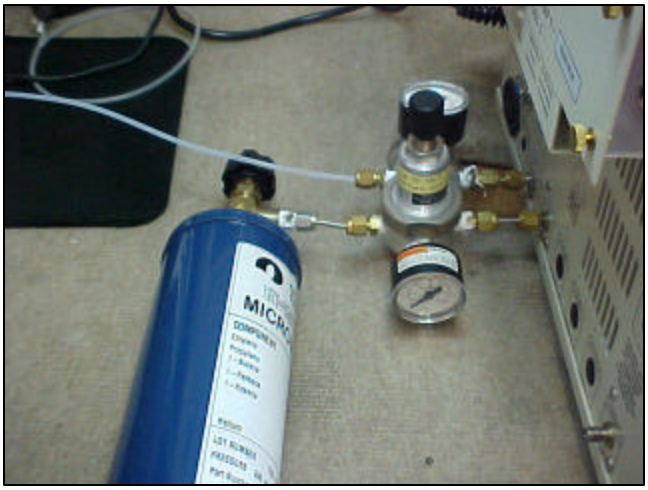
Operating the SRI Automatic Calibration Accessory (ACS)

The ACS system is built into an SRI 8610C GC and allows automatic calibration of gas samples over a wide range of concentrations (10,000 to 1). It can be used with the built-in TO14 preconcentrator or with a simple gas sampling valve and loop.

The ACS requires a “zero gas” and a “calibration gas” be connected to the labeled bulkhead fittings on the left side of the GC. The “zero gas” will be clean air or nitrogen, not helium since the viscosity of helium will alter the flow rate of the vacuum pump as it pulls standard through the traps. Set the pressure of the “zero gas” to 10psi and use a short piece of connecting tubing from the pressure regulator output. The “zero gas” pressure regulator is supplied with the ACS system.

Connect the “calibration gas” at some steady pressure between 10 and 50 psi. The “ cal gas “ is re-regulated internally by the EPC (electronic pressure regulator) inside the GC controlled by PeakSimple’s channel 2 pressure program.



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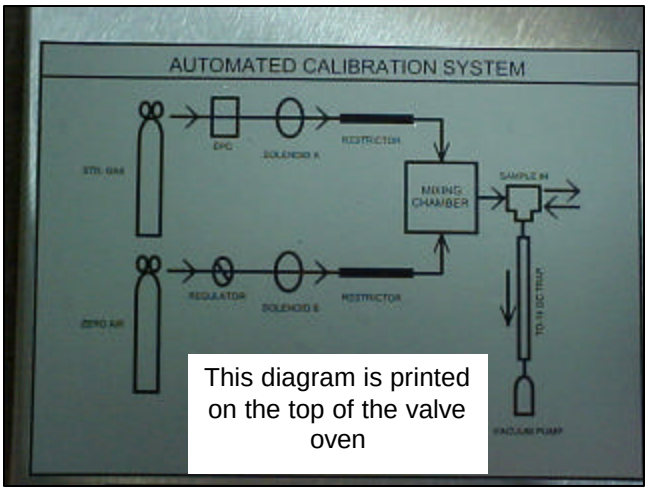
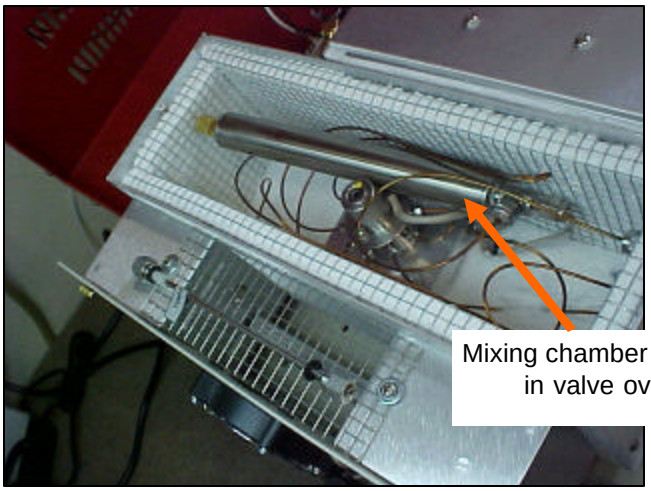
Both “zero” and “cal gas” are controlled by a shut-off solenoid located inside the GC. When the “zero” gas solenoid is actuated by PeakSimple and the pressure is 10psi, the flow rate through the mixing chamber and out the sampling “tee” is 1000ml/minute.

When the “cal gas” solenoid is actuated and the EPC pressure is 10psi (controlled by the channel 2 pressure program) the flow rate is about 10ml/minute. The EPC pressure can be varied between 0.01 and 99.99 PSI. The actual flow of “cal gas” will depend on the balance gas the “cal gas” is supplied in. If for instance the balance gas is helium the flow rate will be higher than if the balance gas is air. The operator must physically measure the “cal gas “ flow rate at different EPC pressures. Measure the flow at the outlet of the sampling “tee”.

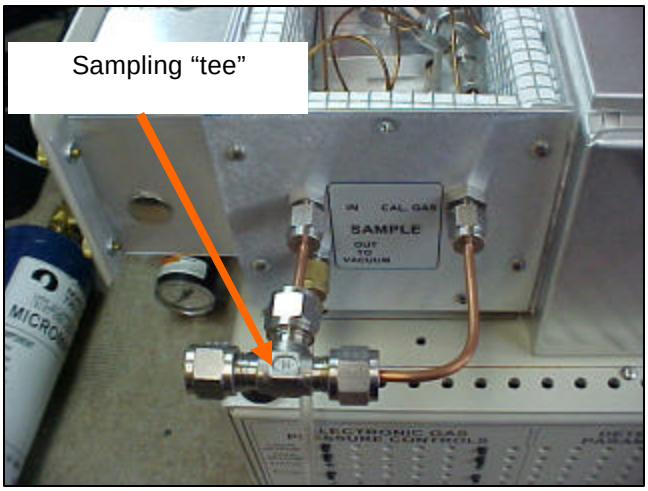
The dilution ratio is the flow of “cal gas” divided by the flow of “zero” gas. So for example if the “cal gas” was 10ppm of BTEX and the flow of “cal gas” was 10ml/minute at an EPC pressure of 10psi, the dilution ratio would be 10/1000 or 100. The 10ppm BTEX would be diluted to 100ppb. A mixing chamber with a volume of about 100ml is located in the thermostatted valve oven to ensure complete mixing. The diluted and mixed gas flows through the sampling “tee” displacing ambient air. The vacuum pump which normally sucks about 100ml/minute through the traps then pulls the diluted “cal gas” instead of ambient air.



This diagram is printed on the top of the valve oven



Mixing chamber located in valve oven



Sampling “tee”

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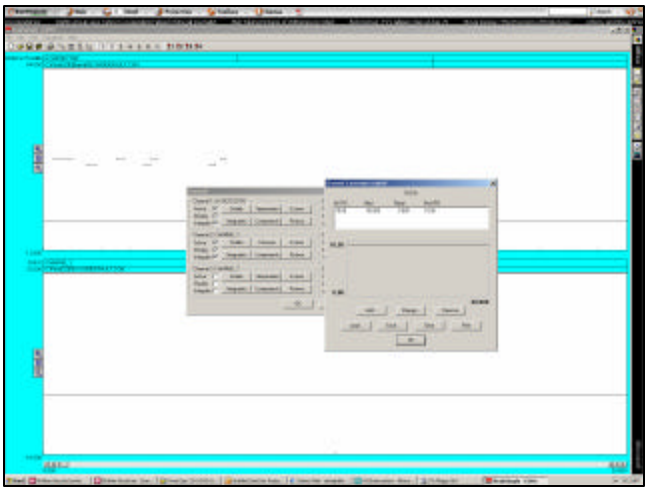
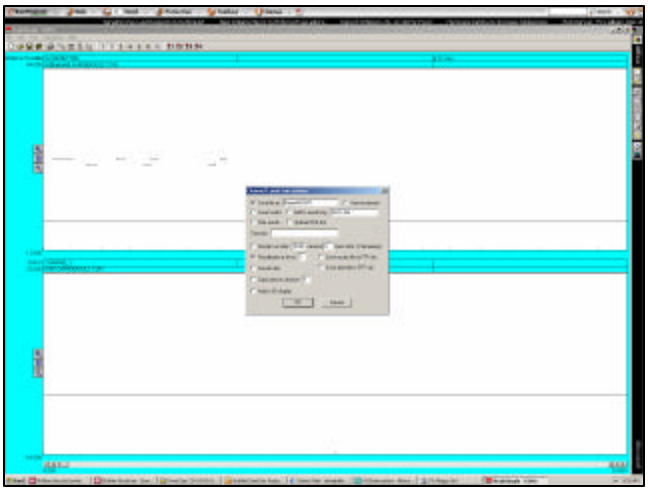
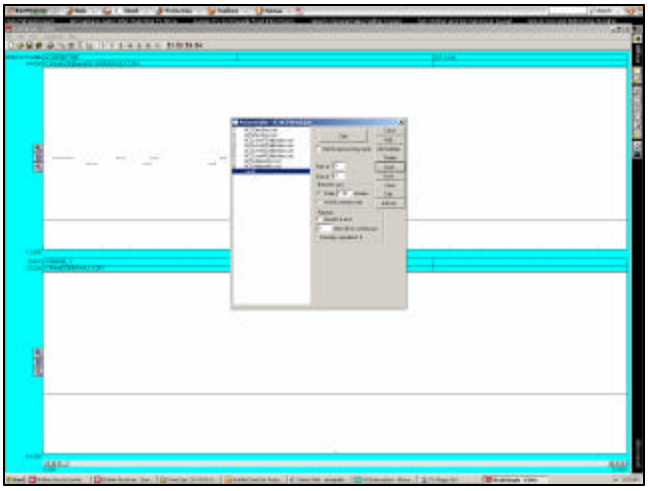
The “cal gas” EPC pressure is controlled by the pressure program loaded into Channel 2 of the PeakSimple data system software. Make sure Channel 2 is Active by clicking the Active box. Set the pressure program to hold the desired pressure for 60 minutes or at least as long as the total analysis time and save the file with the .flo extension. If the time is set too short, the analysis will terminate early.

Construct a Control file for each level of calibration desired. Give each control file a unique name. For example name the control files Level1Calibration, Level2Calibration, Level3Calibration, etc. In the Postrun screen of each control file specify the re-calibration level (i.e Level 1, Level 2 etc.). Adjust the EPC pressure in each control file using the pressure program in Channel 2 to yield the desired dilution ratio. Don’t for get to save the pressure program with a unique name (i.e 10psi.flo, 20 psi.flo etc.).

Build an Autosampler Queue by sequencing the previously constructed control files in a logical order. For example the first control file might be designed to have only the “zero” gas flowing thus simulating a “blank”. The next control file in the queue might be the Level1 calibration follwed by the Level2 calibration etc. As each control file is run, the ACS makes the appropriate dilution, the analysis is performed and during Postrun the calibration curves are updated based on the fresh data.







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If the desired dilution ratio is higher than can be achieved by lowering the “cal gas “ EPC pressure, then the time during which the “ cal gas” solenoid is actuated can be controlled from PeakSimple’s Channel 1 Event table. This is only valid for molecules which trap completely with no breakthrough during the sampling period. For example, BTEX traps completely on Tenax-GR with no breakthrough for a 5 minute sampling period whereas ethylene would not. For molecules which do not breakthrough the trap, the “ cal gas” solenoid can be activated for a fraction of the sampling period.

In the example Event table below, The “cal gas “ solenoid (Relay A on this particular GC) is actuated at 0.2 minutes and de-activated at 3.00 minutes. Notice that the “zero” gas (Relay C) flow remains on from 0.1 to 6.150 minutes or until the Vacuum Pump (Relay D) turns off. Notice also that both “zero” and “ cal gas “ are turned on two minutes before the vacuum pump begins pulling gas through the traps. This is to allow the gas flows to equilibrate prior to sampling the diluted flow.