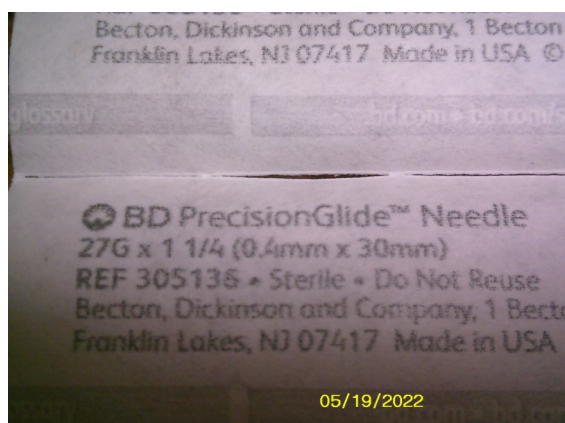


Greenhouse Gas 10 and 20 position Vial Autosampler May 2022

The GreenHouseGas 10 position Vial Autosampler (SRI part# 8690-0047) and 20 position Vial Autosampler (part# 8690-0049) look similar.

The 20 position version is shown connected to a SRI Greenhouse Gas GC system (ECD and FIDmethanizer detectors) used primarily to measure N₂O, methane and CO₂.

Inside the box is an array of 10 or 20 vertically mounted needles (27 gage x 1.25 inch) to puncture the septum top of the 40ml or smaller (Exetainer) septum capped vial that field samples are often collected in.



27 gage 1.25" Luer-lok needles



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Greenhouse Gas 10 position Autosampler

May 2021

Install the needles on the vertically oriented Luer-Lok fittings using the needle cover as a wrench. Push down and turn clockwise until you feel a firm connection.

Leave the cover on each needle until you have finished installing all 10-20 needles to protect against getting stabbed accidentally.

Remove the covers left to right if you are right handed so you don't get stabbed.



Greenhouse Gas 10 and 20 position Vial Autosampler May 2022

The sample vial can be a 40ml septum vial as shown or any other type of septum vial.

Carefully guide the septum vial down onto the upright 27gauge needle. The guide hole is designed for 40ml vials, so if you use smaller vials it may make sense to cut smaller holes in cardboard and paste over the top panel so the smaller vials have some support side to side.

Connect the 24 volt DC power supply to each valve actuator. There will be one valve for the 10 position AS and two power supplies and two valves for the 20 position version.



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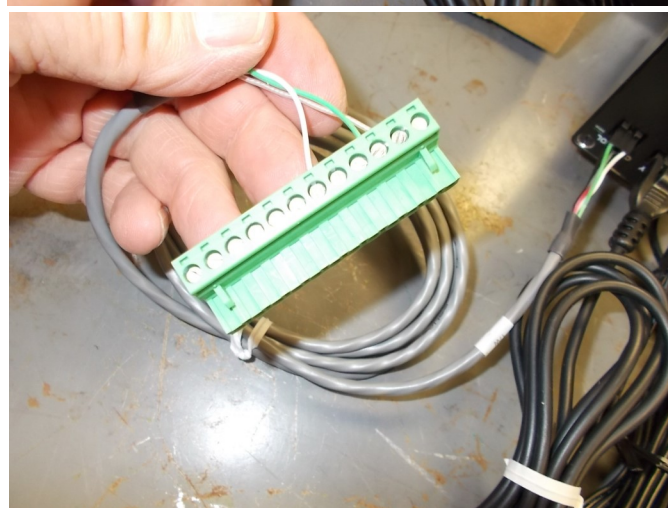
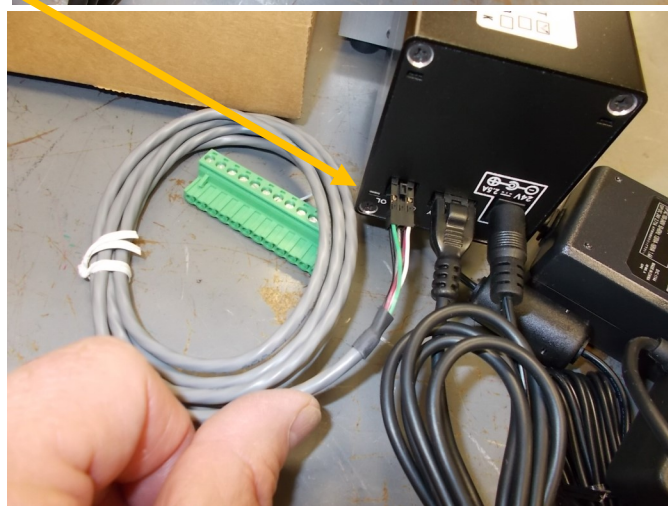
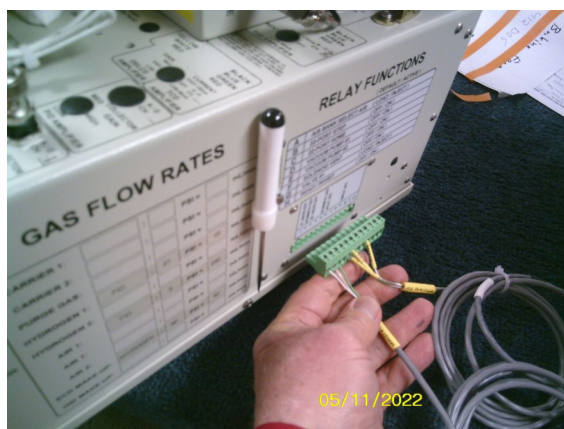
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Greenhouse Gas 10 and 20 position Vial Autosampler May 2022

This is the manual control box for the valves

Connect the control box and the AS to GC interface cable to the back of the actuator.

The interface cable plugs into the right side of the SRI 8610C GC. The interface cable allows the PeakSimple software to control which vial is selected as part of an automated sequence.



Greenhouse Gas 10 and 20 position Vial Autosampler May 2022

The 10 position AS has only the one 22 port valve. This valve is arranged as two banks of 10. The 10 position AS uses only Bank 1. Bank 2 is not used.

The 20 position AS has an additional valve to select Bank1 or Bank 2 for a total of 20 positions.

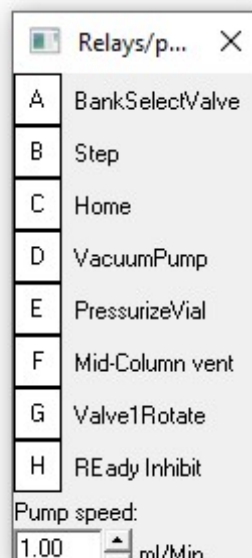
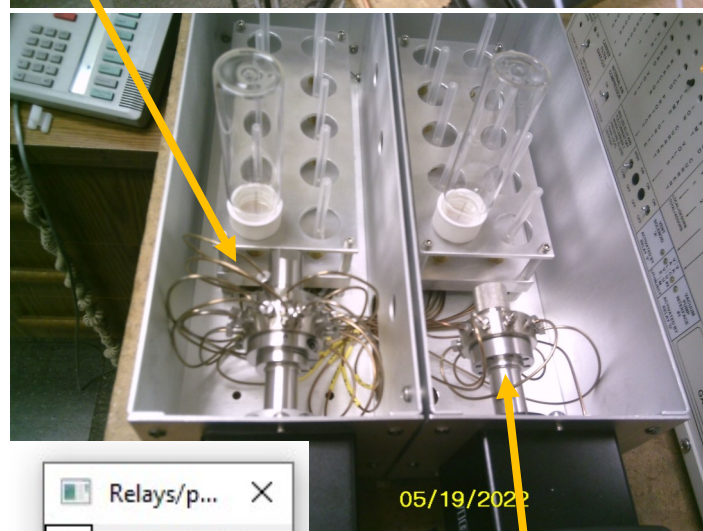
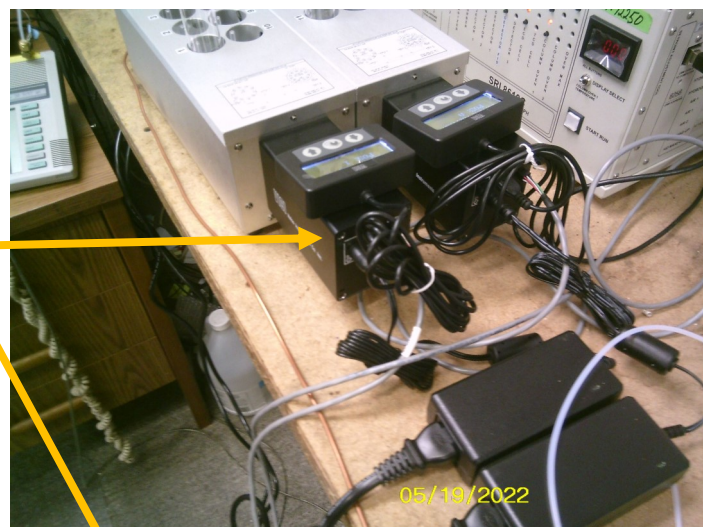
The 22 port valve is controlled by two relays. Relay B advances (index) the valve to the next position. Relay C makes the valve rotate all the way to Position 1 (Home).

The Bank select valve has only two positions and is controlled by Relay A. When A is OFF, Bank 1 is selected (positions 1-10).

When A is On , Bank2 is selected (positions 11-20).

Relays A-H can be turned on/off manually from the PeakSimple View/ RelayWindow screen shown here.

The relays can also be controlled automatically by PeakSimple's Event table.



Bank select valve

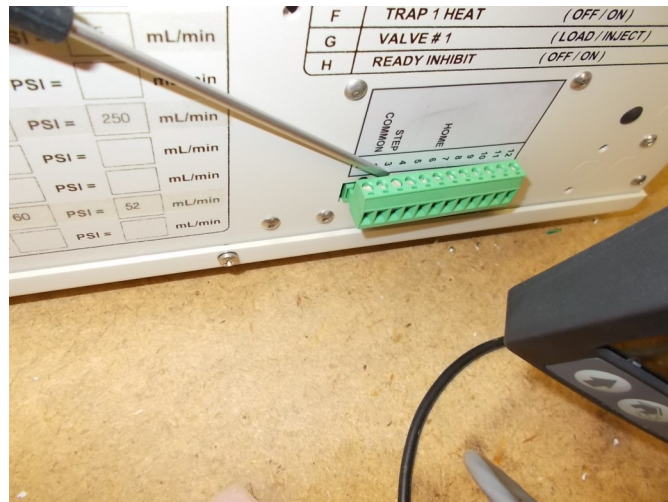


Greenhouse Gas 10 and 20 position Vial Autosampler May 2022

If there is already a blank plug in the jack, use a small screwdriver to pry the plug loose.

Insert the AS plug firmly. It needs to be pushed in as far as it will go to make good contact.

Connect a 1/16" or 1/8" Teflon or metal tube from the outlet of the AS to the GC's sample inlet fitting. In the photo below a 1/8" Teflon tube is used.



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Greenhouse Gas 10 and 20 position Vial Autosampler May 2022

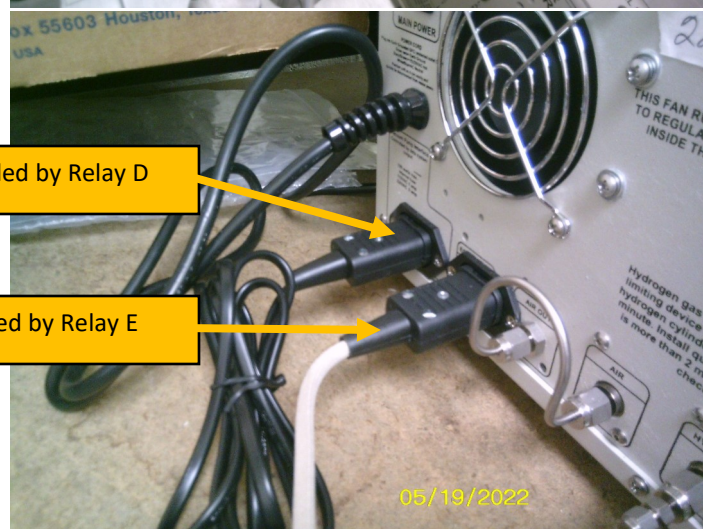
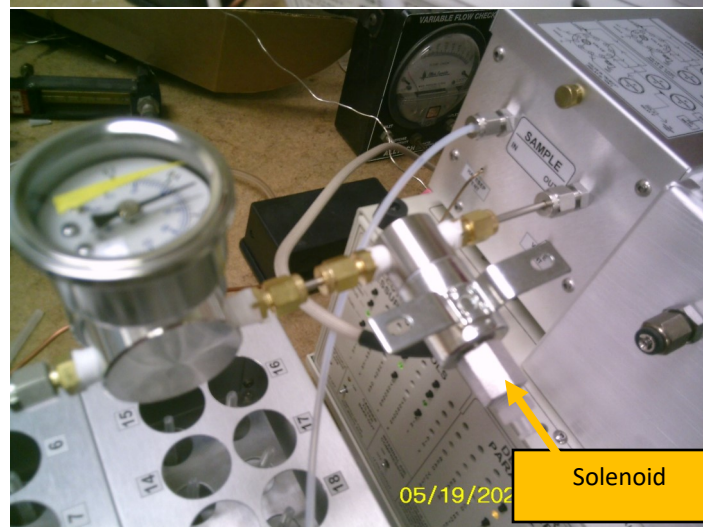
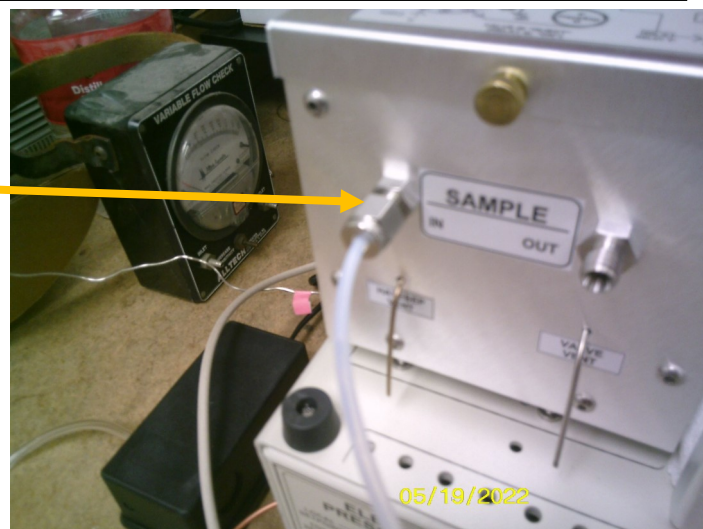
Connect the other end of the tube to the sample IN fitting on the front of the GC's valve oven.

Connect the vial control (VC) assembly to the sample outlet fitting.

The Vial Control consists of a pressure regulator typically set to 7psi (.5 bar) and an electrically operated solenoid valve.

The solenoid is plugged into one of the power outlets at the left rear of the GC.

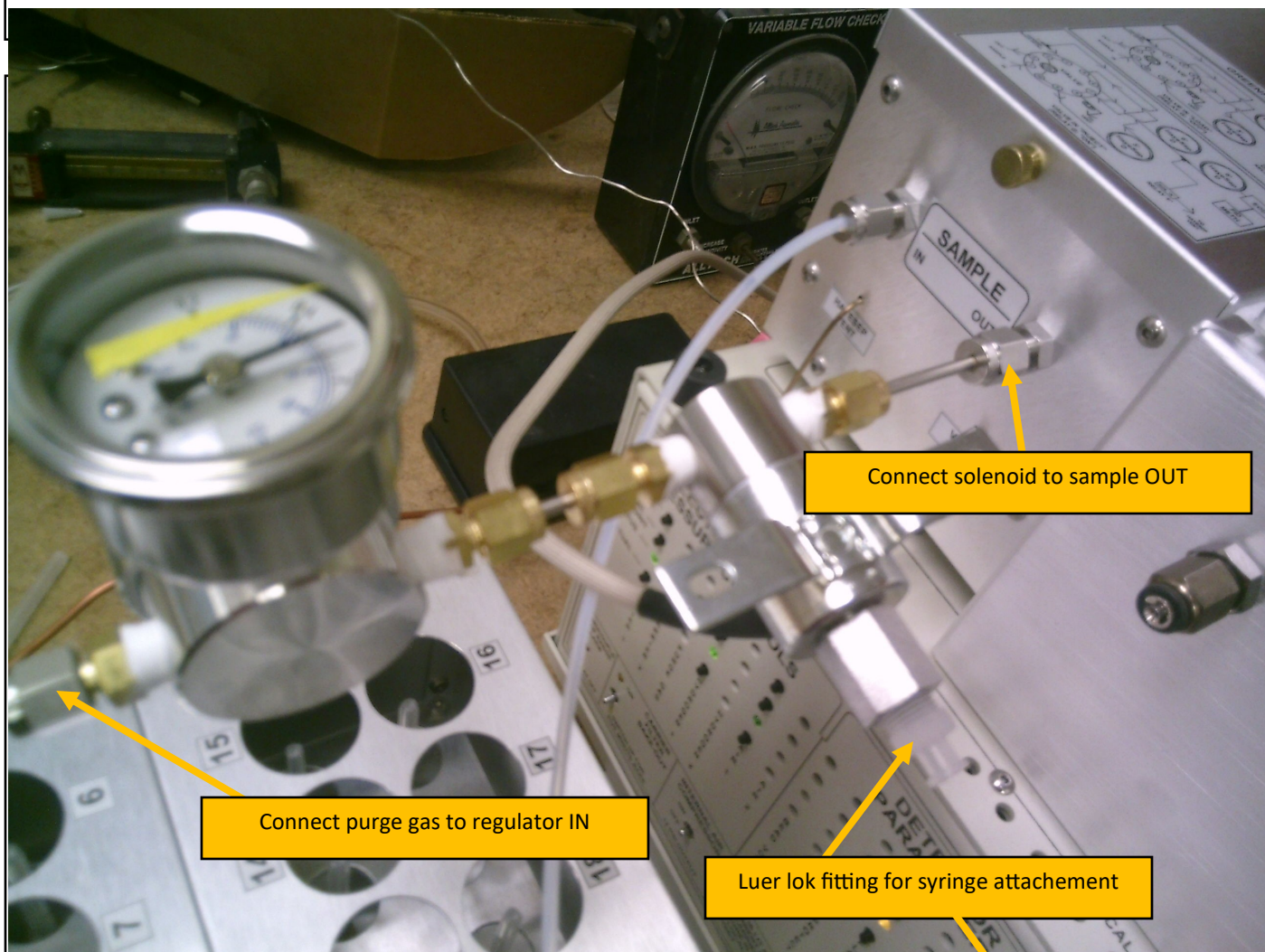
One power outlet is normally used to turn the vacuum pump on/off and is controlled by Relay D while the other turns the solenoid on/off and is controlled by Relay E. *Relay assignments may change depending on the exact GC configuration*



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Greenhouse Gas 10 and 20 position Vial Autosampler May 2022



The Luer-lok syringe port is a convenient way to manually inject a sample without going through the VS, and is where the vial finally exhausts to the atmosphere after passing through the sample loop.



Greenhouse Gas 10 and 20 position Vial Autosampler May 2022

To verify proper operation:

Insert one or more vials onto the needles in the AS. The photo shows one 40ml vial and one 12ml Exetainer type vial.

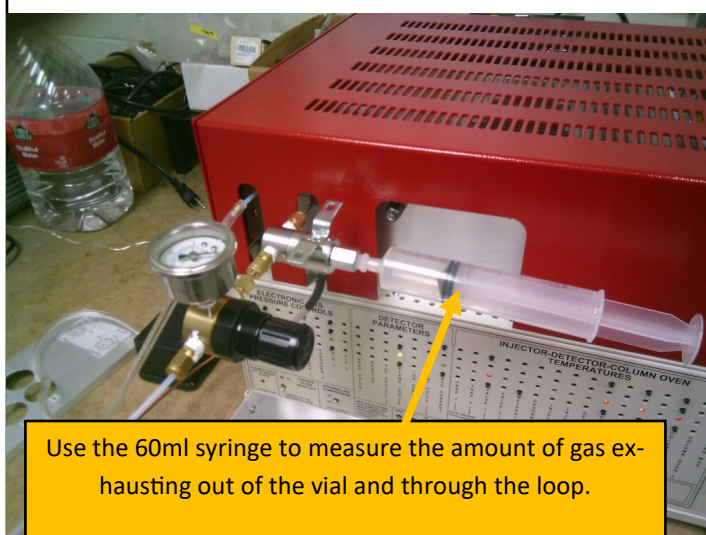
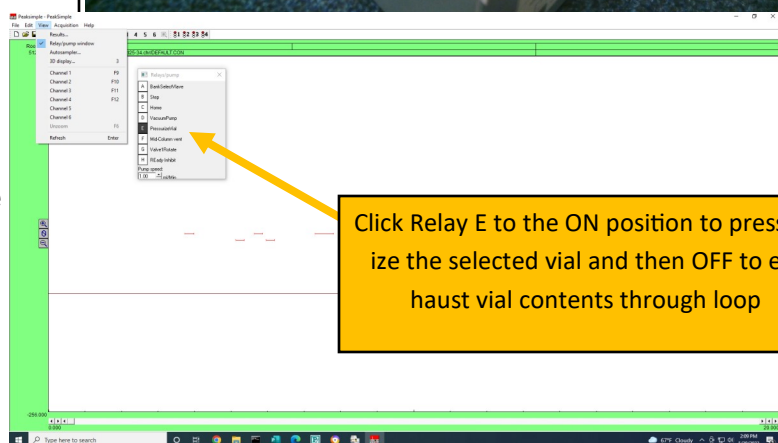
Use the manual control box or PeakSimple's View/RelayPumpWindow to index the valves to the position where the vial is inserted.

Activate Relay E for 10-20 seconds to pressurize the vial to .5 bar.

Turn relay E off and measure the volume of gas which exhausts through the GCs sample loop and into the 60ml syringe connected to the Luer-lok port on the solenoid.

If the 40ml vial is pressurized to .5bar, the volume of gas exhausting should be 20 ml. If the volume is less than 20ml, then either the vial is leaking or the pressure did not build up to .5bar.

Remove the 60ml syringe for normal AS operation.



Greenhouse Gas 10 and 20 position Vial Autosampler May 2022

To run the 10 or 20 vials there are two methods.

The simple method is to click the “Restart run” box in the Postrun screen and then specify the number of repeats (typically either 10 or 20).

Use the manual control box to index the 22port valve to position 10 and then insert the vials. The Bank select valve be in position A (vials 1-10). The next sample would then be Vial 1.

The Event table would look like this.

0.00 minutes	Auto-Zero the detector signal
.02 minutes	Activate Relay B to index valve to position1.
.04 minutes	De-activate Relay B
.1 minutes	Activate E to pressurize vial
.3 minutes	De-activate Relay E to release vial pressure through loop. Allow .3 minutes for vial to completely vent.
.6 minutes	Activate Relay G to inject loop contents into GC columns

When the 1st run is started it will be Vial 1 that is pressurized and sampled.

Time	Event
0.000	ZERO
0.020	B ON (Step)
0.040	B OFF (Step)
0.100	E ON (PressurizeVial)
0.300	E ON (PressurizeVial)
0.600	G ON (Valve1Rotate)



Greenhouse Gas 10 and 20 position Vial Autosampler May 2022

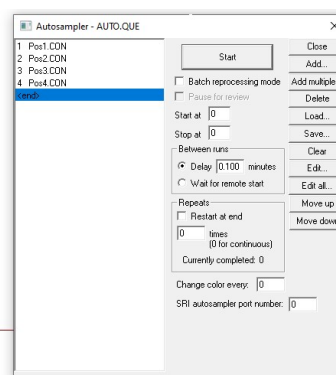
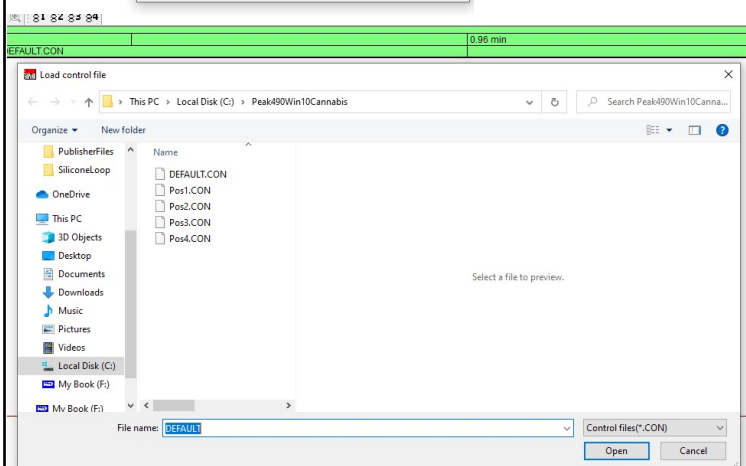
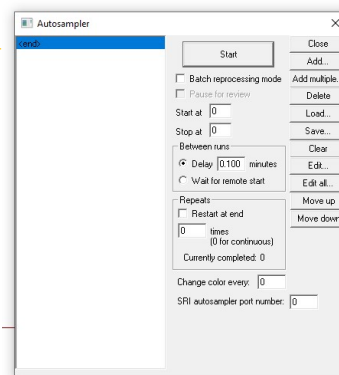
The other way to operate the AS is to use the View/Autosampler screen.

The Autosampler Queue lets you load a sequence of Control Files. A control file remembers everything you set in PeakSimple, It remembers the name of the temperature program file, the event file, the component table file, etc.

Make 10 or 20 control files each with a unique name (click File/save Control File). You might name the control files Pos1, Pos2, Pos3, Pos4 etc as shown, but any name is OK.

Then using the “Add” button in the Autosampler Queue Window, make a list of the control files. You can customize the control files any way that makes sense.

Each control file will have a slightly different Event table to index the AS to the correct vial. Each Event table will have a unique name like Pos 1.evt Pos 2.evt etc and will be remembered by the Control file of the same name.



Greenhouse Gas 10 position

Vial Autosampler May 2022

For example, this might be the event table for vial positions 1-10.

There is no entry for Relay A, so Bank 1 is selected.

Channel 1 events

Time	Event
0.000	ZERO
0.020	B ON (Step)
0.040	B OFF (Step)
0.100	E ON (PressurizeVial)
0.300	E ON (PressurizeVial)
0.600	G ON (Valve1Rotate)

Click on this line to highlight

Add... Change... Remove Describe...
Load... Save... Clear Print
OK Shift...

This would be the Event table for positions 11-20. Notice that in this event table Relay A is activated which selects Bank 2.

Channel 1 events

Time	Event
0.000	ZERO
0.020	B ON (Step)
0.040	B OFF (Step)
0.050	A ON (BankSelectValve)
0.100	E ON (PressurizeVial)
0.300	E ON (PressurizeVial)
0.600	G ON (Valve1Rotate)

Add... Change... Remove Describe...
Load... Save... Clear Print
OK Shift...



Greenhouse Gas 10 position Vial Autosampler May 2022

After each vial is vented through the loop and out the Luer-lok port, the sample gas remains in the connecting tubing.

To flush the tubing so carryover from vial to vial does not occur, add many Relay E “on then off” cycles to progressively dilute the gas remaining in the connecting tubing. This can occur during the analysis so no time is wasted.

If the vial is pressurized to .5bar each time, the first flush adds 20ml to the 40ml already in the vial so the sample is diluted to 67% of its original concentration.

The 2nd flush dilutes 67%
 $\times .67 = 48.9\%$

The 3rd flush dilutes $48.9 \times .67 = 30\%$
 4th=20% 5th=13.5% 6th=9% 7th=6%
 8th=4% 9th=2.7% 10th=1.8%

You can do as many flushes as you think necessary.

Channel 1 events

Time	Event
0.000	ZERO
0.020	B ON (Step)
0.040	B OFF (Step)
0.050	A ON (BankSelectValve)
0.100	E ON (PressurizeVial)
0.300	E ON (PressurizeVial)
0.600	G ON (Valve1Rotate)
1.000	E ON (PressurizeVial)
1.300	E OFF (PressurizeVial)
1.500	E OFF (PressurizeVial)
1.800	E OFF (PressurizeVial)
2.000	E ON (PressurizeVial)
2.300	E OFF (PressurizeVial)
2.500	E ON (PressurizeVial)
2.800	E OFF (PressurizeVial)

Add as many flushes as you think necessary to the event table to occur during the analysis.

Buttons: Add... Change... Remove Describe... Load... Save... Clear Print OK Shift...



Greenhouse Gas 10 position Vial Autosampler May 2022

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You can do as many flushes as you think necessary.



Chromtech (Chromalytic Technology) Addendum Sept22

yet to be confirmed by **SRI GCs**

re > **10&20Vial SRI Update May2022.**

The Initial 10Vial AS was built-in to the 8610 chassis as a SRI Custom GC with the necessary solenoids and h'ware PCBs etc installed as necessary

Retrofit > required by SRI USA factory (recommended !)

Pre-empt as user add-on required ordering the **GH-GC** with the GC built-in h'ware pre-installed for convenience as complete user installation after-sales can be "user-complicated".

Similarly for the revised 20&40mlVial update > partial internal GC upgrade (pre-empted) and the external h'ware add-on.

> **pre-order** the essential GC built-in h'ware option at time of **GH-GC** purchase.

Then the 10&20ml system is an external h'ware add-on with respective vial oven(s), solenoids, pressure regulator etc required to complete the AS upgrade.

ASSUMES the "Flush sequence is for the connecting lines ONLY (Not relevant to the vial itself > of-course !

NOTE :

If **duplicate sample analysis** is required (essential?) from a closed and/ or evacuated vial then each successive sample is diluted by the necessary pressurisation (0.5bar) of the Vial by the default AS Method.

A Minimum Injected Sample volume (set by the PS valve timing & as measured by the outlet syringe) is required to flush the transfer lines and sample injection loop (normally 1cc)

- **pre-evacuated Vials** (12ml Exetainer recommended / advised) particularly for small actual sample sizes (eg 1 cc from sample source) require extreme care (high vacuum ~1-5mm & assured).

ASK for advice (Chromalytic) on details **how** to avoid / minimise sample leaks, air infusion thru' needle "pin-holes" etc relating to sample /vial transit / storage delays etc).

RESULTS

Need to be rationalised/adjusted for any such dilution effects !

Calibration

Reference Gases are Expensive (> production time delays are The "norm" !)

Method evaluation

- assume GC Detector linearity (over a limited range x10 Only ? > to be confirmed later with certified Gas Standards, if/as necessary) **Gas Standards (ideally need to overlap concentrations being actually measured.**

"Clean" Ambient Air; methane 1.8ppM, CO2 420ppM, N2O 1.3ppM

(> but verify from an external source)

- simple sample dilution and approx Detector linearity can be confirmed using a (10cc) gas-tight syringe (with on/off valve) and clean Air (or N2 diluent) (and to approx +/- 5% with care !)

- Wet samples **"Be-a-Ware"** ! CO2 forms carbonic acid in-situ and sample heating may be required ? . > for both external sampling and GC vial oven as supplied).

- Complete GC automation of "dirty" samples (eg from fermentation / digesters etc eg Ankonic) and will / may complicate transfer line h'ware options.

This certainly will effect the actual LODs attainable using this SRI system.

> partly off-set perhaps by increasing the sample loop size from 1cc to 2cc ?
but still with Min sample purge (of 3-4cc ?) .

- ultimately ANY automation possibilities after "trial & error" from Manual sample via syringe injections (assay levels vs dirty sample contamination !).