



GC Innovations

Environmental Testing Solutions from SRI

Time tested field favorites, our BTEX, Environmental, and TO-14 GC systems come completely equipped.

The unique SRI Purge & Trap design features dual traps with different adsorbents and independent temperature setpoints to optimize the trapping and releasing of analytes.



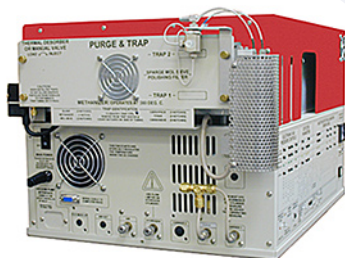
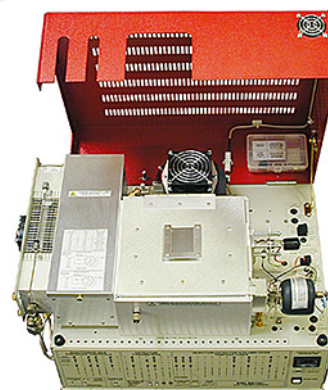
SRI Purge & Trap concentrators and Heated Static Headspace injectors are built into the GC to reduce dead volume for better peak shape.

All SRI GC systems are portable, with a built-in, Windows compatible PeakSimple data system for onsite field analysis or laboratory testing.

Over 1000 possible custom configurations—name your application!

BTEX, Environmental and TO-14 GC systems

The BTEX GC system comes complete with FID and PID detectors and a built-in, Method 5030 compliant Purge & Trap concentrator. The Environmental GC system is identical to the BTEX, except that it features a combination FID/DELCD detector. Both systems may be upgraded to the Method 5030/5035 compliant Purge & Trap concentrator which features interchangeable purge heads and a syringe port. Also equipped with PID and FID/DELCD detectors, the TO-14 Air Monitoring GC uses a dual trap concentrator similar to the purge and trap, and a PeakSimple controlled vacuum pump interface for drawing ambient air samples through the GC. All three units are equipped with a built-in, "whisper quiet" air compressor, and may be used with a hydrogen generator for tankless field operation.

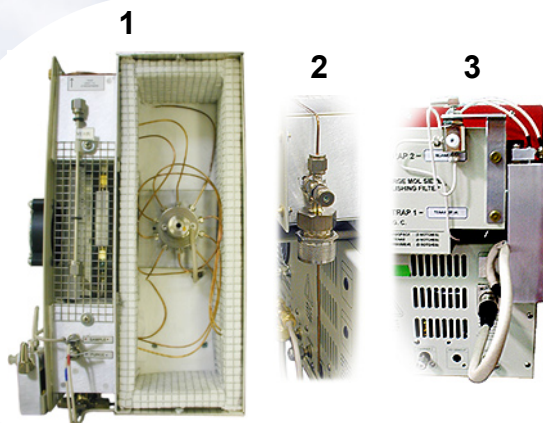


Heated Static Headspace Injector

The Heated Static Headspace Injector is ideal for complex or dirty samples, and for minimizing sample preparation time. The mechanically agitated VOA vial heater body is thermostatted from ambient to 90°C.

Purge & Trap Concentrator

- 1 The SRI built-in Purge & Trap Injector is EPA Method 5030 and/or 5035 compliant with single or dual traps and a heated 10 port gas sampling valve.
- 2 The Method 5030 purge head is designed for the ambient purging of aqueous samples using disposable test tubes.
- 3 The Method 5030 / 5035 Purge & Trap features a syringe port and interchangeable purge heads. The 5035 purge head shown here is heated (ambient-45°C) and mechanically agitated under control of the PeakSimple data system.

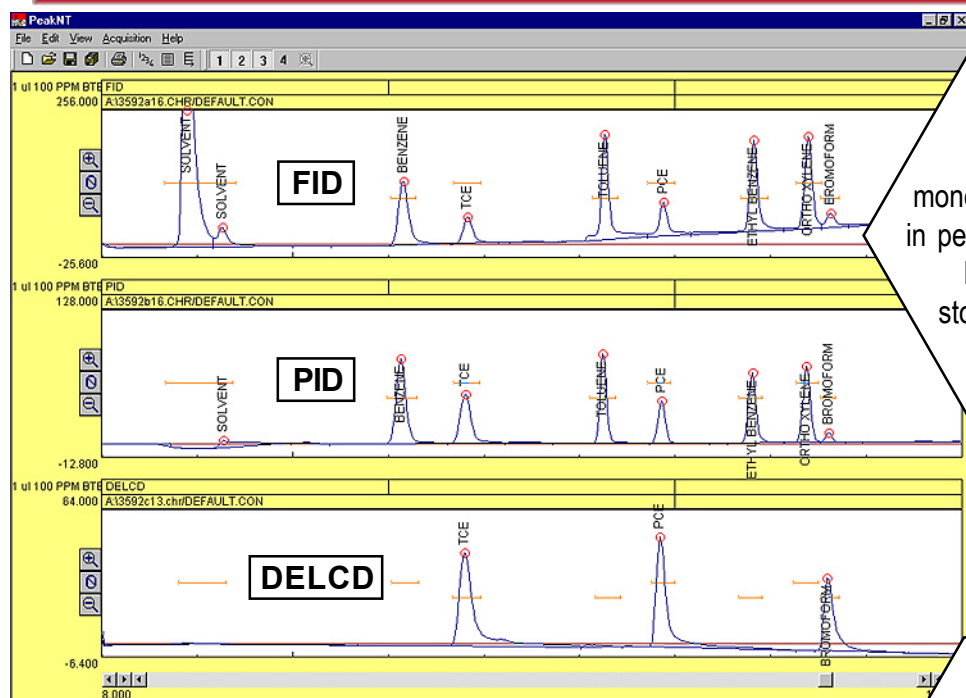


AIR

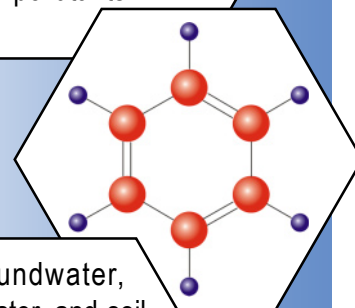
SOIL

WATER

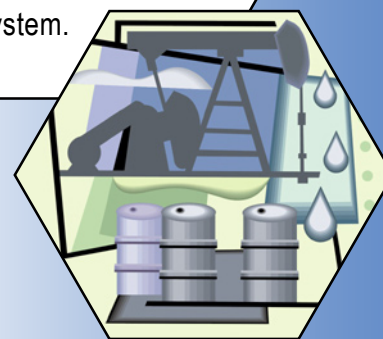
Environmental Testing Solutions from SRI



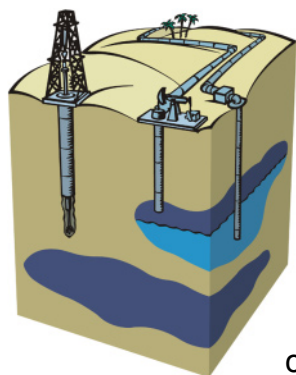
The BTEX chemicals (Benzene, Toluene, Ethylbenzene, and Xylenes) are volatile monoaromatic hydrocarbons found in petroleum products like gasoline. Due to industrial spills and storage tank leakage, they are common environmental pollutants.



Groundwater, wastewater, and soil are tested for BTEX chemicals in many everyday situations. This chromatogram was obtained using an SRI Environmental GC system.



There is more to industry than meets the eye. Not only are there constant technological advances and improvements, but we are learning more and more each day about the long term effects and consequences of chemicals in the environment. To keep abreast of testing requirements for environmental regulations has long been an important goal at SRI Instruments. Like the other areas of chemical analysis that we service, we strive to provide unique, portable, and economical solutions for your environmental testing needs.



Popular Systems

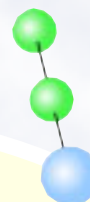
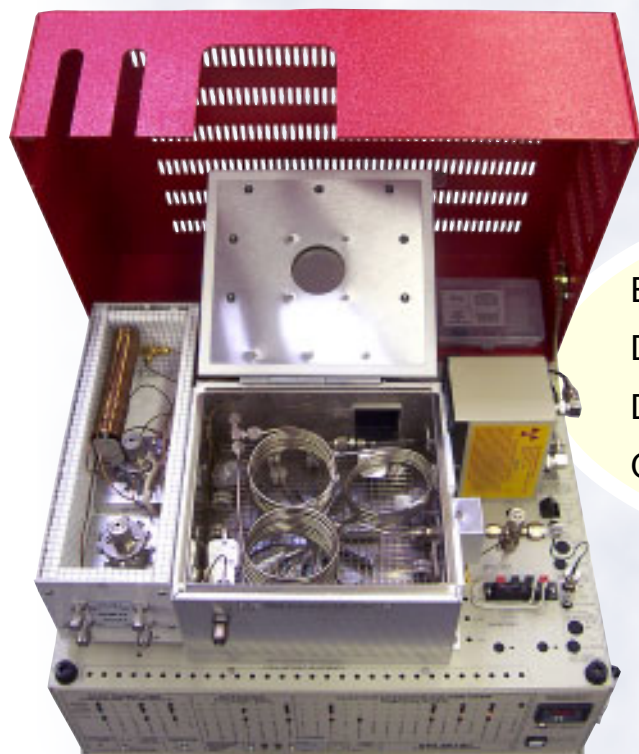
- 8610-0050 BTEX GC with PID and FID detectors, Method 5030 compliant Purge & Trap, built-in air compressor, and 60m capillary column
- 8610-0059 Environmental GC with PID and FID/DELCD detectors, Method 5030 compliant Purge & Trap, built-in air compressor and 60m capillary column
- 8610-0114 TO-14 Air Monitoring GC with PID and FID/DELCD detectors, dual trap sample concentrator, air compressor, vacuum pump interface and 60m capillary column
- 8610-0050 Heated Headspace GC with Heated Static Headspace Injector, FID detector, built-in air compressor, and 30m capillary column

Upgrades and Options

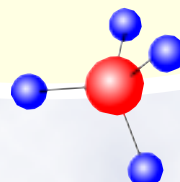
- 8690-5052 Upgrade the Environmental GC or BTEX GC to Method 5030/5035 compliant Purge & Trap concentrator
- 8680-0350 H₂-50 Hydrogen Generator
- 8690-0072 Optional Vacuum Pump Interface (specify 120 or 220 VAC)



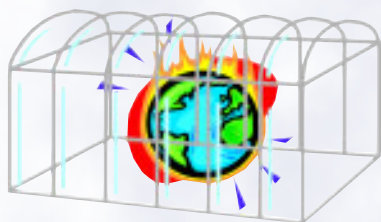
Greenhouse Gas Detection and Analysis



ECD and FID-Methanizer detectors
Dual packed columns with pre-column
Dual 10-port gas sampling valves & 5mL sample loop
On-column injector



THE GREENHOUSE EFFECT



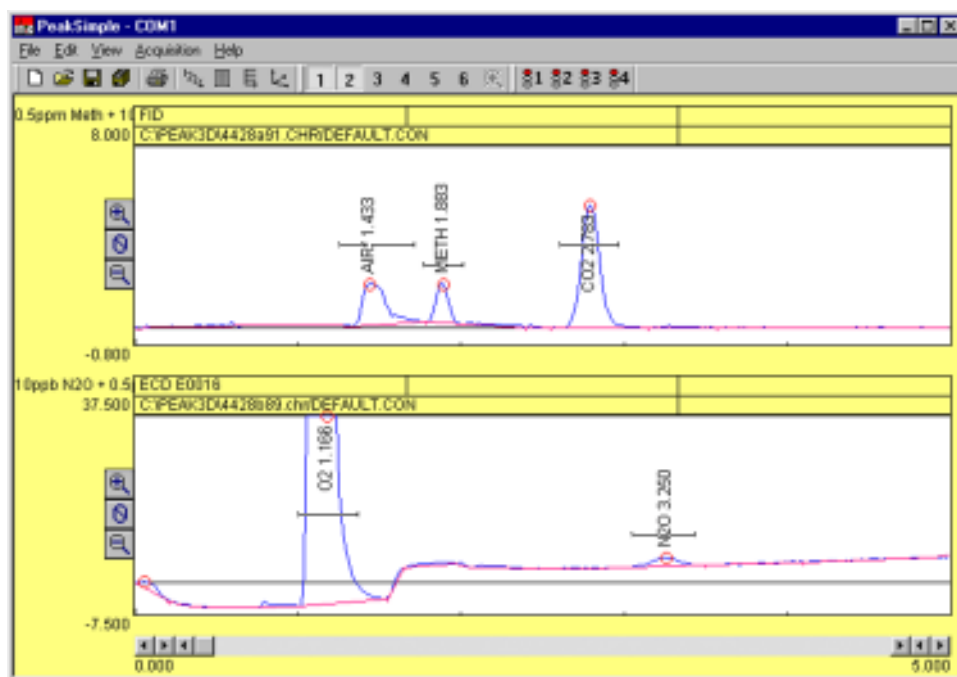
Greenhouse gases naturally present in the atmosphere—mostly water vapor, carbon dioxide, and ozone—absorb thermal infrared radiation emitted by Earth. Warmed by this process, the atmosphere emits infrared radiation in response, a significant proportion of which warms Earth's surface and lower atmosphere. This is the phenomenon known as the greenhouse effect, and the infrared active gases responsible for it are greenhouse gases.

Since the industrial revolution, human activity has contributed significantly to the amount of greenhouse gases present in the atmosphere. The most abundant anthropogenic greenhouse gases are carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). Carbon dioxide is released into the atmosphere when fossil fuels, coal, solid waste, and wood products are burned, during cement production, and also when land surface cover is changed by humans. Increases in methane are from fossil fuels, rice cultivation, animal husbandry, biomass burning, and landfills. The main anthropogenic sources for nitrous oxide are agriculture, and industrial sources including adipic and nitric acid production. Combustion of solid waste and fossil fuels also contribute to atmospheric N_2O .

Greenhouse Gas Detection and Analysis

CO₂, METHANE, AND N₂O

These two chromatograms show an analysis of 0.5ppm methane + 10ppb N₂O by the SRI GC pictured on the previous page.

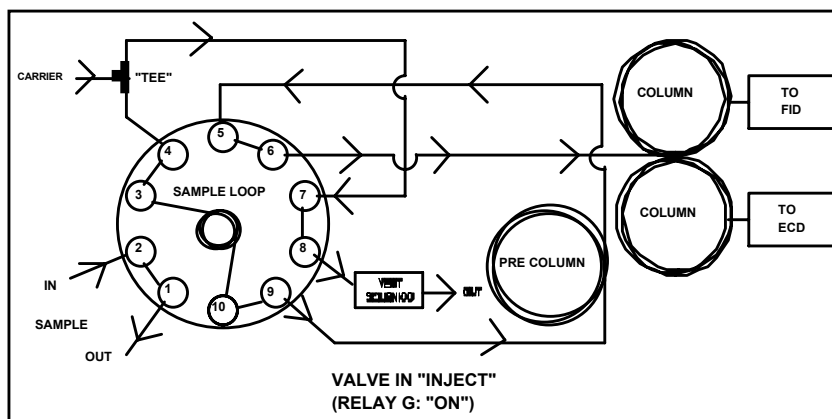
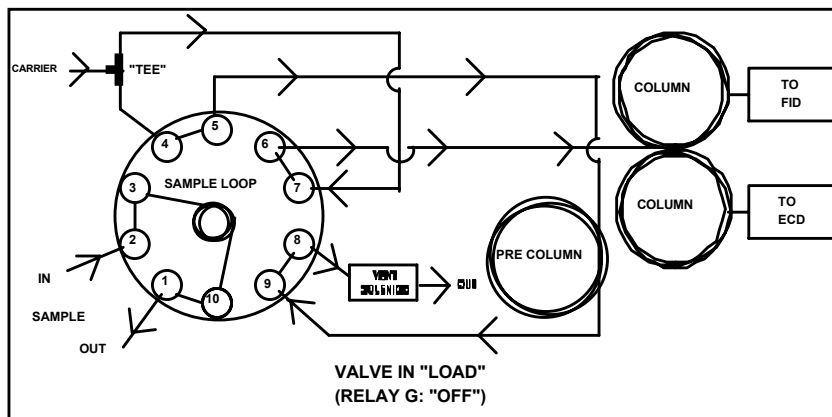


Use an SRI Greenhouse Gas Monitoring GC System for stack or ambient air monitoring; in a plane for atmospheric air analysis; any situation where you need to provide an Emissions Inventory for Clean Air Act compliance or other regulatory requirements. Use Emissions Inventories for auditing, air permit applications, health risk assessments, or other environmental impact studies. Give an accurate, comprehensive, up-to-the-minute accounting of your air pollutant emissions, and pay for no more than you release. Take advantage of EPA compliance incentives and become a self-auditor with your own SRI Greenhouse Gas Monitoring GC System.



10 PORT VALVE WITH BACKFLUSH

EVENT TIME	EVENT	EVENT FUNCTION
0.000	ZERO	ZERO
0.045	A "ON"	CLOSE VENT
0.050	G "ON"	VALVE #1 INJECT
1.500	G "OFF"	VALVE #1 LOAD
1.550	A "OFF"	OPEN VENT



Configuration:

8610 GC w/4 channel Data System

ECD Detector

FID Detector

Methanizer

Air Compressor

10-port Electric Valve

Valve Oven

(2) 3m Porapak Q packed columns

1m Porapak Q Pre-column

5ml Sample Loop



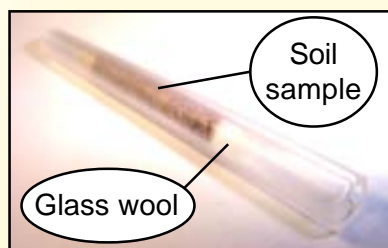
PCB GC System

- **High Sensitivity**
- **No Sample Preparation**
- **Accepts Large Samples—up to 1 gram**
- **Hydrocarbon Speciation & Quantification**
- **Chlorine & Bromine Specific**

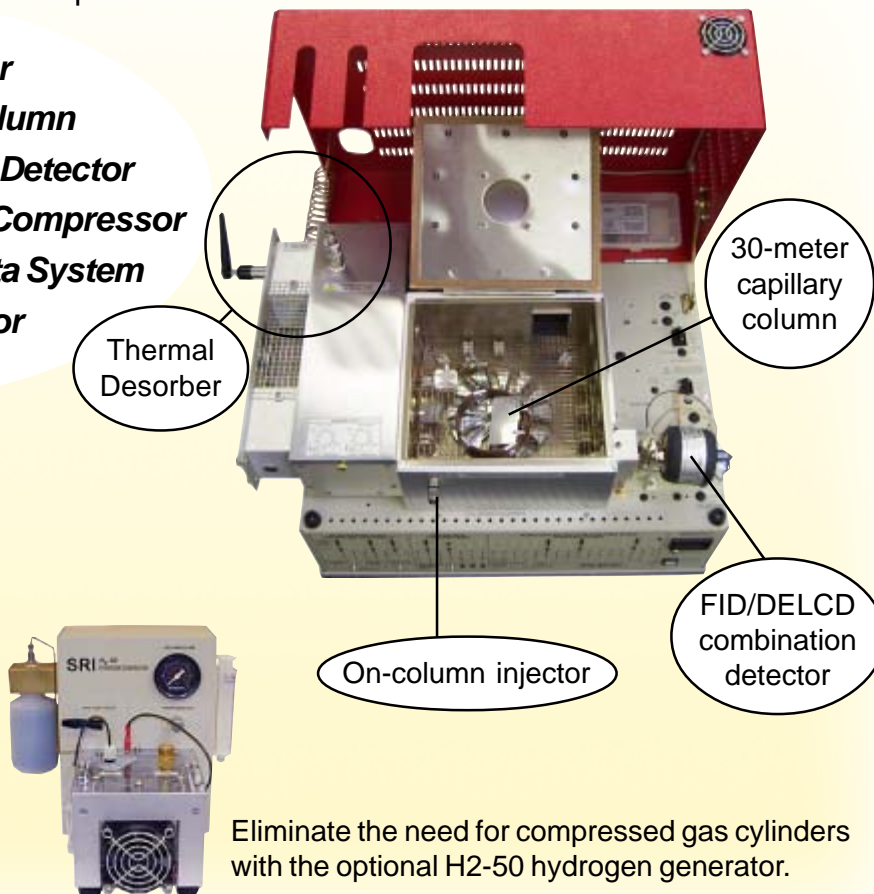
The SRI PCB GC System has everything you need to detect PCBs in soil and other solid matrices. The Thermal Desorber accessory permits the user to inject and analyze PCBs with high sensitivity and little or no sample preparation—no solvent extraction is required! Up to one gram of soil or another

solid matrix can be loaded into the re-usable glass desorption tubes. The FID detector responds to all hydrocarbons, and the DELCD identifies which are chlorinated or brominated. The PCB GC is also useful for detecting pesticides, PAHs, JP-4, kerosene, and diesel in soil. Because soil samples are typically 20-50% water, the unique design of the SRI FID automatically relights the flame after a large water peak. The 30-meter capillary column efficiently separates hydrocarbons up to $C_{40}+$. The built-in, “whisper quiet” air compressor provides air for the detectors, and if used with the H_2 -50 hydrogen generator, no cylinders are required.

- **Thermal Desorber**
- **30-meter Capillary Column**
- **FID/DELCD Combination Detector**
- **Built-in, “whisper quiet” Air Compressor**
- **4 Channel PeakSimple Data System**
- **On-Column Injector**



Up to one gram of soil or other solid matrix can be loaded into the re-usable glass desorption tubes.

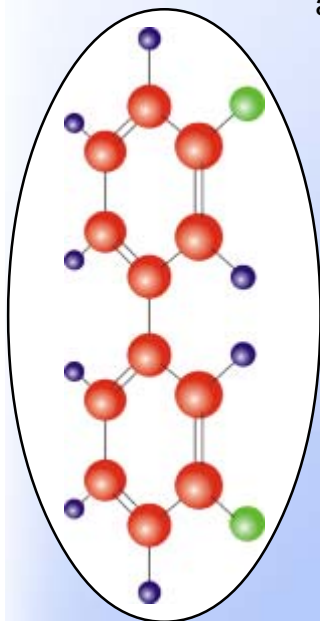


Eliminate the need for compressed gas cylinders with the optional H₂-50 hydrogen generator.

PCB GC System

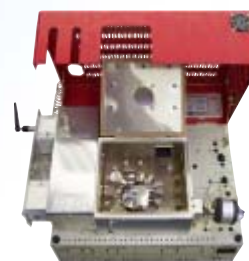
From their commercial introduction in 1929 to the cessation of US production in 1977, 1.5 billion pounds of polychlorinated biphenyls were manufactured in the United States. From 1929-1989, 1.5 million tons of PCBs were produced worldwide.

Manufacturing of PCBs was halted in the United States because of their toxicity and persistence in the environment. However, there are still PCB-containing transformers, capacitors, hydraulics, and other products in use that will have to be properly flushed and disposed of at the end of the product life. The same attributes that made PCBs ideal for use in transformers, capacitors, hydraulics, etc., cause them to not break down in our environment. Studies show that PCBs bind to soil better than air, water, sediment or plants and animals. However, PCBs are found in fish and shellfish, and are the leading chemical risk in fish consumption. Because polychlorinated biphenyls are ubiquitous, most people have low levels of PCBs in their body from environmental exposure.



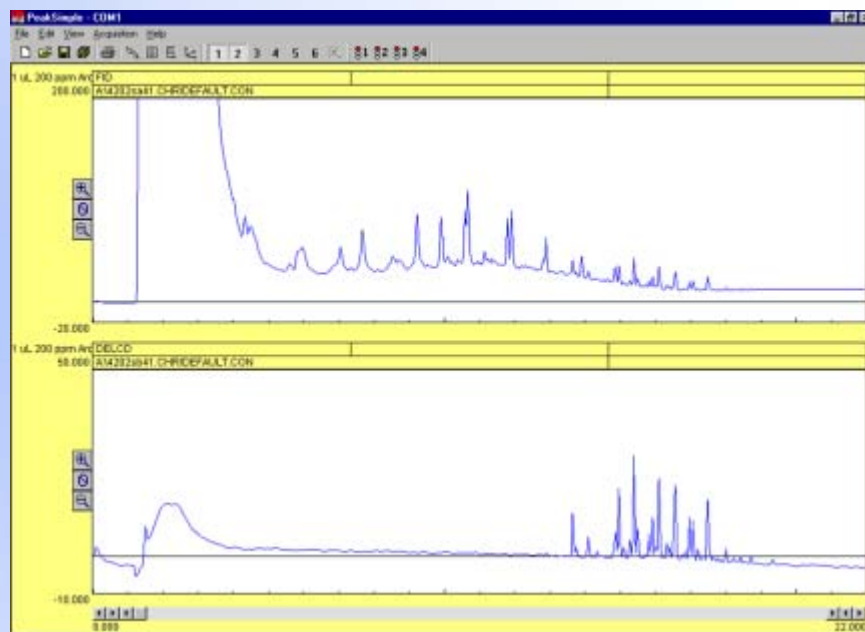
In 1976 through the Toxic Substances Control Act (TSCA), Congress legislated “cradle to grave” management of PCBs in the United States, requiring specific labelling, storage and disposal methods of PCB transformers and capacitors, electrical equipment, hydraulic machines, and other PCB-containing items. Solvents such as kerosene, xylene, and toluene are used to flush PCBs from transformers and other contaminated items, and may be reused for the same purpose until the PCB concentration in the solvent reaches 50ppm. Compliance with all these regulations requires testing.

The PCB GC System can screen soil and solvent samples alike for PCBs. Up to one gram of soil or another solid matrix can be loaded into the re-usable glass desorption tubes. Liquid samples may be introduced via the On-column injector, and the optional Programmable Temperature Vaporization (PTV) injector upgrade allows the injection of large liquid samples (up to 1mL+).

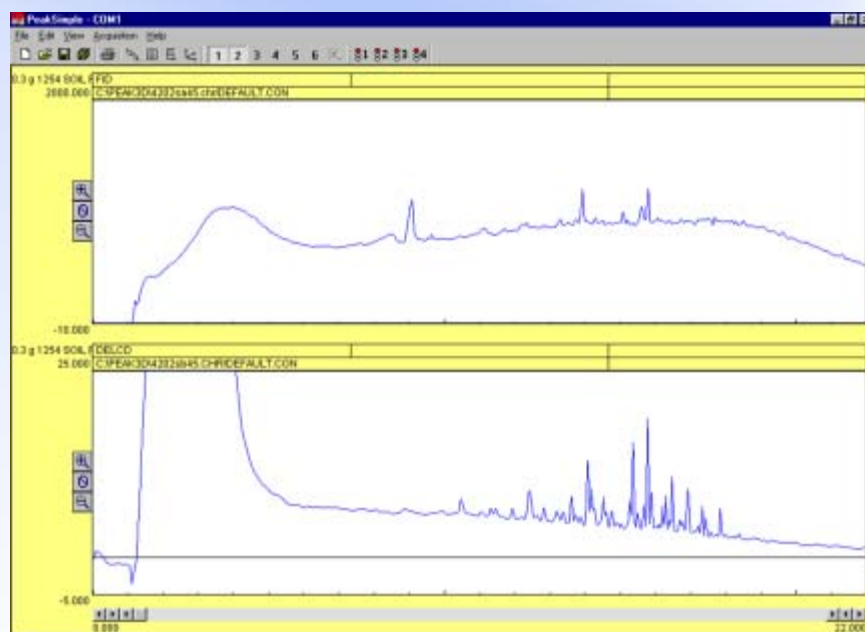


Due to the extreme selectivity of the DELCD, PCBs can be discriminated even in the presence of massive hydrocarbon contamination. The DELCD itself is protected from hydrocarbon contamination because the FID pre-combusts the sample.

This set of chromatograms shows the analysis of a 200ppm Aroclor 1254 sample in diesel. The FID shows the diesel hydrocarbons and the PCBs. In contrast, the DELCD shows only the PCBs, revealing what was obscured by hydrocarbons in the FID chromatogram.

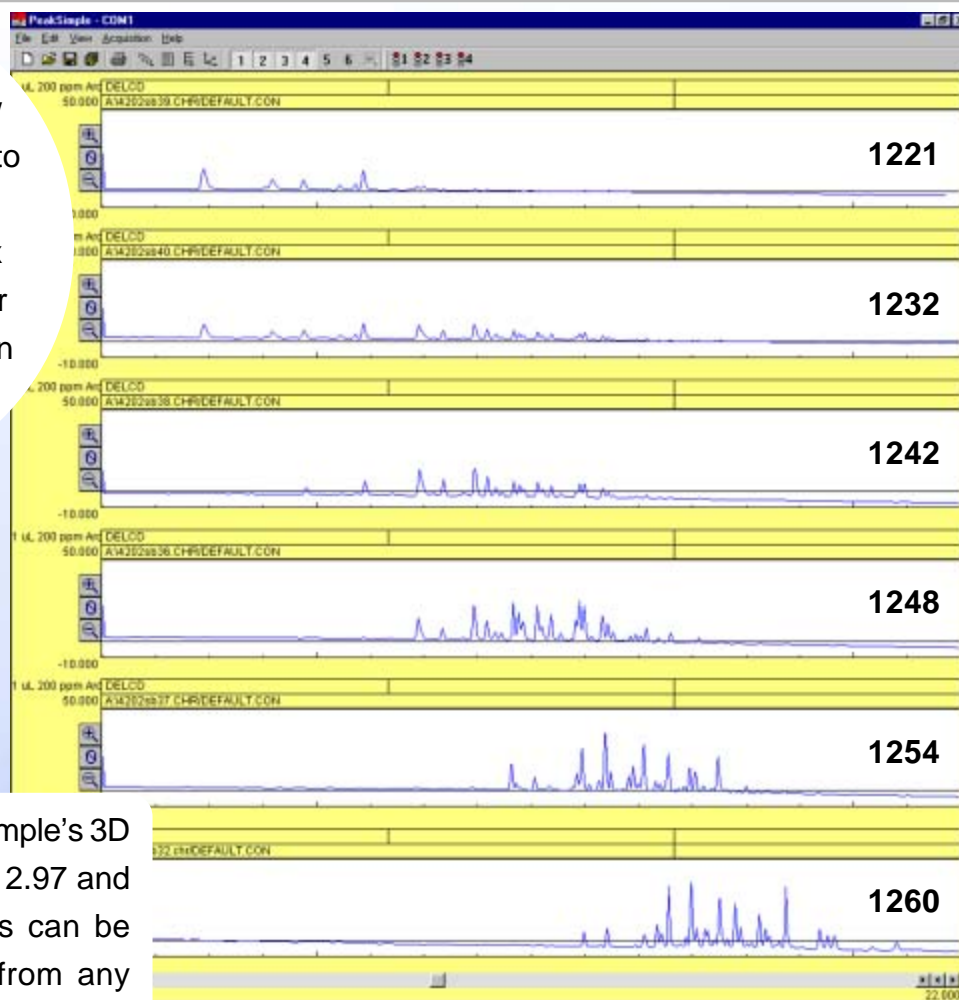


This set of chromatograms shows the analysis of a real world standard: 0.3 grams of soil from a contaminated site. This standard is NIST certified to contain 1.34ppm Aroclor 1254. The DELCD clearly shows the PCBs in the sample.

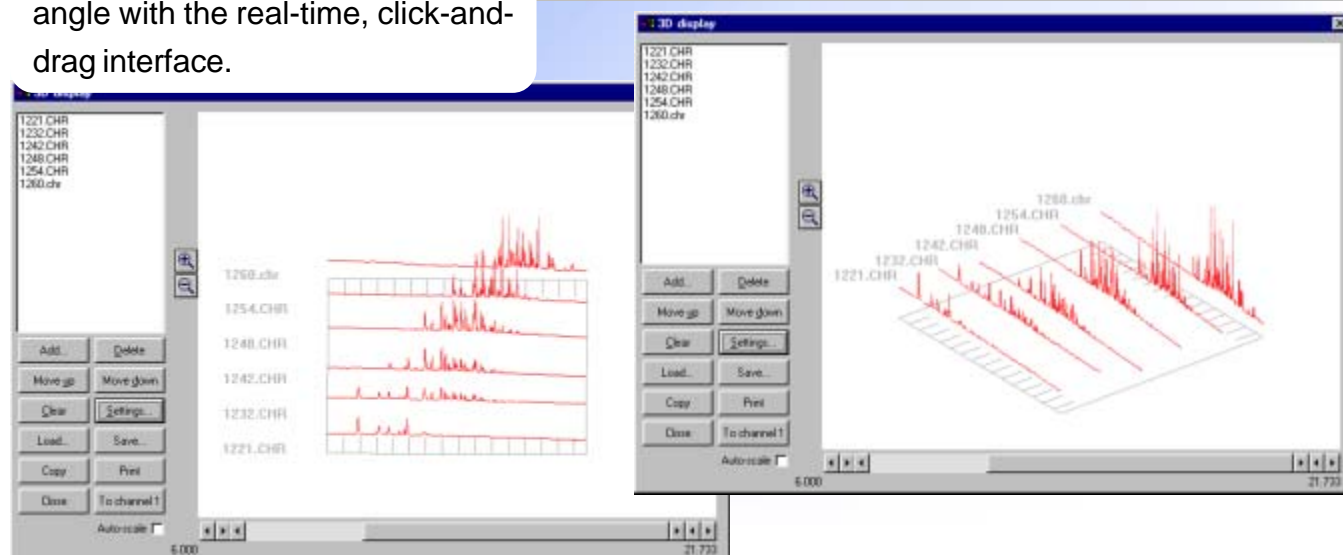


PCB GC System

These six chromatograms show the DELCD response to six different Aroclor PCB samples. All six runs were made under the same conditions on a PCB GC system.



When loaded into PeakSimple's 3D display feature (versions 2.97 and up), the peak signatures can be viewed and compared from any angle with the real-time, click-and-drag interface.



8610-0080

PCB GC System

\$ 14,995.00

Voltage: for 110VAC, use 8610-00780-1; for 220VAC, use 8610-0080-2

Options and Upgrades: additional detectors, 6 channel USB PeakSimple data system, Split/Splitless and PTV injector upgrades

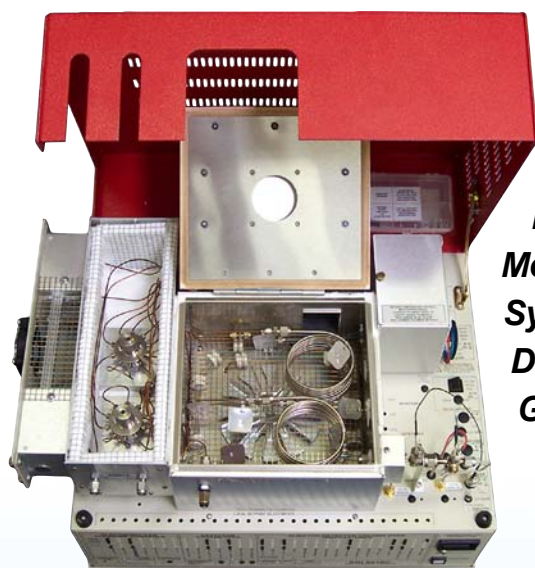


GC Innovations

TOGA GC System

for Transformer Oil Gas Analysis

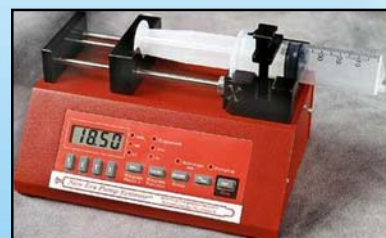
SRI now offers an affordable, field portable GC system for determining the type and quantity of gases dissolved in your transformer oil.



HID and/or TCD Detectors
Built-in PeakSimple Data System
Molecular Sieve and Silica Gel packed Columns
Syringe Pump for Industry Standard 50mL Syringes
Dual 10-port Gas Sampling Valves
Gas Extraction Loop

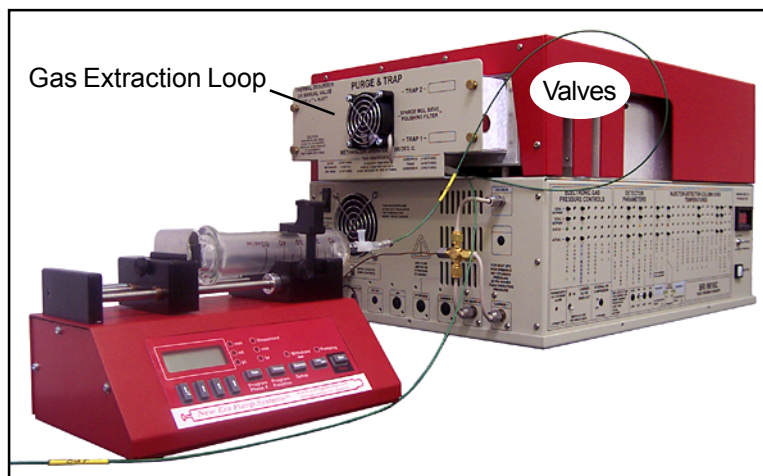
The TOGA GC may be equipped with an HID detector, TCD detector, or both. The HID and TCD detectors are universal, and can detect the entire spectrum of gases typically found dissolved in transformer oil: hydrogen, oxygen, nitrogen, methane, carbon monoxide, carbon dioxide, ethylene, ethane, and acetylene. For sub-ppm detection limits, choose the HID detector. The TCD can detect the target analytes down to 5-10ppm (except hydrogen). For a 1-100% detection range for all of the analytes listed, choose both detectors.

In the SRI TOGA GC, the transformer oil sample is injected by syringe pump through a unique gas extraction loop. The extracted gases are then injected into the carrier gas stream by the dual 10-port valve injection system. The syringe pump accepts standard 50mL syringes. This means the sample can be loaded into the syringe from the transformer, then into the syringe pump without ever being handled. This helps to protect the transformer oil sample from ambient contaminants.



Transformer Oil Gas Extraction and Injection

The SRI TOGA GC system uses a unique dual 10-port valve and gas extraction loop configuration for extracting and injecting dissolved transformer oil gases. Once the transformer oil-filled syringe is loaded into the pump, it is connected to the gas extraction and injection system.

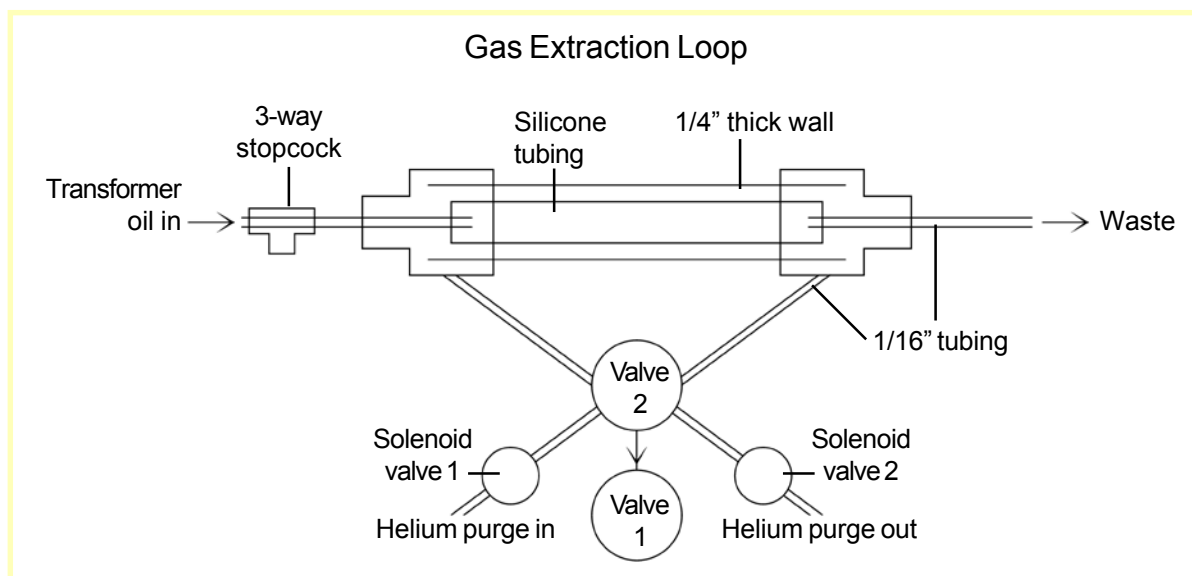


Gas Extraction Loop



The syringe is connected to the gas extraction loop with PEEK tubing, through a three-way stopcock. The gas extraction loop consists of silicone tubing encapsulated in a trap (at left, shown from above). The silicone tubing is plumbed to the syringe (sample IN), the dual 10-port valves, and waste (sample OUT). When the transformer oil is pumped through the gas extraction loop, the dissolved gases in the transformer oil selectively permeate through the silicone membrane into the surrounding chamber.

permeate through the silicone membrane into the surrounding chamber.

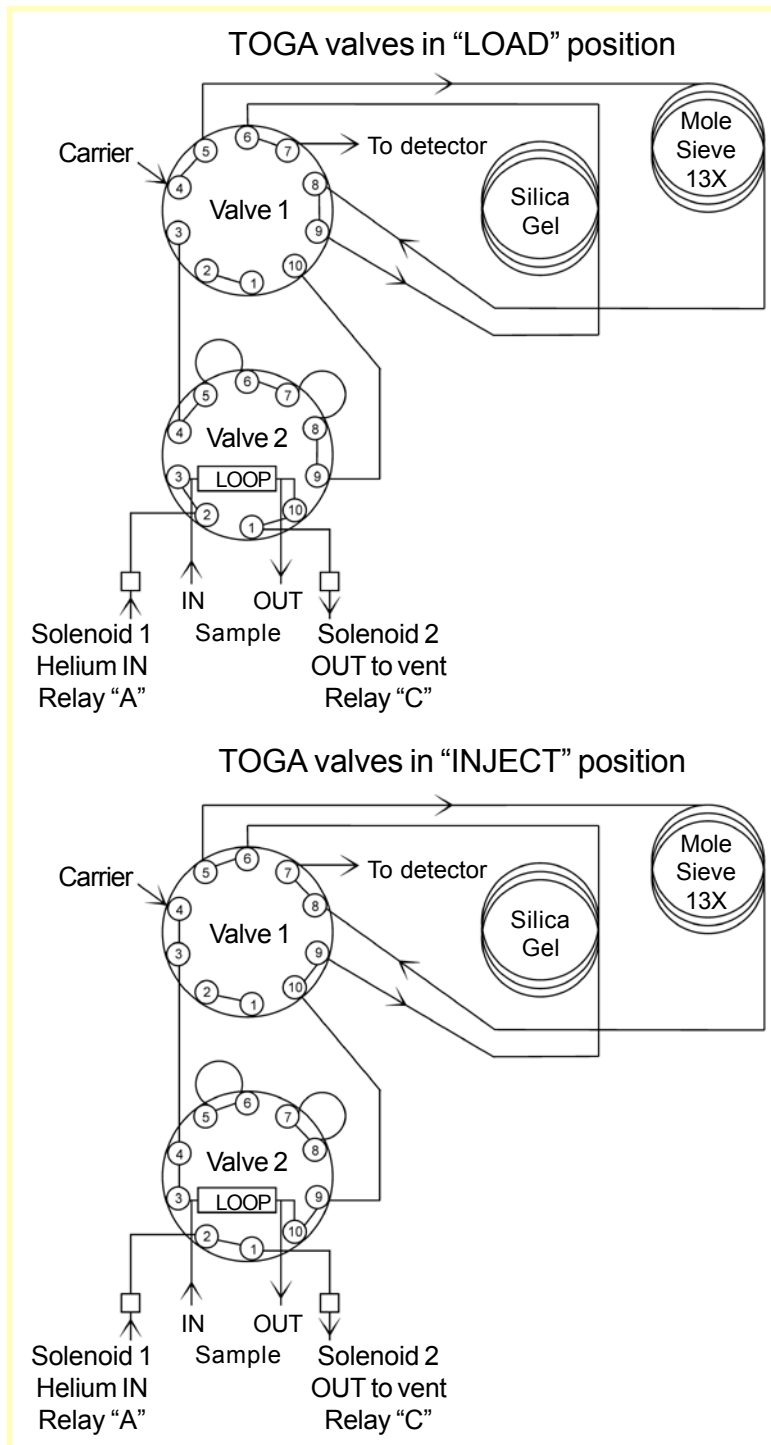
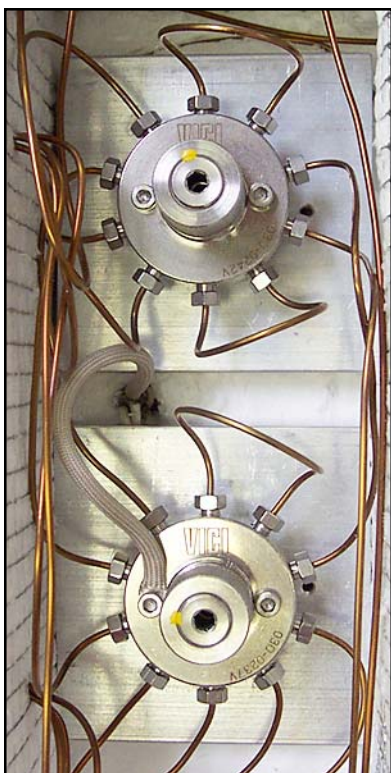


SRI TOGA GC System

Dual 10-port Valves

Two 10-port electrically actuated valves are plumbed to the gas extraction loop and columns. Valve #1 is plumbed to the MoleSieve 13X column, then the Silica Gel column. Valve #2 is plumbed to the gas extraction loop. Also plumbed to the 10-port valves are two solenoid valves for purging the gas extraction loop with helium between sample injections.

While the transformer oil is being pumped through the gas extraction loop, the valves are in the LOAD position, and both solenoid relays are ON. During this time, the dissolved gases in the transformer oil are extracted, and allowed to selectively permeate the silicone membrane. When the valves are switched to the INJECT position, the contents of the loop are swept into the MoleSieve 13X column, then on to the Silica Gel column.



SRI TOGA GC System

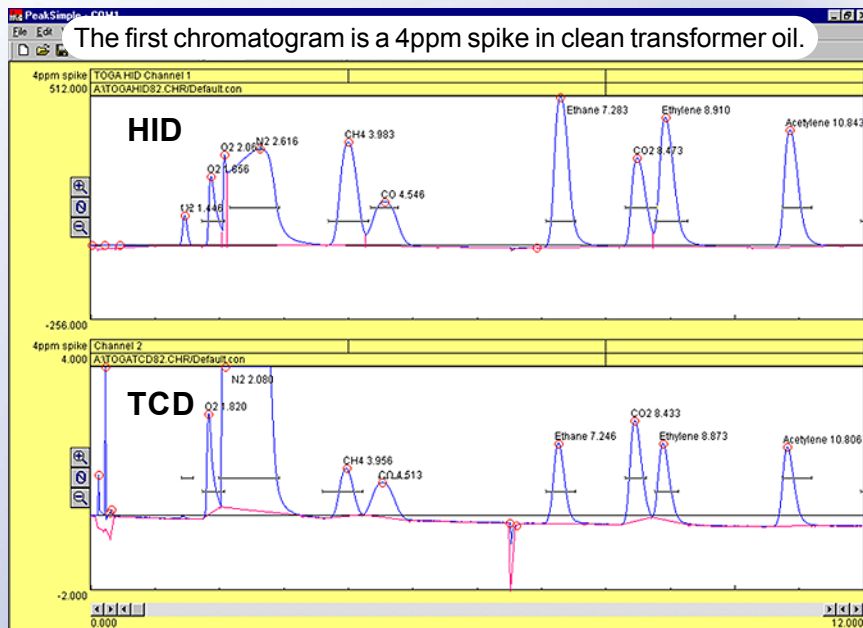
The following chromatograms are from an SRI TOGA GC System equipped with both HID and TCD detectors.

HID Results:

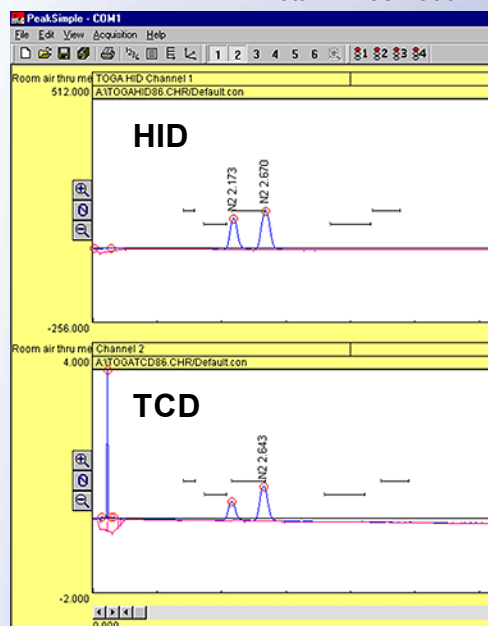
Component	Retention	Area
H2	1.446	495.7932
O2	1.856	1850.5721
N2	2.616	14360.5984
CH4	3.983	6094.0500
CO	4.546	3735.2072
Ethane	7.283	7749.7332
CO2	8.473	4392.9036
Ethylene	8.910	6908.3536
Acetylene	10.843	5935.2208
Total		51522.4321

TCD Results:

Component	Retention	Area
O2	1.820	14.9656
CH4	3.956	17.9312
CO	4.513	19.8740
Ethane	7.246	25.2856
CO2	8.433	31.5780
Ethylene	8.873	23.3550
Acetylene	10.806	25.7712
Total		158.7606



The second chromatogram is the result of running room air through the gas extraction loop.



HID Results:

Component	Retention	Area
N2	2.670	1127.6346
CO2	8.606	10.0868
Total		1137.7214

TCD Results:

Component	Retention	Area
N2	2.643	7.4516

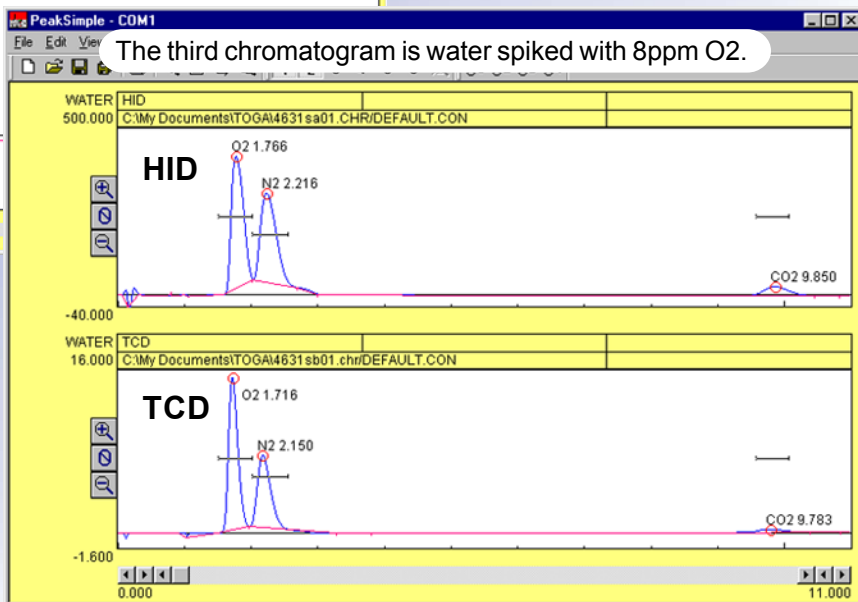
The third chromatogram is water spiked with 8ppm O2.

HID Results:

Component	Retention	Area
O2	1.766	4831.0175
N2	2.216	4365.0860
CO2	9.850	710.0270
Total		9906.1305

TCD Results:

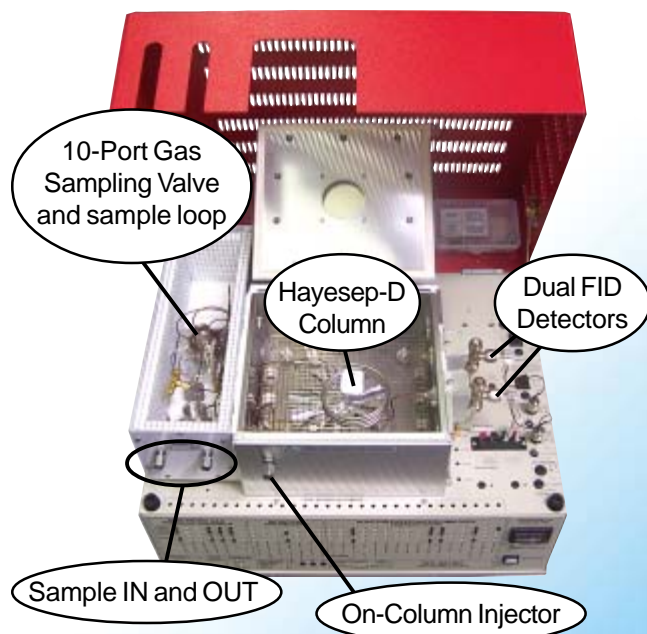
Component	Retention	Area
O2	1.716	142.2680
N2	2.150	94.0050
CO2	9.783	8.1520
Total		9906.1305



8610-0030	TOGA GC System with TCD Detector & 1 channel data system	\$ 15,995.00
8610-0031	TOGA GC System with HID Detector & 1 channel data system	\$ 17,495.00
8610-0032	TOGA GC System with TCD & HID Detectors, & 4 channel data system	\$ 19,995.00



Mud-Logging GC Systems



Mud-Logging GC

- *Dual FID Detectors*
- *Hayesep-D Column*
- *10-port Gas Sampling Valve*
- *Built-in "whisper quiet" Air Compressor*
- *Temperature Programmable Column Oven*
- *4 channel PeakSimple Data System*
- *...on the compact 8610C chassis*

SRI now offers two versions of our Mud-Logging GC Configuration to suit your application needs

and working environment. The 8610C Mud-Logging GC System is full-featured, yet small enough to be portable/used in the field. The 410 Rack-Mount Mud-Logging GC System packs the same features into a GC that fits on your shelf-equipped, 19-inch rack.

410 Rack-Mount Mud-Logging GC

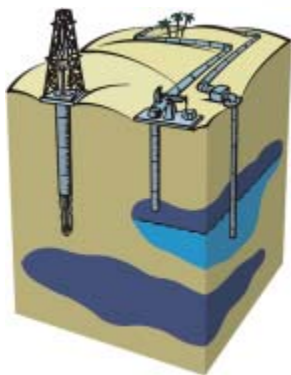
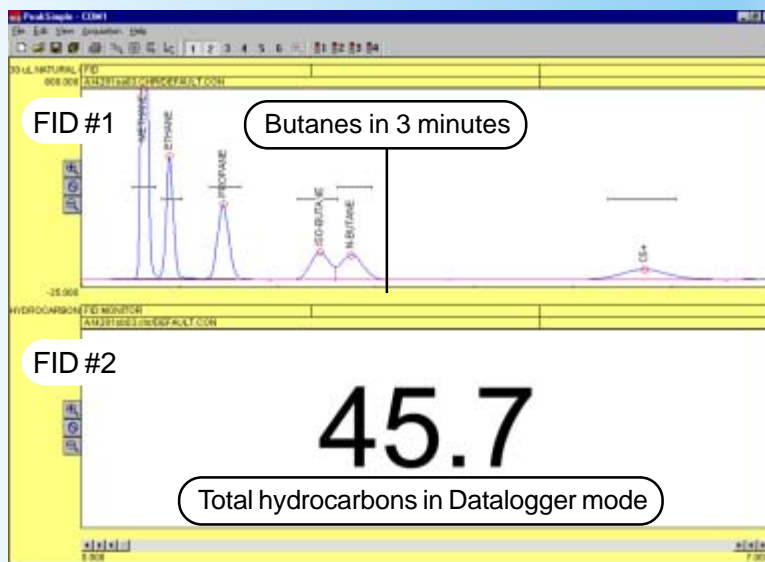
- *Dual FID Detectors*
- *Hayesep-D Column*
- *10-port Gas Sampling Valve*
- *Standard & Sample Stream Solenoids*
- *Built-in "whisper quiet" Air Compressor*
- *Temperature Programmable Column Oven*
- *4 channel PeakSimple Data System*
- *...on the rack mountable 410 chassis*



SRI Mud-Logging GC Systems

Both Mud-logging GC systems are designed to provide a continuous reading of total hydrocarbons in a gas stream while periodically performing a chromatographic separation of the sample to determine the exact hydrocarbon composition of the sample stream. The sample gas stream is connected to a bulkhead fitting on the heated valve oven, where it flows through the loop of the 10-port gas sampling valve, and also to the second FID detector, which continually monitors the hydrocarbon content of the gas. Automatically, at a repeating time interval controlled by the operator, the gas sampling valve injects the contents of its loop into the GC column, where it is separated into the constituent hydrocarbon peaks and detected by the first FID detector.

The built-in, four channel PeakSimple data system connects quickly and easily to your Windows™ PC or Laptop, and displays both the continuous total hydrocarbon reading and the separated peaks. PeakSimple's Datalogger mode allows you to display a scaled and calibrated result in large numbers in place of one strip chart chromatogram for the second FID detector. An alarm function can visually or audibly alert the operator if an external measure, area, or signal is not within the specified range. Summary reports are easily printed, or copied into Excel or similar programs.



The built-in, "whisper quiet" air compressor provides combustion air for the FID detectors. The Hayesep-D (high purity divinyl benzene, max temp 290°C) packed column is good for separating gases and other low molecular weight compounds. For heavier molecular weight liquids, use a 30 or 60 meter MXT-1 capillary column.

8610-0065	Mud-Logging GC System	\$13,495.00
0410-0065	Rack-Mount Mud-Logging GC System (rack not included)	\$13,495.00
Voltage: for 110VAC, use "part number-1" [ex: 8610-0065-1]; for 220VAC, use "part number-2"		
Options and Upgrades: six channel USB PeakSimple data system, solenoids for sample and standard streams, additional gas sampling valve, PTV or Split/Splitless injector upgrade, capillary column		



GC Innovations

Multiple Gas Analyzer #1

Keep your gas products in spec! Monitor gas product purity, natural gas, and ambient air quality.

Sounds expensive and complicated to operate?

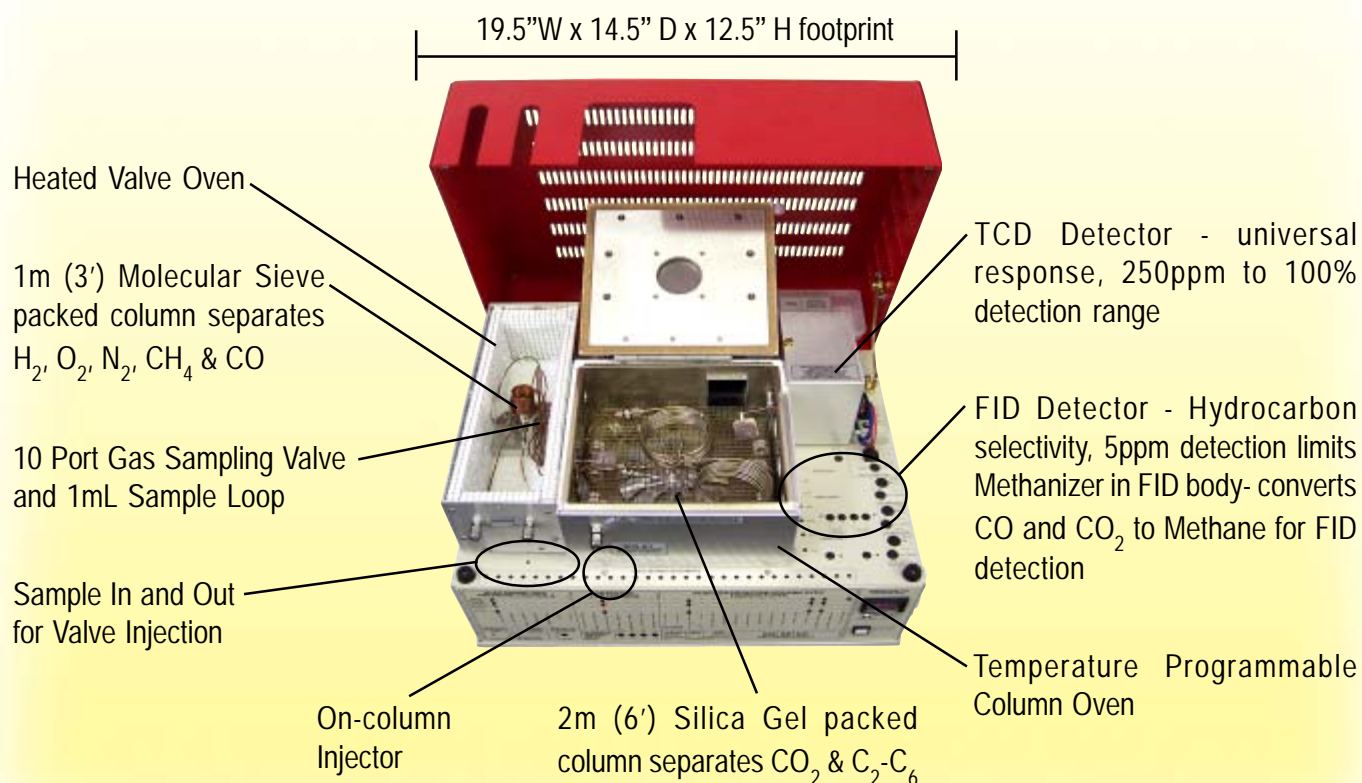
Not from SRI! The SRI Multiple Gas

Analyzer #1 uses just ONE gas sampling valve and TWO

analytical columns to perform the same separations that require multiple valves and columns in other systems.

Best of all, the Multiple Gas Analyzer #1 can achieve ppm to 100% concentrations with a single injection!

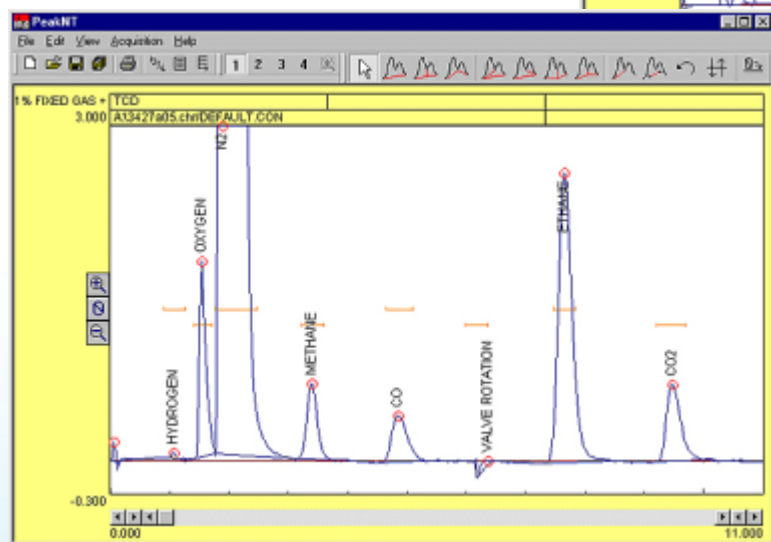
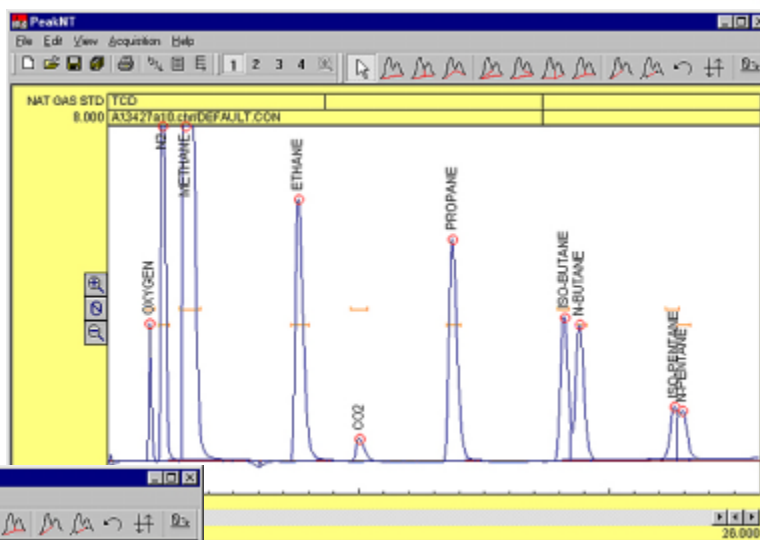
- ★ Separates multiple gases with a single injection
- ★ Very tolerant of user adjustments and timing variations
- ★ Simpler than other multi-gas capable GC systems
- ★ Multiple gas analysis in a compact unit



**Specifically Designed for
Separation of Whole Gas Components and Natural Gas Samples**

Multiple Gas Analyzer #1

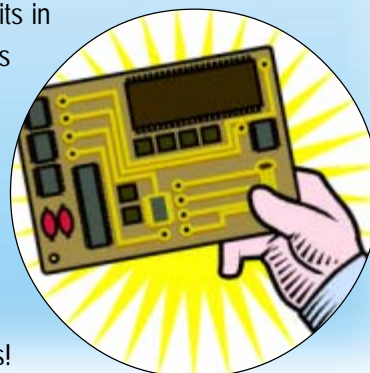
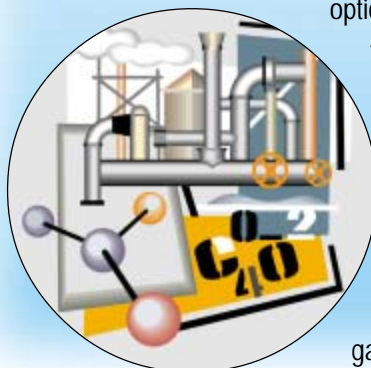
Separating out the hydrocarbon components of natural gas facilitates accurate BTU quantification. This compositional analysis of a natural gas standard by an SRI Multiple Gas Analyzer #1 shows good separation up to the pentanes. Performing compositional analyses of natural gas product before and after refining helps to maximize process efficiency and profit.



The same instrument produced this chromatogram, separating a sample mix of 1% fixed gas standard and ethane. With the built-in PeakSimple data system, the gas sampling valve was programmed to inject the sample loop contents into the carrier gas stream at 5 seconds, then rotate back at 6 minutes, after CO elution.

The basic Multiple Gas Analyzer #1 has a TCD detector only; this model provides analyses in the 250ppm to 100% range for fixed and natural gases. A second option is a TCD, Methanizer, and FID detector combination which adds 5ppm detection limits for CO, CO₂, and all hydrocarbon peaks; this model is useful for air quality monitoring and other applications. A third option is a TCD-HID detector combination, for detection limits in

the 10ppm range for all analytes...the HID even sees hydrogen! Since we build each GC from the boards up, the Multiple Gas Analyzer #1 may be further customized to suit your application needs. With the optional built-in "whisper-quiet" air compressor, the Multiple Gas Analyzer #1 can be used with the SRI H₂-50 hydrogen generator to separate multiple gases anywhere, without using compressed gas cylinders!



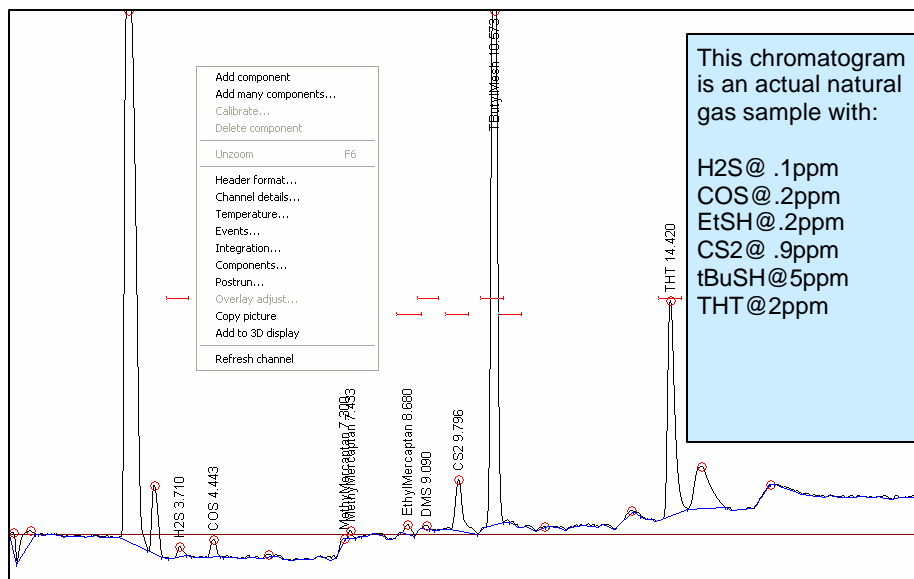
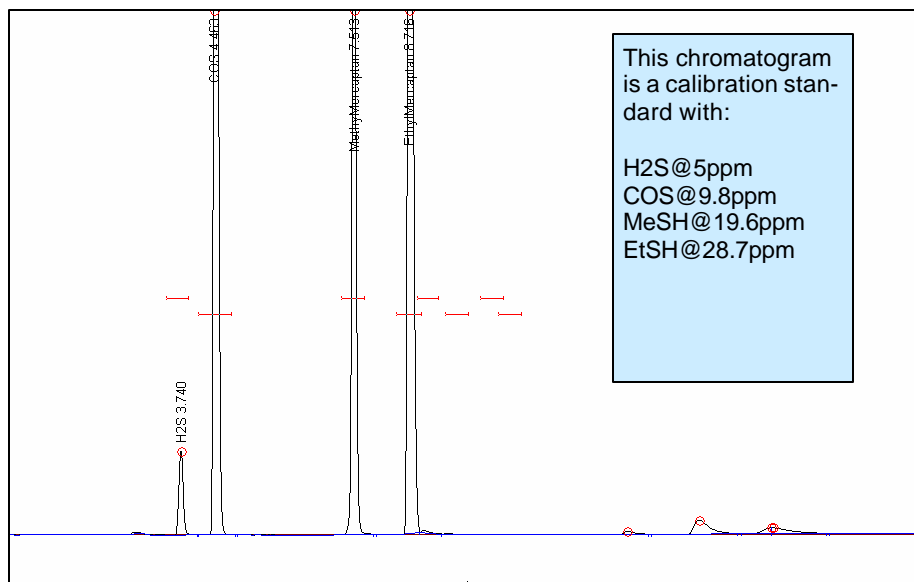
8610-0070	Multiple Gas Analyzer #1 GC with TCD detector	\$ 9,995.00
8610-0071	Multiple Gas Analyzer #1 GC with TCD, Methanizer, FID & built-in Air Compressor	\$13,995.00
8610-0072	Multiple Gas Analyzer #1 GC with TCD & HID detectors	\$14,495.00
8690-0070	Built-in Air Compressor, 120 VAC	\$ 595.00
8690-2270	Built-in Air Compressor, 220 VAC	\$ 695.00

Sulfur in Natural Gas GC System

For the laboratory or field portable

The SRI **Sulfur in Natural Gas GC System** uses two columns, a 60 meter MXT 1 and a 15 meter Rt-Q Plot and a unique stop flow solenoid valve to chromatographically separate the sulfur peaks from hydrocarbon interferences.

An FPD/FID detector is used to simultaneously measure the Sulfur compounds and also the Hydrocarbons. The operator can easily verify that the hydrocarbons do not interfere with the sulfur peaks (a common problem with other similar systems)



8610-6555 Sulfur in Natural Gas GC System \$17495.00
Includes: SRI 8610C GC with 6 channel USB data system, PeakSimple software, FPD/FID detector, two capillary columns, stop flow valve, 10 port gas sampling valve, heated valve oven, and built-in air compressor

SRI Instruments 20720 Earl St. Torrance CA 90503 USA
310-214-5092 fax 5097 www.srigc.com

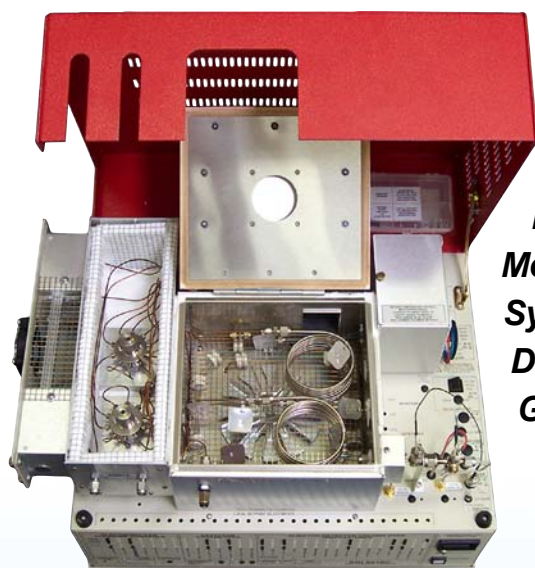


GC Innovations

TOGA GC System

for Transformer Oil Gas Analysis

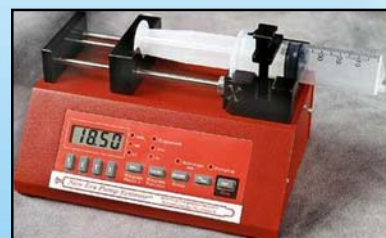
SRI now offers an affordable, field portable GC system for determining the type and quantity of gases dissolved in your transformer oil.



- HID and/or TCD Detectors**
- Built-in PeakSimple Data System**
- Molecular Sieve and Silica Gel packed Columns**
- Syringe Pump for Industry Standard 50mL Syringes**
- Dual 10-port Gas Sampling Valves**
- Gas Extraction Loop**

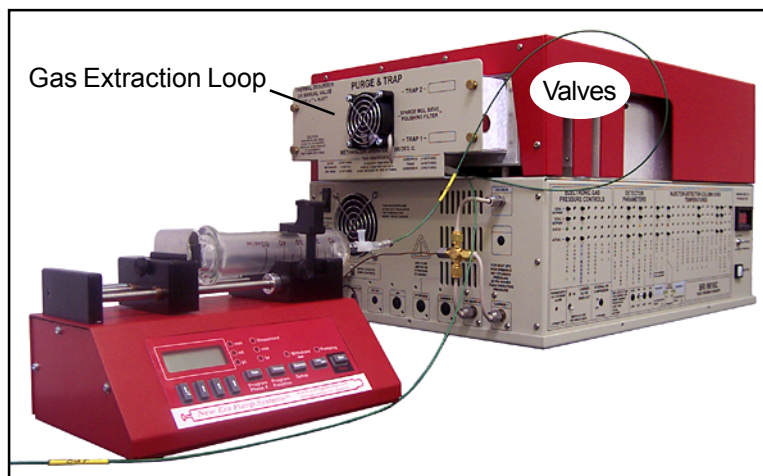
The TOGA GC may be equipped with an HID detector, TCD detector, or both. The HID and TCD detectors are universal, and can detect the entire spectrum of gases typically found dissolved in transformer oil: hydrogen, oxygen, nitrogen, methane, carbon monoxide, carbon dioxide, ethylene, ethane, and acetylene. For sub-ppm detection limits, choose the HID detector. The TCD can detect the target analytes down to 5-10ppm (except hydrogen). For a 1-100% detection range for all of the analytes listed, choose both detectors.

In the SRI TOGA GC, the transformer oil sample is injected by syringe pump through a unique gas extraction loop. The extracted gases are then injected into the carrier gas stream by the dual 10-port valve injection system. The syringe pump accepts standard 50mL syringes. This means the sample can be loaded into the syringe from the transformer, then into the syringe pump without ever being handled. This helps to protect the transformer oil sample from ambient contaminants.



Transformer Oil Gas Extraction and Injection

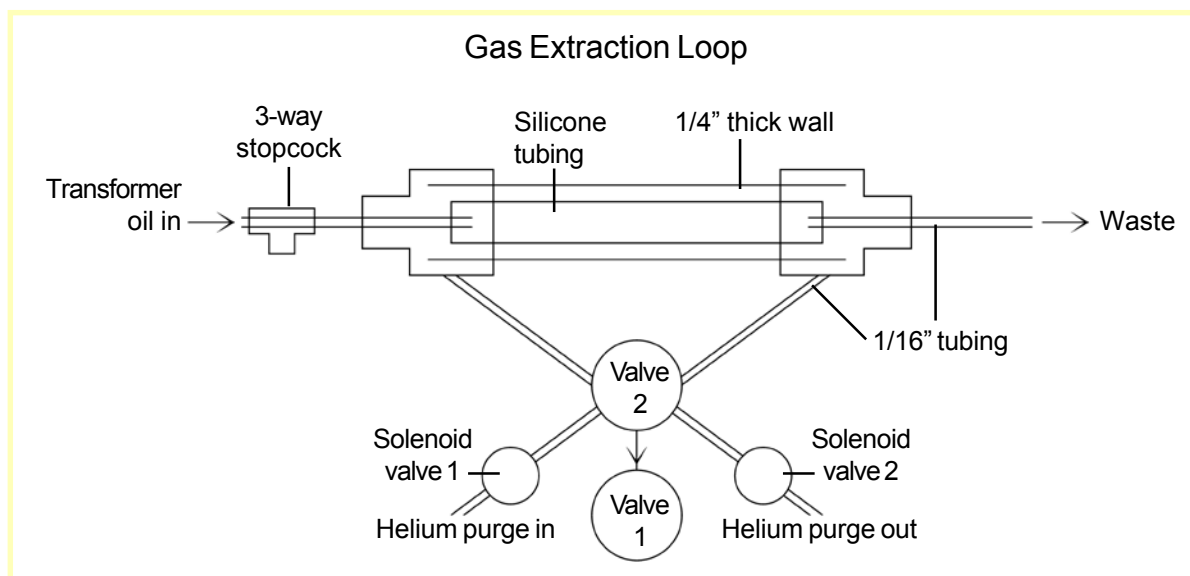
The SRI TOGA GC system uses a unique dual 10-port valve and gas extraction loop configuration for extracting and injecting dissolved transformer oil gases. Once the transformer oil-filled syringe is loaded into the pump, it is connected to the gas extraction and injection system.



Gas Extraction Loop



The syringe is connected to the gas extraction loop with PEEK tubing, through a three-way stopcock. The gas extraction loop consists of silicone tubing encapsulated in a trap (at left, shown from above). The silicone tubing is plumbed to the syringe (sample IN), the dual 10-port valves, and waste (sample OUT). When the transformer oil is pumped through the gas extraction loop, the dissolved gases in the transformer oil selectively permeate through the silicone membrane into the surrounding chamber.

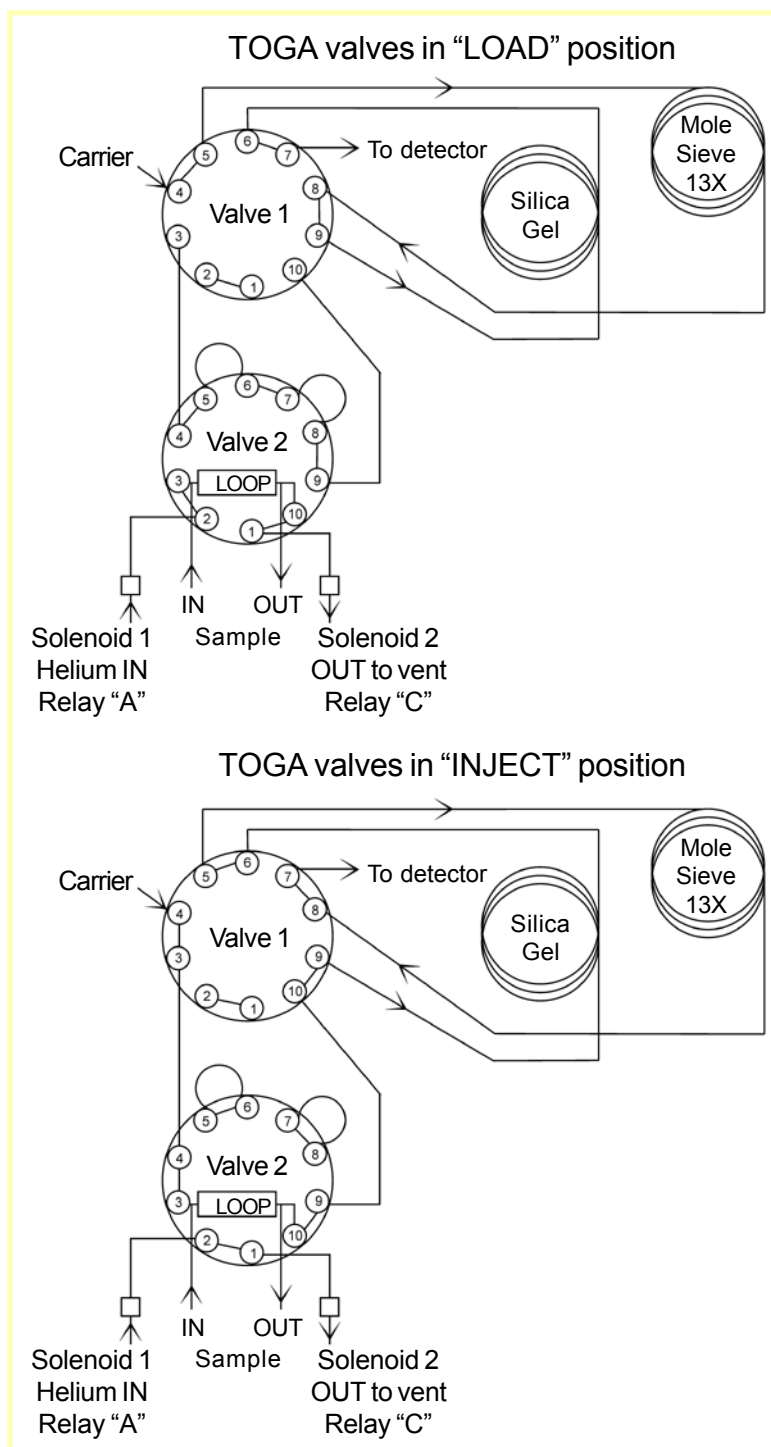
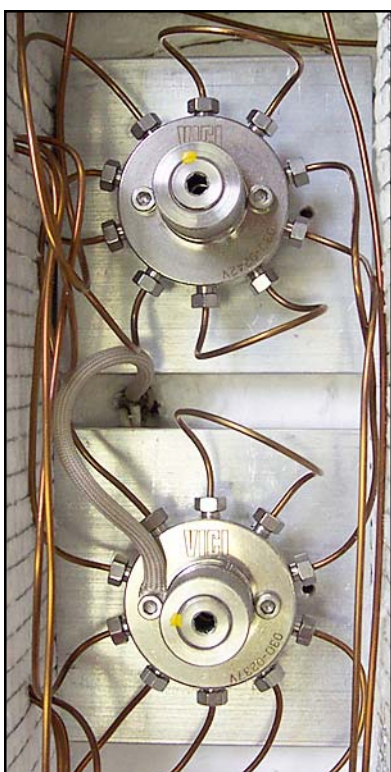


SRI TOGA GC System

Dual 10-port Valves

Two 10-port electrically actuated valves are plumbed to the gas extraction loop and columns. Valve #1 is plumbed to the MoleSieve 13X column, then the Silica Gel column. Valve #2 is plumbed to the gas extraction loop. Also plumbed to the 10-port valves are two solenoid valves for purging the gas extraction loop with helium between sample injections.

While the transformer oil is being pumped through the gas extraction loop, the valves are in the LOAD position, and both solenoid relays are ON. During this time, the dissolved gases in the transformer oil are extracted, and allowed to selectively permeate the silicone membrane. When the valves are switched to the INJECT position, the contents of the loop are swept into the MoleSieve 13X column, then on to the Silica Gel column.



SRI TOGA GC System

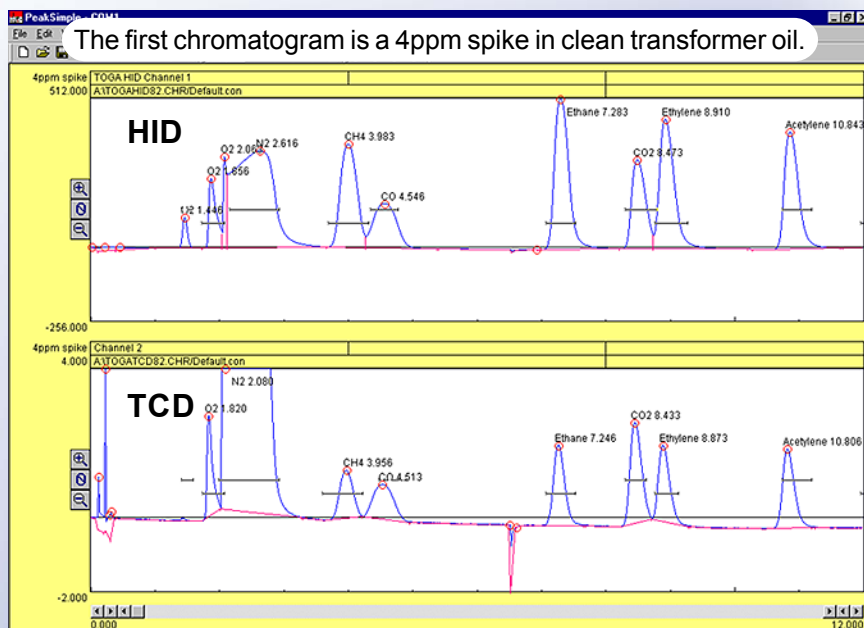
The following chromatograms are from an SRI TOGA GC System equipped with both HID and TCD detectors.

HID Results:

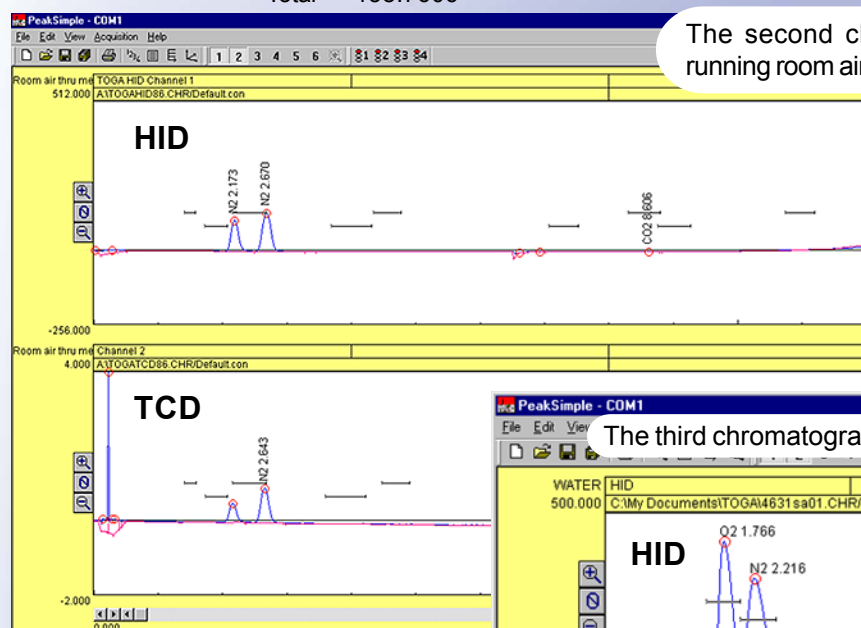
Component	Retention	Area
H2	1.446	495.7932
O2	1.856	1850.5721
N2	2.616	14360.5984
CH4	3.983	6094.0500
CO	4.546	3735.2072
Ethane	7.283	7749.7332
CO2	8.473	4392.9036
Ethylene	8.910	6908.3536
Acetylene	10.843	5935.2208
Total		51522.4321

TCD Results:

Component	Retention	Area
O2	1.820	14.9656
CH4	3.956	17.9312
CO	4.513	19.8740
Ethane	7.246	25.2856
CO2	8.433	31.5780
Ethylene	8.873	23.3550
Acetylene	10.806	25.7712
Total		158.7606



The second chromatogram is the result of running room air through the gas extraction loop.



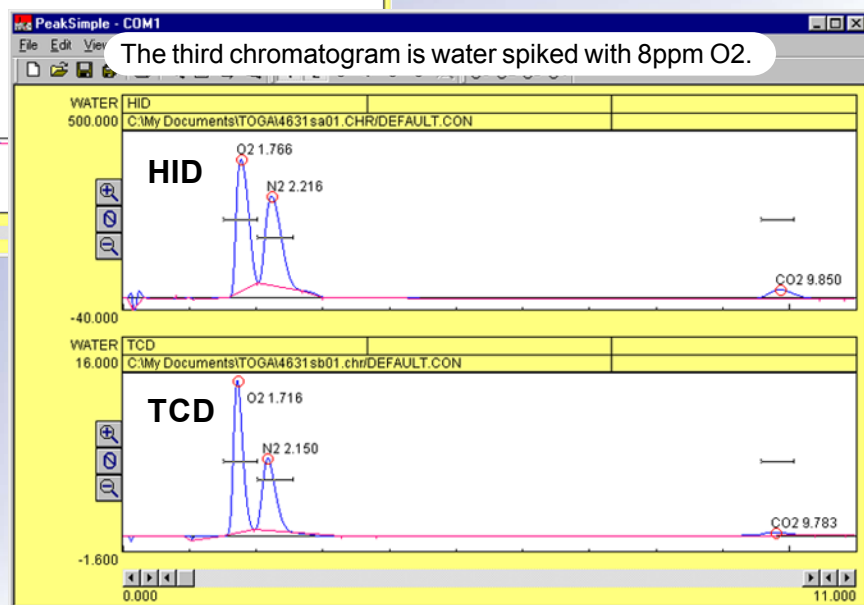
HID Results:

Component	Retention	Area
N2	2.670	1127.6346
CO2	8.606	10.0868
Total		1137.7214

TCD Results:

Component	Retention	Area
N2	2.643	7.4516

The third chromatogram is water spiked with 8ppm O2.



HID Results:

Component	Retention	Area
O2	1.766	4831.0175
N2	2.216	4365.0860
CO2	9.850	710.0270
Total		9906.1305

TCD Results:

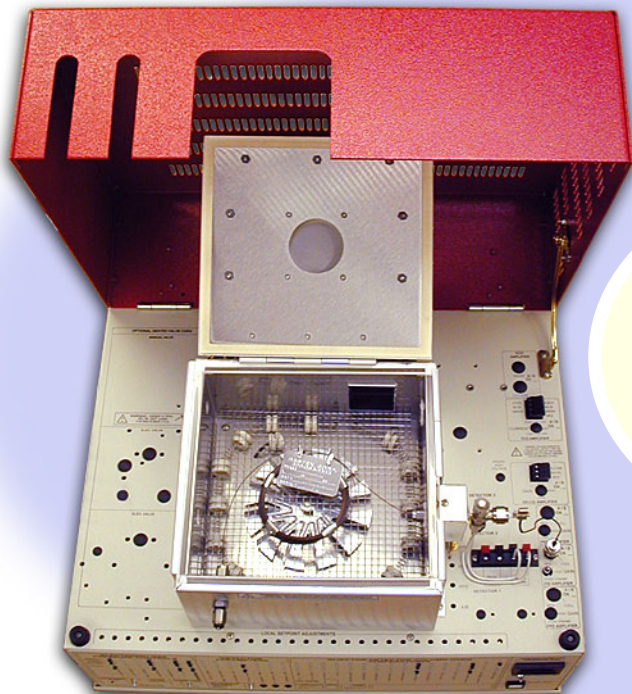
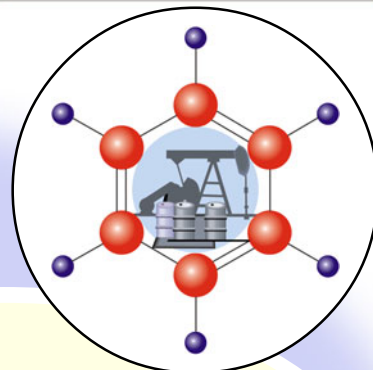
Component	Retention	Area
O2	1.716	142.2680
N2	2.150	94.0050
CO2	9.783	8.1520
Total		9906.1305

8610-0030	TOGA GC System with TCD Detector & 1 channel data system	\$ 15,995.00
8610-0031	TOGA GC System with HID Detector & 1 channel data system	\$ 17,495.00
8610-0032	TOGA GC System with TCD & HID Detectors, & 4 channel data system	\$ 19,995.00



GC Innovations

Capillary FID GC System



- FID detector
- 30 meter capillary column
- Built-in, "whisper quiet" air compressor
- On-column injector

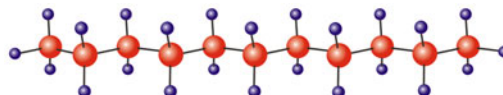
The Capillary FID GC system from SRI is a state-of-the-art, general purpose, temperature programmable gas chromatograph in a compact, low-cost package. The FID detector responds to all hydrocarbons. The 30 meter capillary column can efficiently separate hydrocarbons up to C_{40}^+ . In addition to a wide range of general gas chromatography applications, the Capillary FID GC is excellent for both environmental testing and quality control applications.



Use it to:

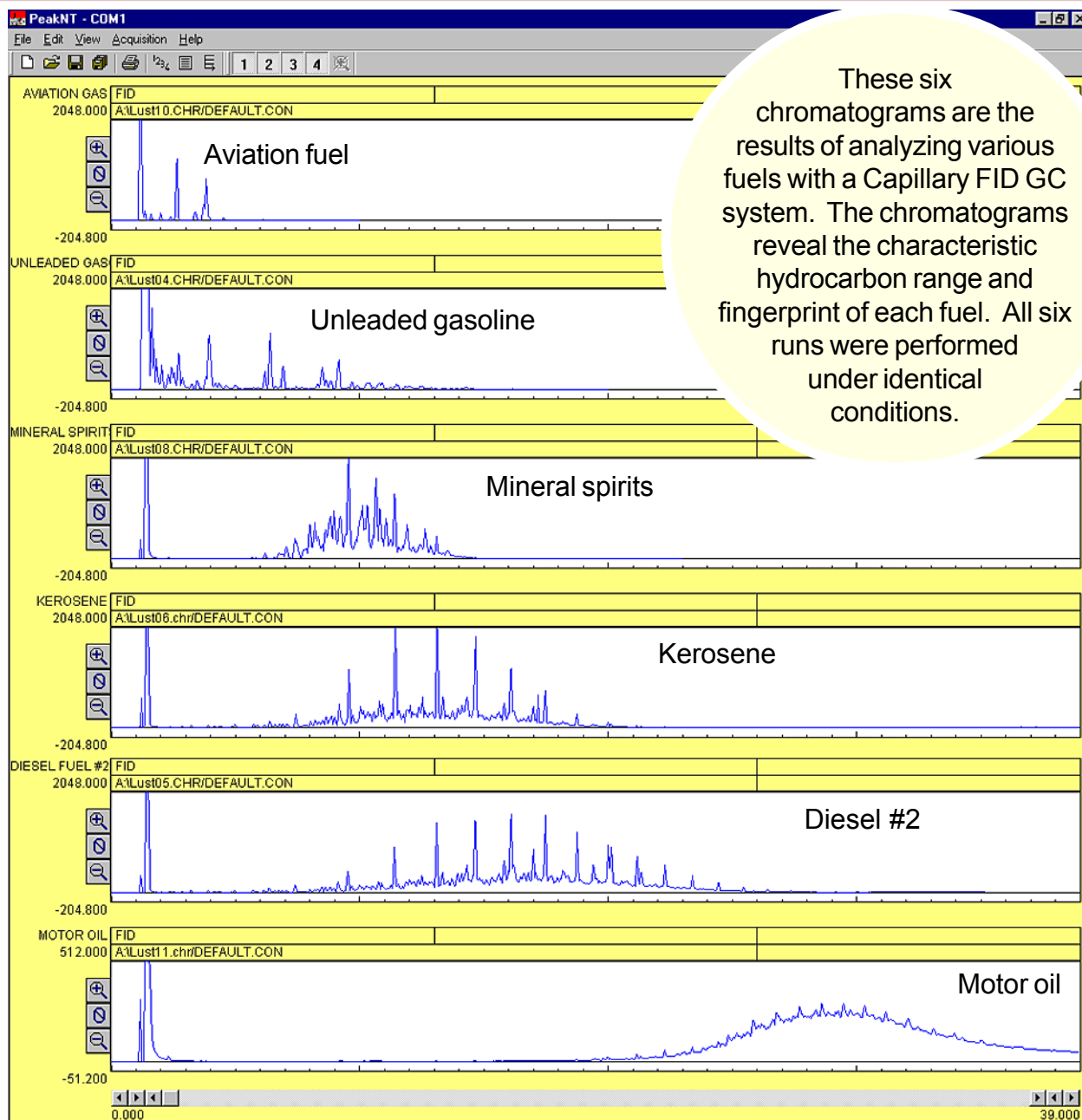
- Screen samples to identify the hydrocarbon range and calculate TPH concentrations
- Determine chemical composition and product purity

...and more!



LUST - Leaking Underground Storage Tanks account for the majority of gasoline contamination in groundwater and soils. This and other environmental problems, including illegal fuel dumping, necessitate the analysis of soils and groundwater for fuel pollution.

Capillary FID GC System



SRI's Capillary FID GC system includes everything you need to detect fuels and other hydrocarbon compounds, and is small enough to travel with you as airline baggage. It can be connected to our H₂-50 hydrogen generator for operation without gas cylinders. The H₂-50 supplies enough hydrogen for carrier gas and FID combustion gas, including enough to run a split/splitless injector for short periods.



H₂-50
Hydrogen
Generator

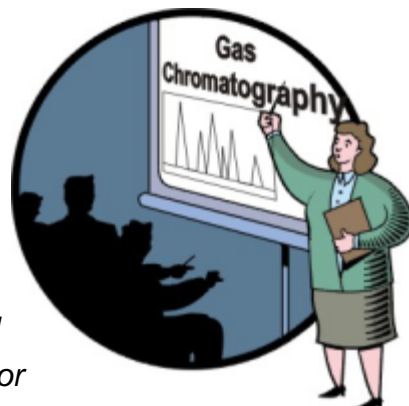
8610-5400	Capillary FID GC system	\$7,995.00
8690-0034	Split/splitless injector upgrade	\$1,495.00
8680-0350	H ₂ -50 Hydrogen Generator	\$2,295.00



GC Innovations

Gas-less™ Educational GC

Your curriculum requirements mandate GC acquisition, but your budget won't allow for conventional GC equipment, not to mention the recurring expense of compressed gas cylinders... and the lab bench space—where will you put it? The SRI Gas-less™



- ★ No gas cylinders required
- ★ Supplies its own air carrier
- ★ Bring GC into the classroom
- ★ Use it with any Windows PC

Educational GC is ideal for

undergraduate chemistry classes where the principles of gas chromatography are demonstrated on the same equipment students will encounter in industry. Its CCD detector responds to combustible molecules and can operate on air carrier gas from the built-in, whisper-quiet air compressor. Because this instrument operates on the infinite supply of ambient air, GC demonstrations can be performed right in the classroom, instead of the lab. No gas is required, just plug it in. The built-in PeakSimple data system is Windows

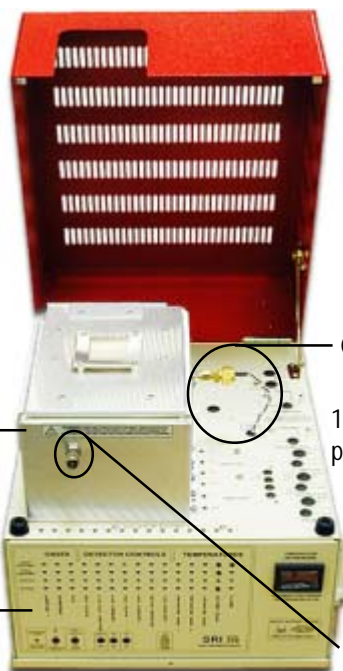
compatible (3x and up) and can be run on any PC, even that dusty old 386. This GC is configured on the compact 310 chassis, so it takes up a minimum of bench space.

Small footprint: 12.5"W x 14.5"D
and just 13.5" high with the lid down



Temperature programmable
Column Oven

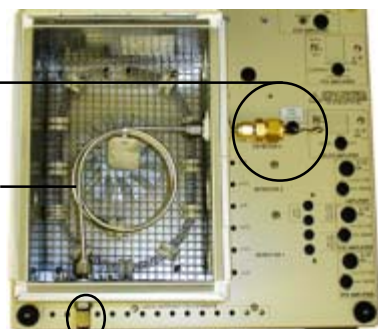
Easy-to-read display panel reports status
of system heating, pressure, and voltage
control zones at the touch of a button



CCD Detector

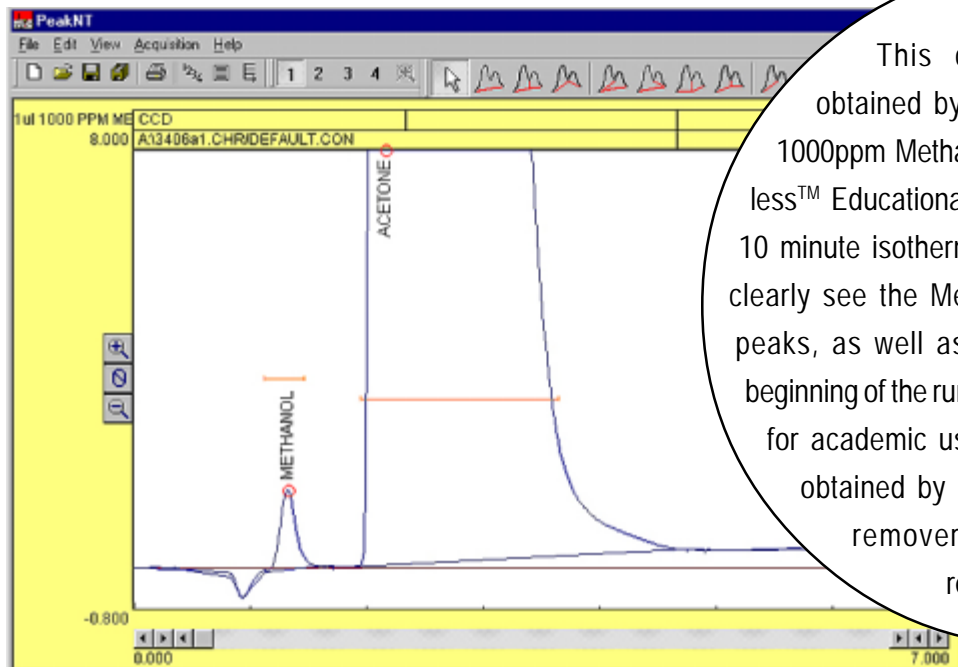
1m Hayesep-D
packed column

On-column injector



**Teach the principles of Gas Chromatography
without the expense & safety hazards of compressed gas cylinders**

Gas-less Educational GC



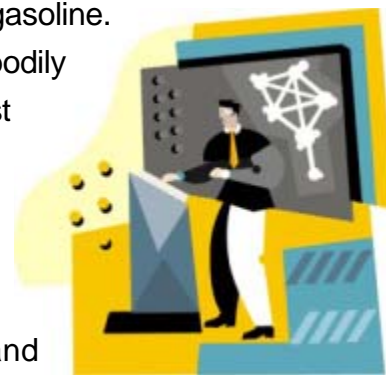
This chromatogram was obtained by a direct injection of 1 μ L 1000ppm Methanol / Acetone mix into a Gas-less™ Educational GC programmed to perform a 10 minute isothermal run at 130°C. Students can clearly see the Methanol and Acetone component peaks, as well as a negative water peak at the beginning of the run. Sample standards are available for academic use, but similar results may be obtained by running a finger nail polish remover sample--cheap and readily available!

The CCD detector responds to all hydrocarbons at a detection limit of 100ppm. Hayesep-D packed columns are useful for analyzing gases and low molecular weight compounds such as alcohols, aldehydes, and ketones. Inexpensive samples are available at grocery, drug, and convenience stores—try rubbing alcohol, fingernail polish remover, or gasoline.

Even student breath alcohol level can be measured, since alcohol is a bodily by-product of the livers' metabolism of sugars. With the optional fast cool-down fans, there's little wait between temperature programmed runs. The Gas-less™ Educational GC's CCD detector has a built-in spare filament, and an entire spare CCD detector is shipped with the instrument in the maintenance kit. The CCD filaments and

detectors are hand-changeable—quick and easy like everything else about this teaching

tool. The compact 310 GC chassis won't cramp your style, and should you wish to upgrade the unit in the future, it can be retrofitted with up to four detectors, and we have 14 to choose from. So don't just tell your students about gas chromatography, SHOW them with the Gas-less™ Educational GC. SRI makes educational gas chromatography affordable, portable, and simple.



0310-1006

Gas-less™ Educational CCD GC (includes fast cool-down fans)



The SRI Family of Educational GC Systems



CCD - Detects Hydrocarbons & Hydrogen

TCD - Detects all Compounds

FID - Detects all Hydrocarbons

310 chassis 12.5" W x 14.5" D x 12.5" H

Single Channel PeakSimple Data System

Temperature Programmable Column Oven

1-meter Packed Column

Your curriculum requires a GC, but your budget won't allow for expensive gas chromatography equipment... and the lab bench space—where will you put it? SRI Educational GC systems are ideal for undergraduate chemistry classes where the principles of gas chromatography are demonstrated on the same equipment students will encounter in industry. These GCs are configured on the compact 310 chassis, so they take up a minimum of bench space. Choose from three detector types: the Gas-less™ Catalytic Combustion Detector (CCD), Thermal Conductivity Detector (TCD), or Flame Ionization Detector (FID). Each SRI Educational GC includes a single channel, Windows™ based PeakSimple data system. The Gas-less™ CCD GC includes a one meter Hayesep-D packed column and a built-in, whisper-quiet air compressor which allows operation without external gas supplies. The TCD and FID Educational GCs include a one meter Silica Gel packed column, and Electronic Pressure Control (EPC).

Gas-less™ CCD

Catalytic Combustion Detector

- Hydrocarbon selectivity
- 100% to 500ppm sensitivity



TCD

Thermal Conductivity Detector

- Universal selectivity
- 100% to 200ppm sensitivity



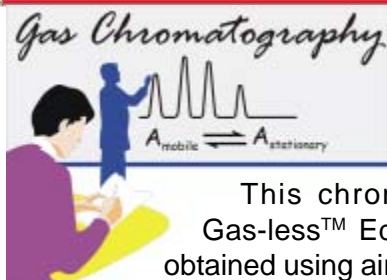
FID

Flame Ionization Detector

- Hydrocarbon selectivity
- 100% to 1ppm sensitivity

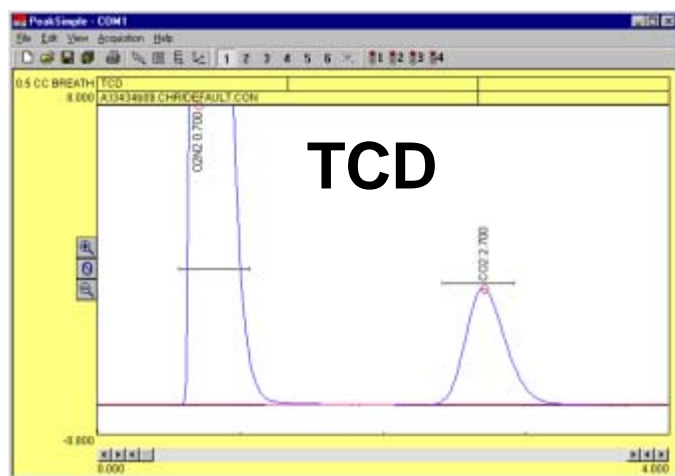
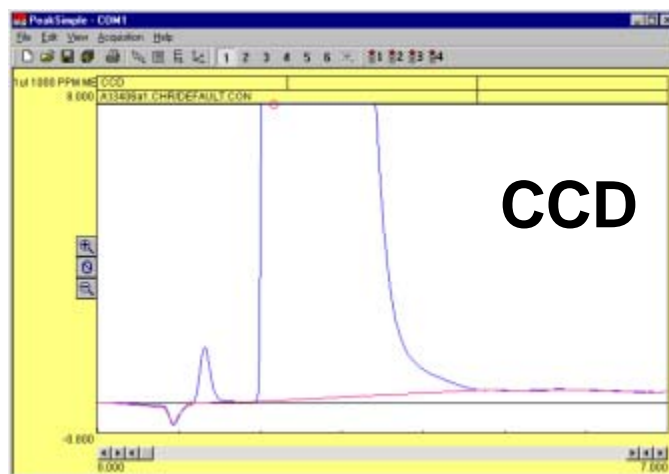


SRI Educational GC Systems



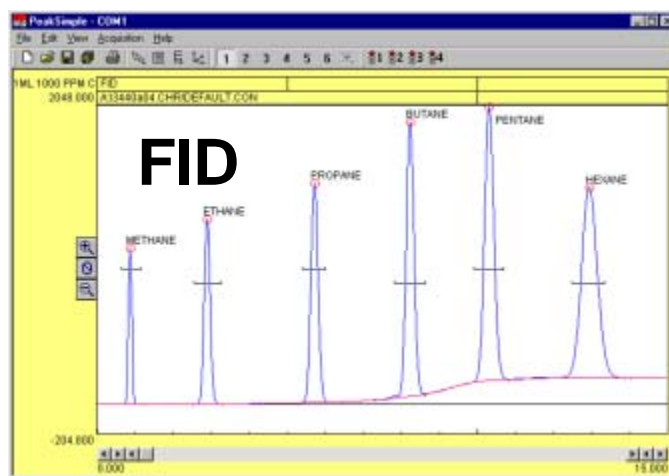
The following three chromatograms are examples of what you can do with an SRI educational GC system:

This chromatogram from a Gas-less™ Educational GC was obtained using air from the built-in air compressor as carrier gas and a direct injection of 1µL 1000ppm Methanol in Acetone mix. Students can clearly see the Methanol and Acetone component peaks, as well as a negative water peak at the beginning of the run. Sample standards are available, but similar results may be obtained by running a finger nail polish remover sample—cheap and readily available!



This chromatogram is from a direct injection of 0.5mL of human breath. The longer we hold our breath, the higher the CO₂ content. This was the result of a class experiment called "Waiting to Exhale," which is included in the manual. It is a contest to see who can blow the most CO₂. Participants merely exhale into a 3mL syringe, then inject 0.5mL into the on-column injector of an Educational TCD GC.

A 1mL sample of 1000ppm C₁-C₆ hydrocarbons was separated with an Educational FID GC to produce this chromatogram. The FID response is linear and reproducible. Stable from day to day, the FID is not susceptible to contamination from dirty samples or column bleed. The FID is the preferred detector for general hydrocarbon analysis.



- 0310-1005 Gas-less™ Educational CCD GC system
- 0310-0000 Educational TCD GC system
- 0310-0004 Educational FID GC system

Performing ASTM 6584 free and total glycerin in BioDiesel using an SRI Gas Chromatograph and PeakSimple software

Install a capillary column in the oven of the SRI GC. The ASTM method suggests a 12 meter .32mm id narrow-bore column coupled with a 2.5 meter guard column but permits the use of any column which exhibits acceptable resolution of the glyceride analytes. For ease of use, SRI prefers a 15 meter fused silica lined metal capillary column commonly called a wide-bore MXT column. The ideal column has a thin film (.1-.25 microns thick) and a temperature rating of 380C or higher)

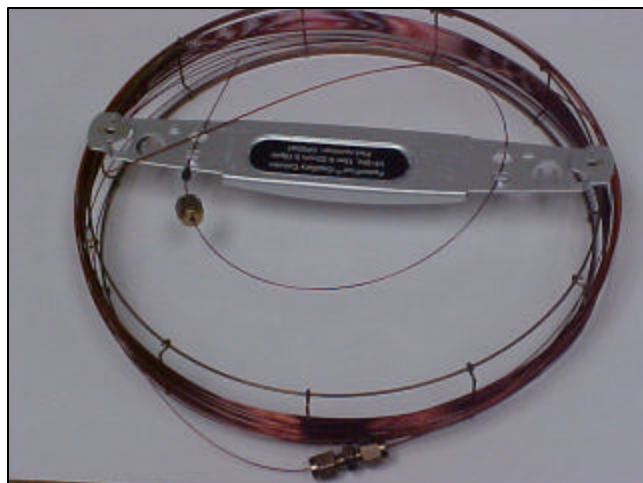
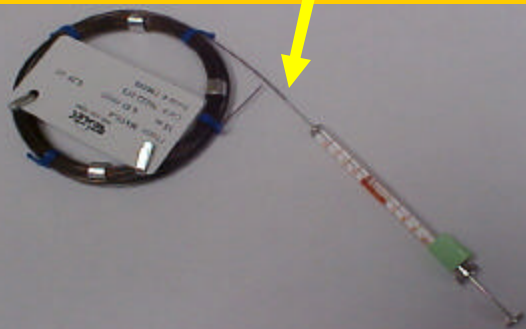
This type of column is **unbreakable** (unlike plain fused silica columns) and allows the injection syringe to deposit the sample directly into the bore of the column itself. This is important because heated or split/ splitless injectors can discriminate against high boiling analytes like triglycerides. The ASTM 6584 method specifies cool-on-column injection like that found as standard equipment on all SRI gas chromatographs to avoid boiling point discrimination.



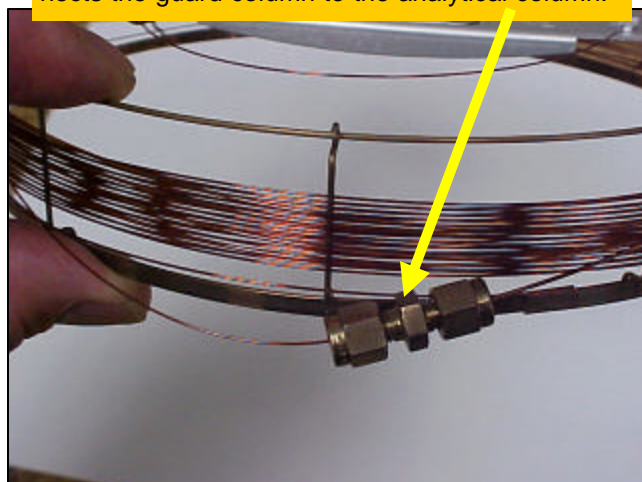
Restek fused silica lined stainless steel MXT
5 .53mm id capillary column coiled to 3.5 inches



The 26 ga. Syringe needle fits inside the .53mm column to accomplish a cool on-column injection as specified in the method.



Chrompack HT5 .32mm id fused silica coupled with 2.5 meter .53mm id guard column. A 1/16" stainless steel union with graphite ferrules connects the guard column to the analytical column.



Performing ASTM 6584 free and total glycerin in BioDiesel using an SRI Gas Chromatograph and PeakSimple software

Connect carrier gas, hydrogen and air to the GC. Helium is recommended as carrier gas, while the hydrogen and air are required for the FID (flame ionization detector) which is used to detect the sample molecules.



You can also use the optional SRI H2-40 hydrogen generator and "whisper quiet" built-in air compressor to provide all necessary gases without bulky gas cylinders

Note: Some pre-made calibration standards (Supelco 44918-U) are 10 times less concentrated, but the instructions specify adding 10 times more volume resulting in the same mass injected.

Prepare your calibration standards. You will need glycerin (500ppm), butanetriol (1000ppm), monoolien (10000ppm), tricaprln (8000ppm), diolien (5000ppm) and triolien (5000ppm) each dissolved in pyridine. You can buy these starting materials(stock solutions) from Supelco(part# 44898-U), Restek, or other sources. You will also need a derivitization reagent called MSTFA and Heptane (a common solvent).

The ASTM 6584 method specifies that for the highest calibration level (level 5), 100ul of each material (in pyridine) is added to a 10 ml vial along with 100ul of MSTFA. Allow 20 minutes for the reaction to occur, then add heptane to bring the final volume to 8ml.

The ASTM 6584 method describes making the calibration standards at 5 different levels, so the level 1 calibration standard is prepared using 10ul of each starting material instead of 100ul, but the procedure is otherwise the same.



You will need the starting materials plus MSTFA and Heptane. Some pyridine is also handy to have on hand.

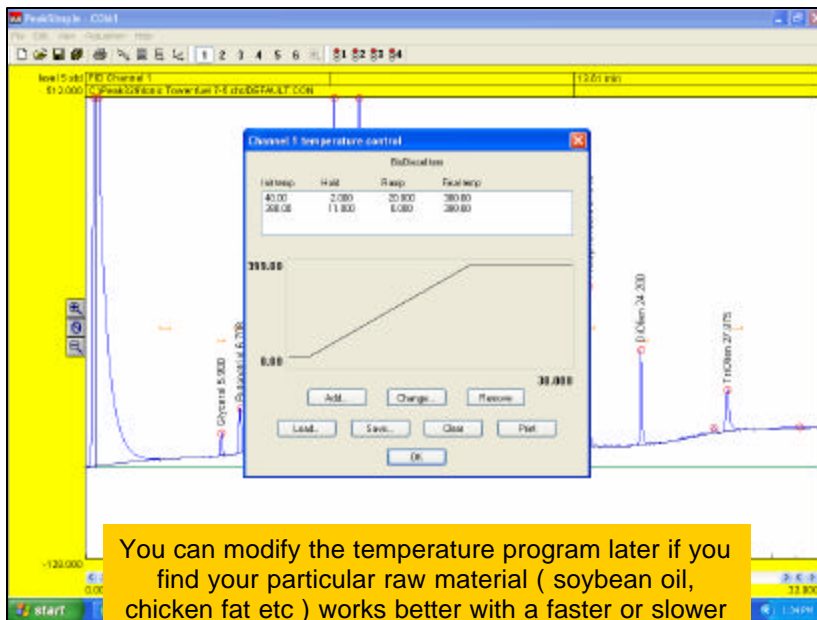


A 100ul syringe is helpful for making the dilutions along with vials, and pipets.

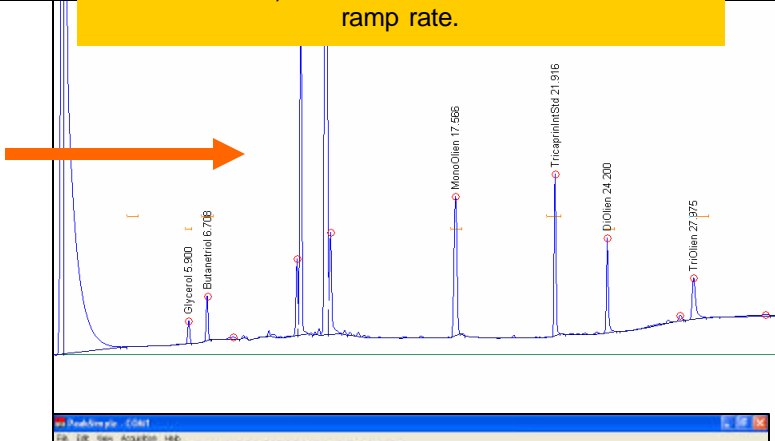
Performing ASTM 6584 free and total glycerin in BioDiesel using an SRI Gas Chromatograph and PeakSimple software

Set up a temperature program in the PeakSimple software (which comes free with every SRI GC) starting at 40 degrees, holding there for 2 minutes, then ramping at 20 degrees per minutes to 380 degrees, and holding there for 11 minutes. The ASTM 6584 method does not specifically recommend a temperature program so long as the peaks are well separated from each other and from any interfering peaks.

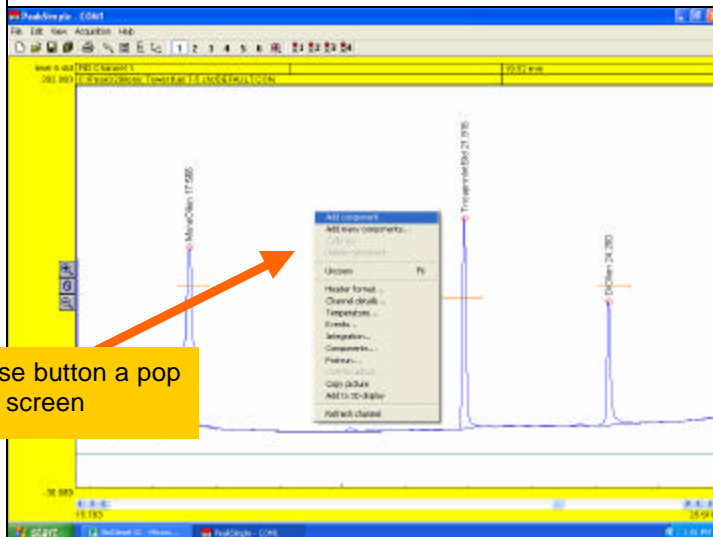
Inject each of the 5 calibration standards, saving the data file under a unique name each time
(level1cal.chr, level2 cal.chr etc).



A typical level 5 calibration is shown to the right.



Create a retention window for each of the 6 peaks by pointing to the peak with your mouse, clicking on the right hand mouse button and then left clicking on “add component”

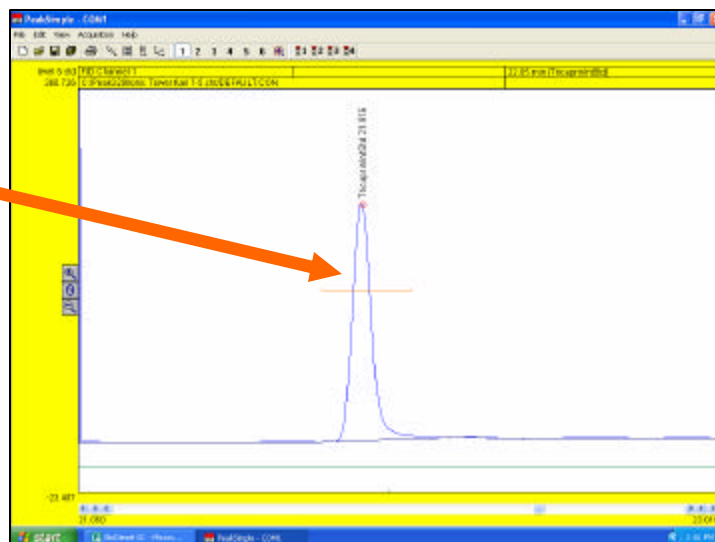


When you click the right hand mouse button a pop up window appears on the screen

Performing ASTM 6584 free and total glycerin in BioDiesel using an SRI Gas Chromatograph and PeakSimple software

Adjust the retention window (the red horizontal line which appears) so that it is centered on the peak. Adjust the width of the retention window so it is just a little wider than the peak. Grab the middle of the H-bar with your mouse to move the window side to side, or grab the vertical ends to narrow or widen the window.

Double click on the retention window or right click then select Edit Component. This brings up the Component Details screen shown at right.



Give each peak a different peak number.

Fill in the peak's name.

For the tricaprins and butanetriol internal standard peaks **ONLY**, enter the concentration in the stock solution. This is how PeakSimple knows the concentration of the internal standards.

Enter the units you prefer to calibrate in (ppm or percent). *Note: one million ppm=100%, 100,000ppm=10%, 10,000ppm=1%, 1000ppm=.1%, 100ppm=.01%, 10ppm=.001%, 1ppm=.0001%.*

Select the largest peak only radio button so PeakSimple finds the largest peak in the window as tricaprins, not a small noise peak

Don't fill in any of the other fields in this screen at this time

Performing ASTM 6584 free and total glycerin in BioDiesel using an SRI Gas Chromatograph and PeakSimple software

Do the same thing for the other internal standard peak, Butanetriol.

Make sure to use a different peak number.

Enter the concentration in the stock solution (1000ppm)

Then do the same thing for the 4 remaining peaks, Glycerin (the free glycerin), monolien, diolien and triolien.

Use a different number for each peak.

Glycerol is the same thing as glycerin, you can use either name.

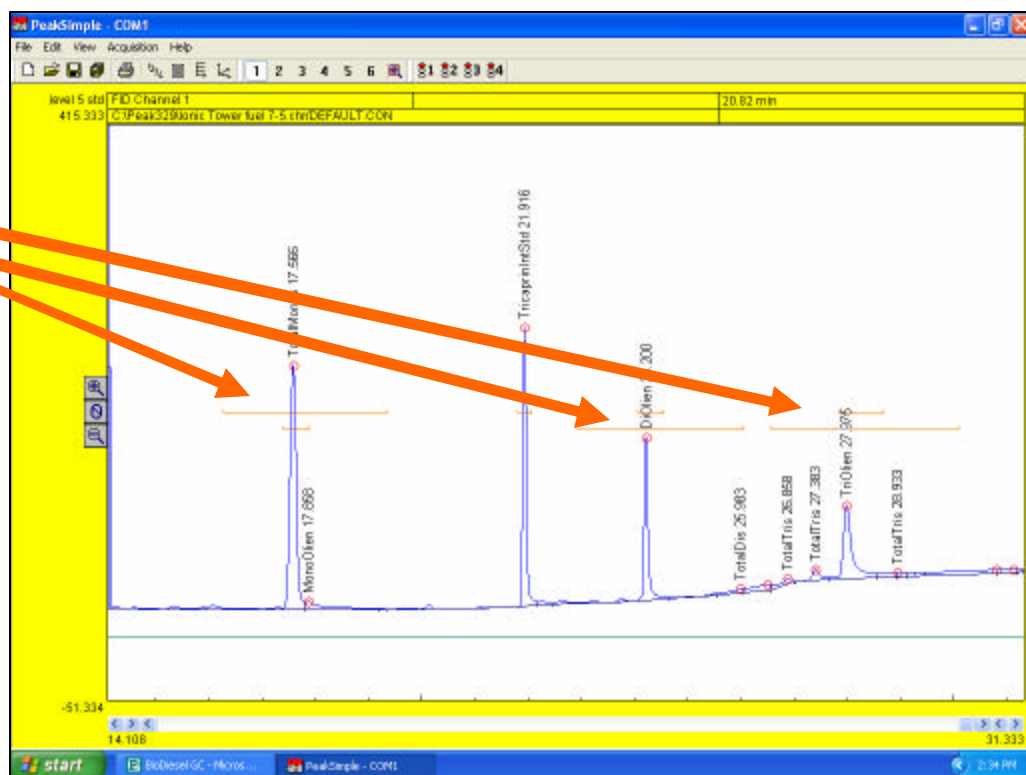
Do **NOT** enter a number in the Internal Standard box, because this peak is **NOT** an internal standard peak.

Enter the peak number of the Butanetriol internal standard. This is how PeakSimple knows to use Butanetriol as the internal standard for Glycerol.

Do the same thing for the monolien, diolien and triolien peaks EXCEPT use the peak number of tricaprinn since tricaprinn is the internal standard for mono, di and triolien.

Performing ASTM 6584 free and total glycerin in BioDiesel using an SRI Gas Chromatograph and PeakSimple software

Create three additional retention windows called Total MonoGlycerides, Total DiGlycerides, and Total Triglycerides. These windows should be wider than the monoolein, diolein and triolein and should overlap the individual calibration compounds. The function of the Total Mono, Di and Tri windows will be to sum up all the mono, di and tri glycerides to arrive at an answer for total bound glycerin.



Enter the peak number for tricaprin since we are still using tricaprin as the internal standard for the Total windows.

Component details

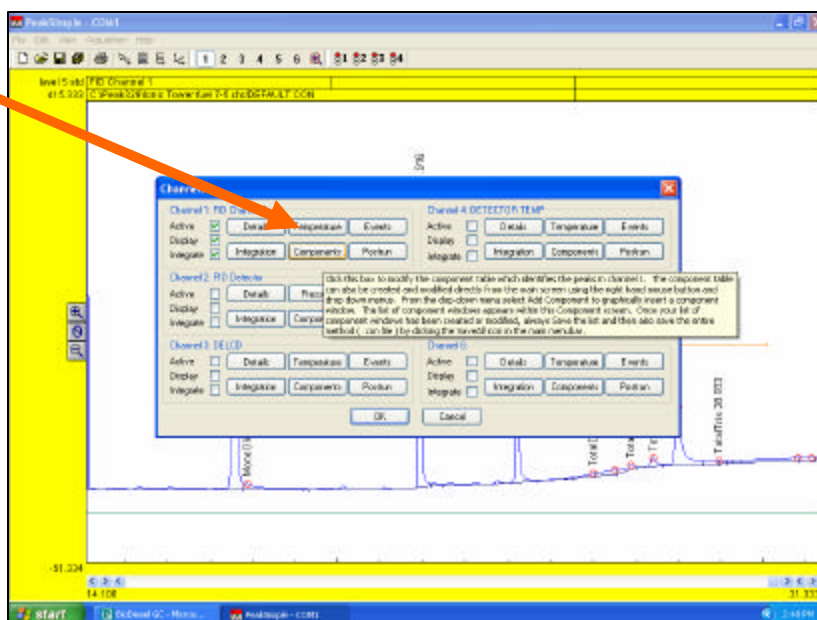
Peak number: 50
 Peak name: TotalMonos
 Start: 16.27 End: 19.34 Expected: 0.00
 Internal standard: 0.000 Units: ppm
 Internal standard peak: 4 Ref peak: 0
 In case of multiple peaks:
☐ Show each peak separately
☐ Show first peak only
☐ Show last peak only
☐ Show largest peak only
☒ Show total of all peaks
 Measure peak:
☒ Area
☐ Height
 Alarms...
 Multiplication factor: .2591
☐ Calculate area as time-slice
 OK Cancel

Select the radio button labeled Show total of all peaks.

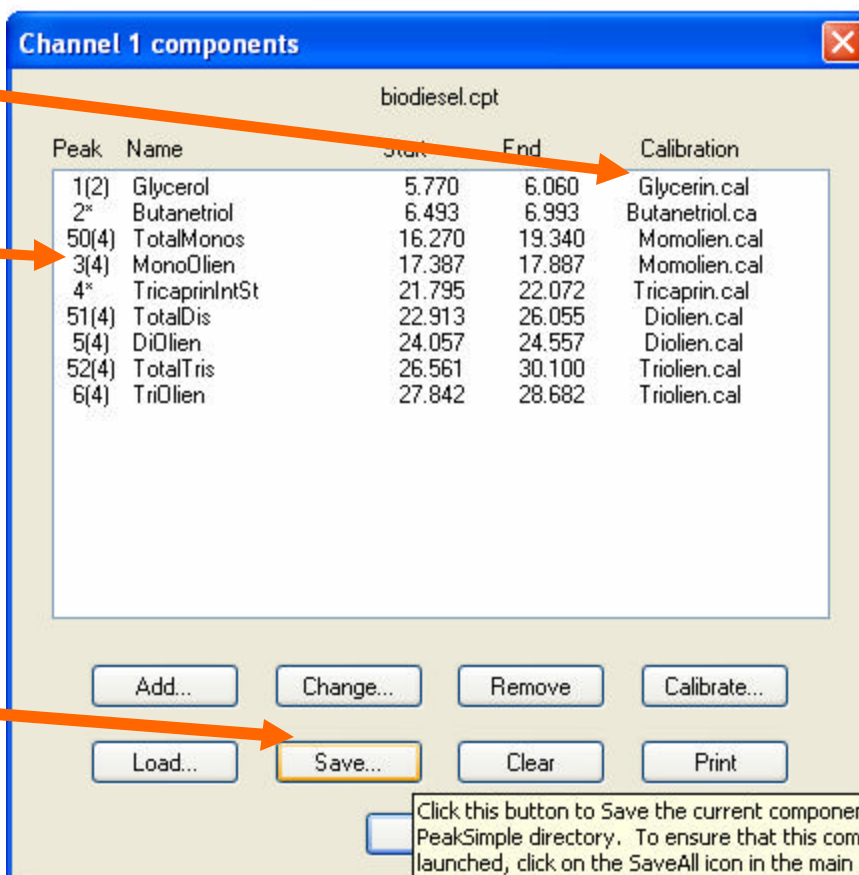
Enter the factor specified in the ASTM 6584 method. Monoglycerides=.2591
 Diglycerides=.1488 Triglycerides=.1044
 This factor accounts for the percentage of the molecule which is bound glycerin.

Performing ASTM 6584 free and total glycerin in BioDiesel using an SRI Gas Chromatograph and PeakSimple software

Navigate to the Component screen for Channel 1.



The Component screen should look like the one to the right except that the names of the calibration curves for each component will not yet have been entered.



Notice that the peak number is followed by a number in parentheses.

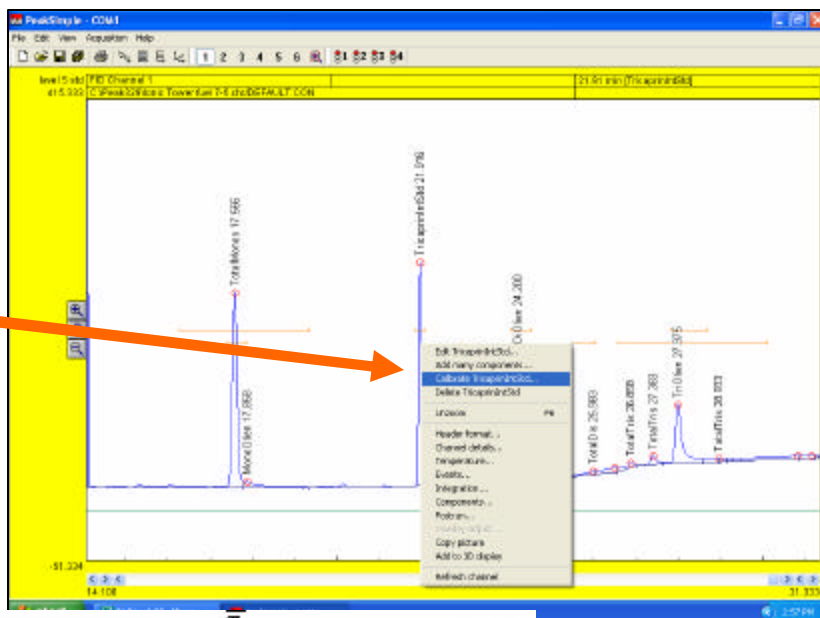
The number in parentheses indicates which peak is the internal standard. So Monolien which is peak#3 uses tricaprin (peak#4) as its internal standard. Glycerol which is peak#1 uses butanetriol (peak#2) as its internal standard.

Save the Component table so you don't have to enter this information over again.

Performing ASTM 6584 free and total glycerin in BioDiesel using an SRI Gas Chromatograph and PeakSimple software

Now that all the components have been identified they can be calibrated. Point to each of the 6 peaks plus 3 Totals peaks and go through the following sequence for each peak in turn.

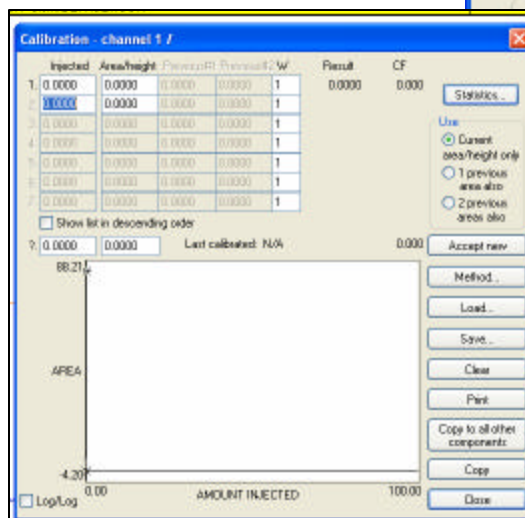
Point to the peak and click on the right hand mouse button. This brings up a menu from which you select "calibrate component" (calibrate glycerol for example).



Since no calibration curve currently exists, PeakSimple asks if you want to copy a template curve. This is a convenience when calibrating many peaks, but for now just say NO.

The next screen asks for the calibration level. Select level 1.

This takes you to a blank calibration curve screen.

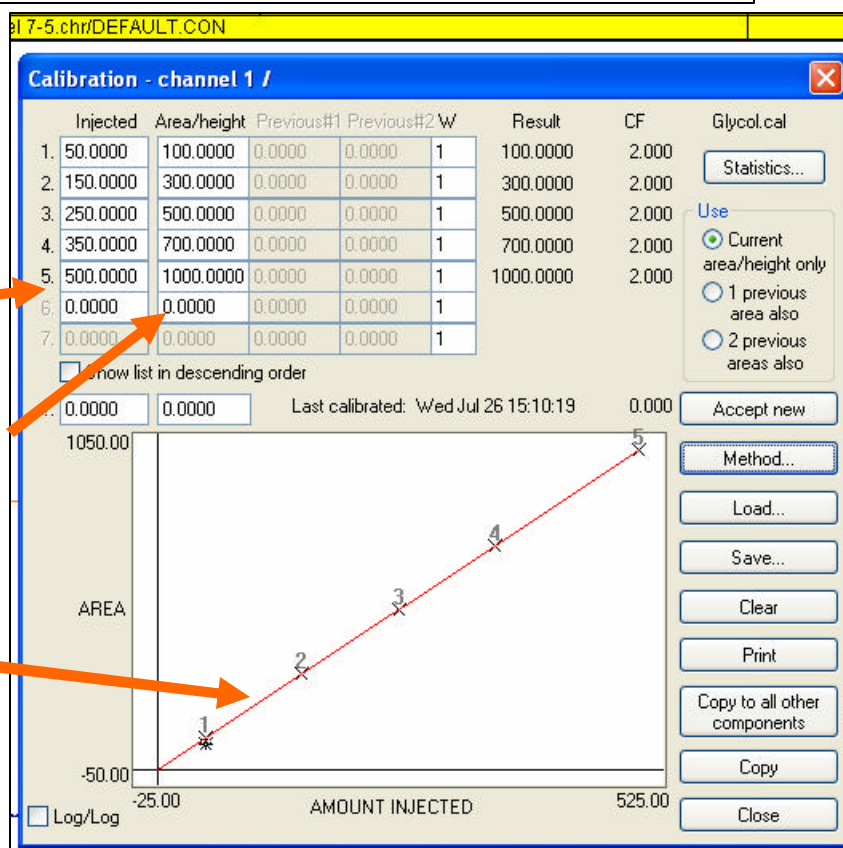


Performing ASTM 6584 free and total glycerin in BioDiesel using an SRI Gas Chromatograph and PeakSimple software

For Glycerin, the 5 point curve corresponds to 50, 150, 250, 350 and 500ppm injected. Enter these numbers in the Injected column of the spreadsheet .

In the Area/Height column enter the area reported for the Glycerin peak for each of the five levels. Take this data from the printout for each of the calibration runs previously performed.

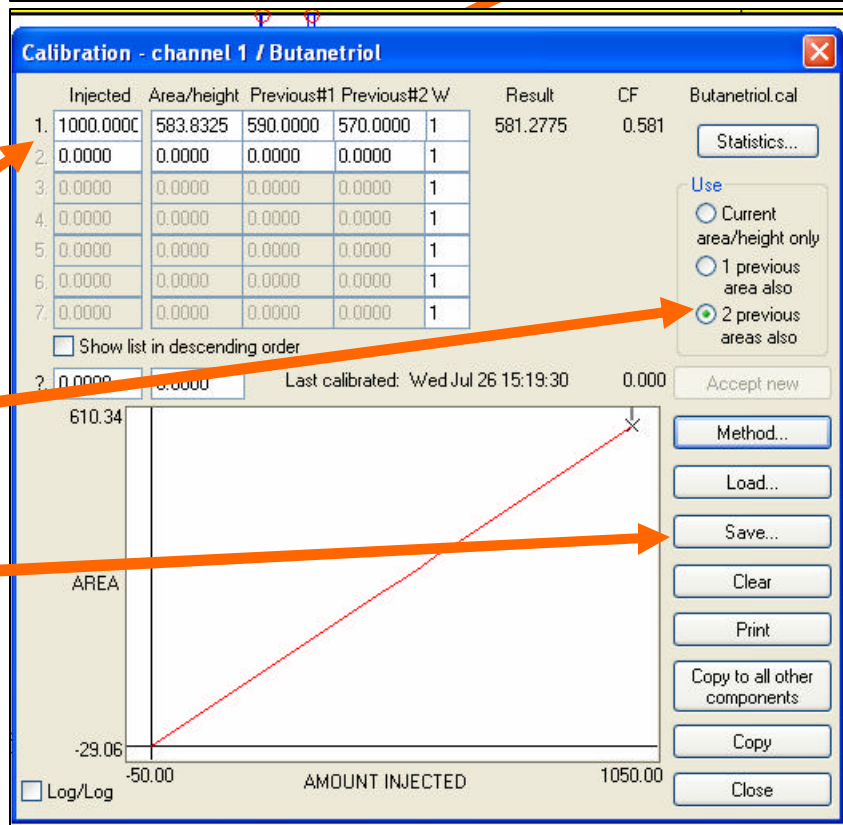
This should result in a relatively straight line calibration curve using a single line best fit .



The Butanetriol curve is only a single point since the Butanetriol internal standard is always present at the same amount (1000ppm) regardless of whether you inject a level 1,2,3,4,5 standard or the unknown Biodiesel itself.

You can average up to 3 injections by clicking the "use 2 previous areas also" button.

Don't forget to save the curves using a unique name for each one



Performing ASTM 6584 free and total glycerin in BioDiesel using an SRI Gas Chromatograph and PeakSimple software

Once all the peaks are calibrated, the component table should look like the one to the right. Notice that the Total Mono, Total Di, and Total Tri components use the same calibration curves as the individual Mono, Di and Triolien peaks. This makes sense because these compounds are chosen in the ASTM 6584 method to be representative of the range of glyceride compounds which may be found in actual samples.

Channel 1 components

biodiesel.cpt

Peak	Name	Start	End	Calibration
1(2)	Glycerol	5.770	6.060	Glycerin.cal
2*	Butanetriol	6.493	6.993	Butanetriol.ca
50(4)	TotalMonos	16.270	19.340	Momolien.cal
3(4)	MonoOlien	17.387	17.887	Momolien.cal
4*	TricaprinIntStd	21.795	22.072	Tricaprin.cal
51(4)	TotalDis	22.513	26.055	Diolien.cal
5(4)	DiOlien	24.057	24.557	Diolien.cal
0		26.691	27.191	Glycol.cal
52(4)	TotalTris	27.419	30.100	Triolien.cal
6(4)	TriOlien	27.842	28.682	Triolien.cal

Buttons: Add... Change... Remove Calibrate... Load... Save... Clear Print

Click this button to Clear (erase) the current component table was previously saved, it

Navigate to the Results screen and verify that the results look like the screen to the right. (for a level 5 calibration standard) Notice that the internal standard result for the Total Mono, Di and Tri is adjusted by the factor (.2591, .1488 and .1044 respectively)

Results

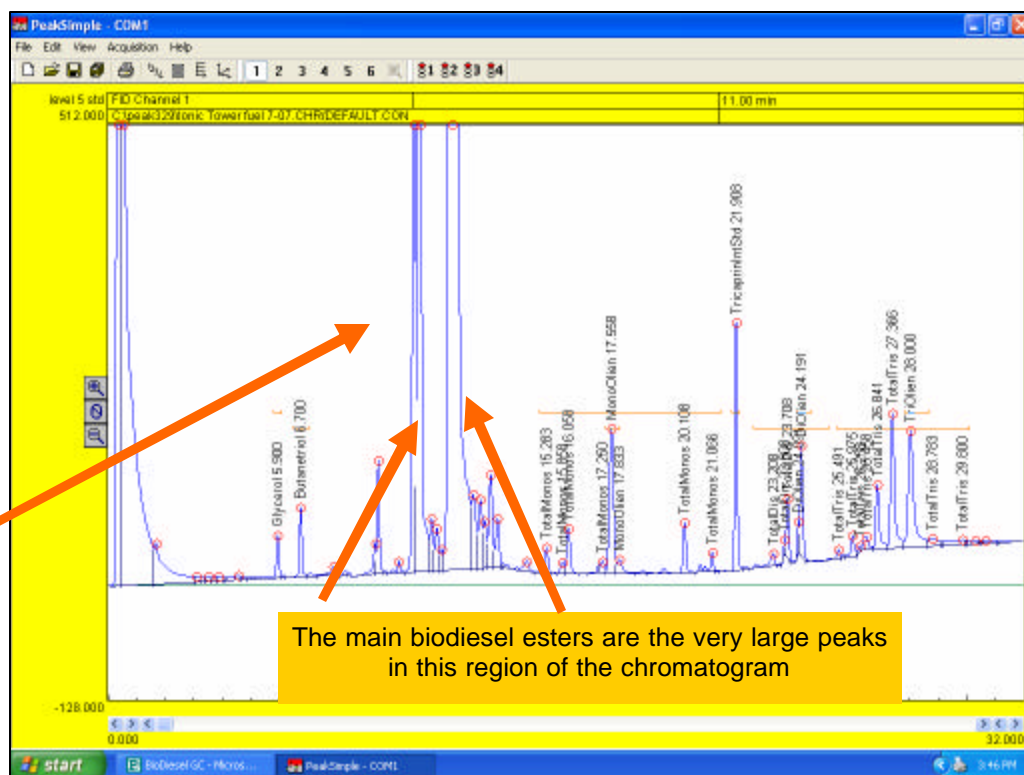
Component	Retention	Area	External	Internal	Units	Width 50%
Glycerol	5.900	579.3100	500.0000	500.0000	ppm	5.1
Butanetriol	6.708	583.8325	1000.0000	1000.0000	ppm	4.1
TotalMonos	17.566	1631.6295	10000.0000	2591.0000	ppm	7.1
MonoOlien	17.566	1496.0330	10000.0000	10000.0000	ppm	4.1
TricaprinIntStd	21.916	930.6765	8000.0000	8000.0000	ppm	4.1
DiOlien	24.200	618.2795	5000.0000	5000.0000	ppm	4.1
TotalDis	25.983	681.8742	5000.0000	744.0000	ppm	365.1
TriOlien	27.975	677.5303	5000.0000	5000.0000	ppm	8.1
TotalTris	28.933	754.1382	5000.0000	522.0000	ppm	247.1
		7953.3027	15500.0000	33357.0000		

Channel: 1 Update Save... Integration... Format...
☒ Recognized peaks only
☐ Undetected components also
 Close Calibrate... Calibrate all... Copy
 Copy results log Clear results log Show results log... Add to results log

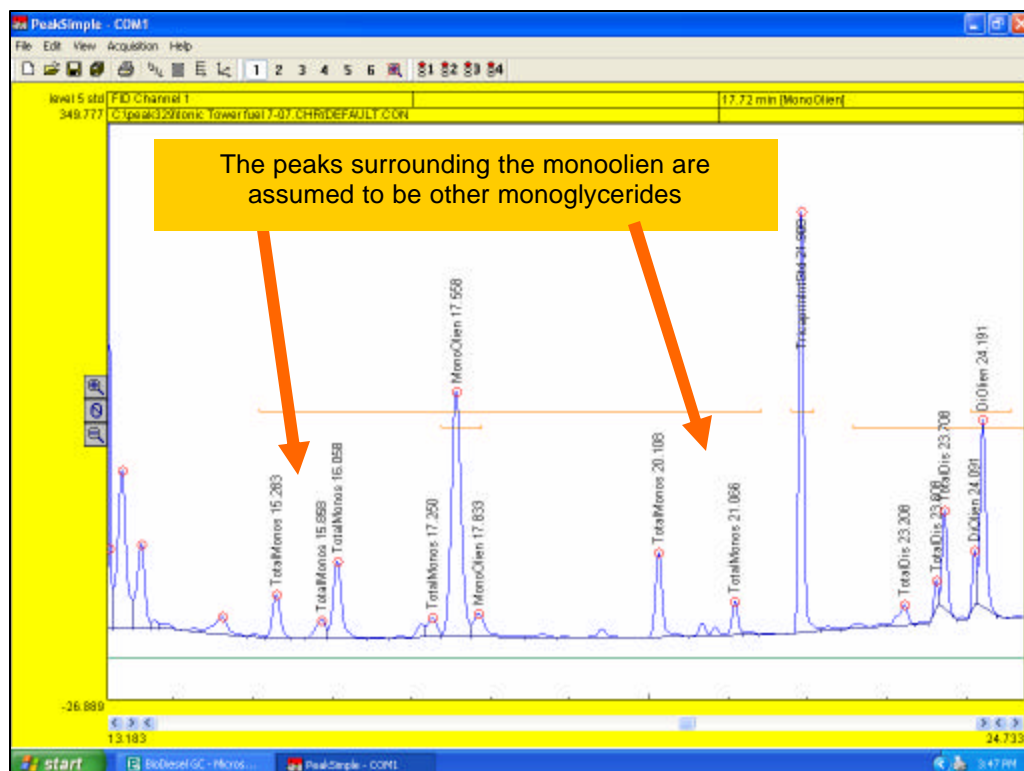
Performing ASTM 6584 free and total glycerin in BioDiesel using an SRI Gas Chromatograph and PeakSimple software

Now that the system is calibrated, prepare an actual BioDiesel sample by placing 100ul of BioDiesel, 100ul of Tricaprin in pyridine, 100ul of Butanetriol in pyridine, and 100ul of MSTFA in a vial. Allow 20 minutes for the reaction then dilute to 8ml with heptane.

Inject 1ul to generate a chromatogram similar to the one at the right



Zoom in to the region surrounding the mono, di and triolien. Stretch the total mono, di and tri component window so it includes the small peaks surrounding the monoolien, diolien and triolien. The ASTM 6584 method does not precisely define which peaks to include or exclude, so there is some judgement required on the part of the operator.



Performing ASTM 6584 free and total glycerin in BioDiesel using an SRI Gas Chromatograph and PeakSimple software

The Results screen now displays the calculated results for the Bio-diesel sample. The result for Glycerol is the free glycerin and the sum of the Total Mono, Total Di and Total Tris are the bound glycerin.

Results

Component	Retention	Area	External	Internal	Units	Width 50%
Glycerol	5.900	217.1280	187.4023	294.3225	ppm	4.5
Butanetriol	6.700	371.7403	636.7241	1000.0000	ppm	4.5
TotalMonos	15.283	2694.7415	16515.6459	3565.3478	ppm	6.5
MonoOlien	17.558	1360.4480	9093.7031	7579.6184	ppm	8.5
TricaprinIntStd	21.908	1116.5860	9598.0590	8000.0000	ppm	4.5
TotalDis	23.208	1157.9355	8490.8288	1054.4911	ppm	7.5
DiOlien	24.191	586.3480	4741.7713	3952.2752	ppm	4.5
TotalTris	25.491	4300.5072	28512.7246	2481.1087	ppm	5.5
TriOlien	28.000	1618.0280	11940.6329	9952.5397	ppm	10.5
		13423.4625	89717.4921	37879.7033		

Channel: 1

☒ Recognized peaks only

☐ Undetected components also

Click the Copy button, then Paste the Results into Excel for further calculations or to produce a report for your client

Microsoft Excel - Book1

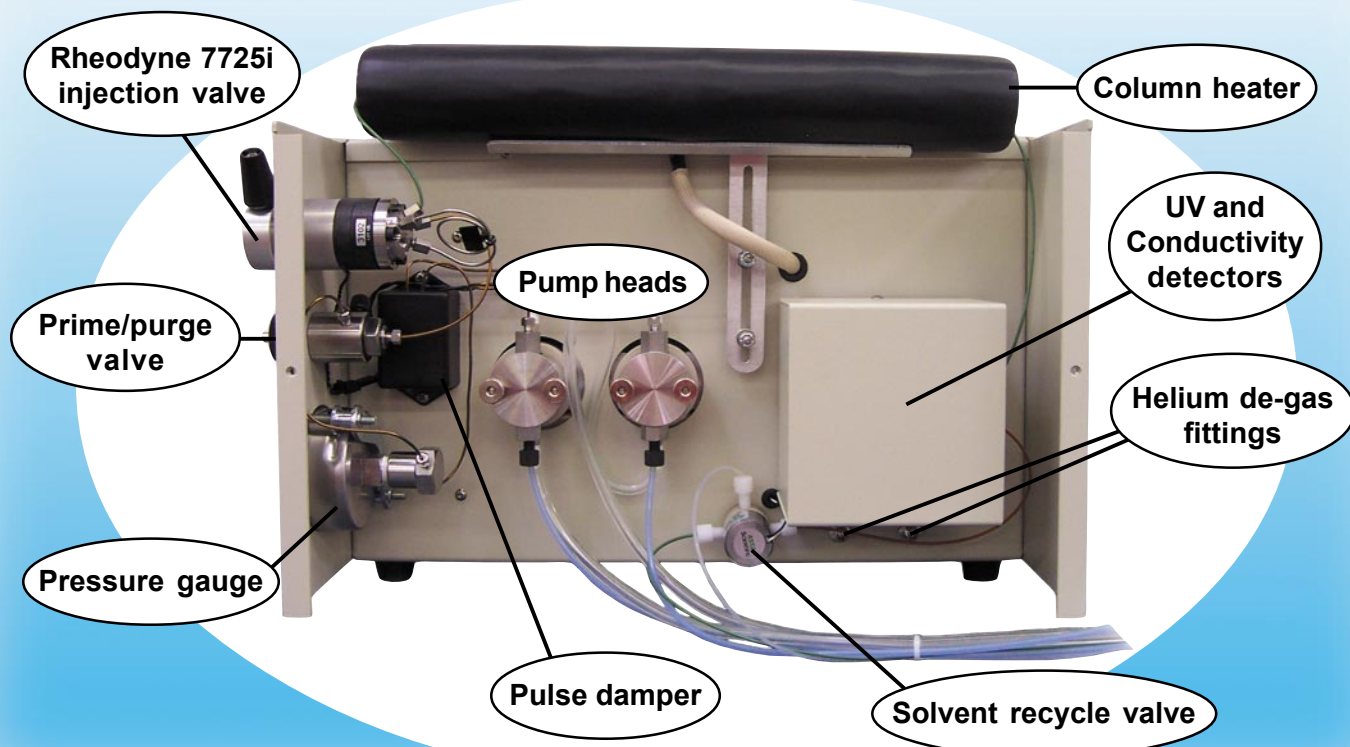
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	Component	Retention	Area	External	Internal	Units	Width 50%	Area%	Wt%						
2	Glycerol	5.9	217.128	187.4023	294.3225	ppm	4.5								
3	Butanetriol	6.7	371.7403	636.7241	1000.0000	ppm	4.5								
4	TotalMonos	15.283	2694.742	16515.65	3565.348	ppm	6.5		1.18						
5	MonoOlien	17.558	1360.448	9093.703	7579.618	ppm	8.5		1.07						
6	TricaprinIntStd	21.908	1116.586	9598.059	8000.000	ppm	4.5		1						
7	TotalDis	23.208	1157.936	8490.829	1054.491	ppm	7.5		0.6						
8	DiOlien	24.191	586.348	4741.771	3952.275	ppm	4.5		0.29						
9	TotalTris	25.491	4300.507	28512.72	2481.109	ppm	5.5		64.83						
10	TriOlien	28.000	1618.028	11940.63	9952.54	ppm	10.5		2.19						



GC-LC Innovations

Model 210D HPLC System

A complete system including PeakSimple Data System in one compact, rugged chassis!

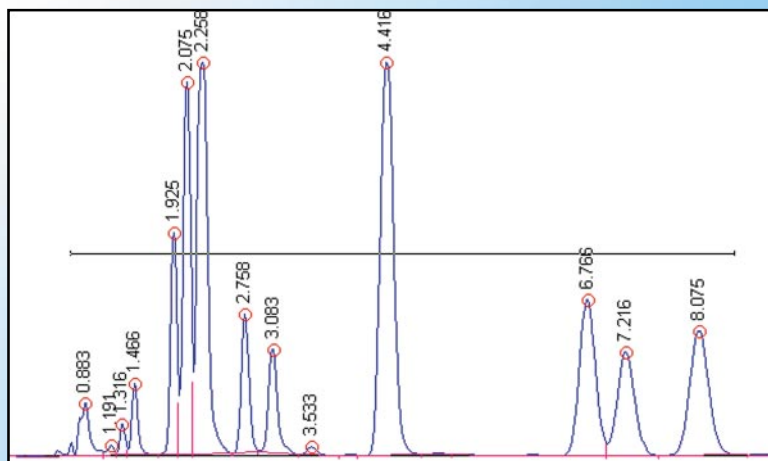


Model 210D HPLC System

The 210D comes standard with two detectors and a single channel A/D board. The signals from the UV and Conductivity detectors are software switchable. The user can toggle between one detector and the other, even during analysis. If both detector signals need to be viewed simultaneously, we recommend upgrading to a four or six channel data system. An additional benefit—there will be 2-4 extra channels available for external detectors, which can be easily connected to the customer access terminals on the left side of the 210D.

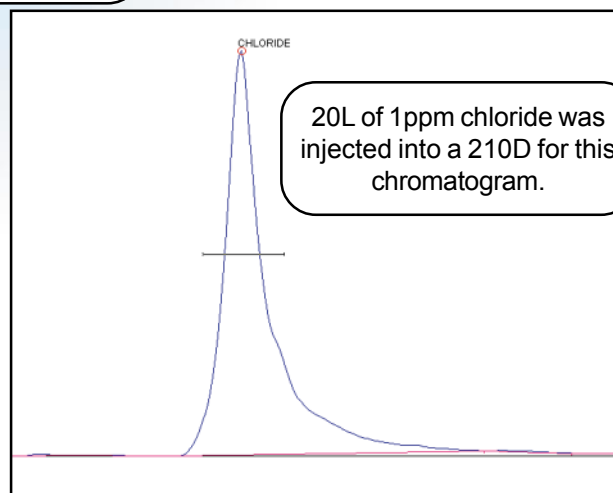


The broadband UV detector monitors multiple wavelengths between 200nm and 400nm. The 254nm emission line from the mercury lamp is the strongest, but other, weaker emission lines (312nm and 365nm) may also be absorbed by the sample as it passes through the cell. In most cases, this is an advantage because it may allow compounds which do not absorb at 254nm to be detected. In other cases, the additional bandwidth of the detector may detect interfering peaks.



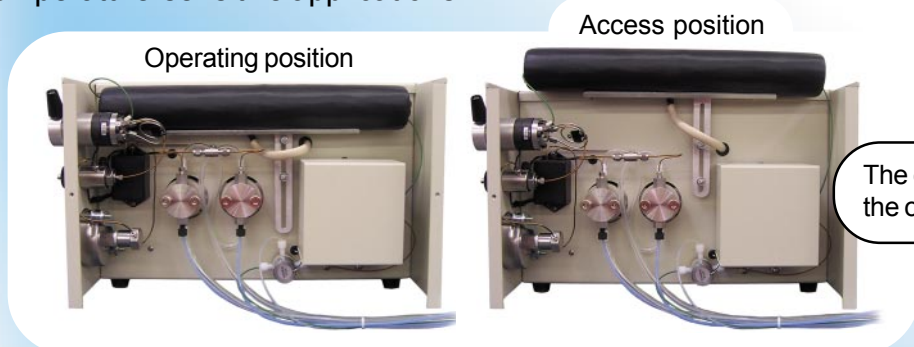
This chromatogram shows the analysis of a mix of polycyclic aromatic hydrocarbons (PAHs) by the UV detector in the Model 210D.

The Conductivity detector is conveniently integrated into the body of the low-volume UV cell. The entire detector compartment is thermostatted to ensure the most stable possible baseline. The Conductivity detector is particularly useful for measuring anions, organic acids, and compounds which do not absorb in the UV.



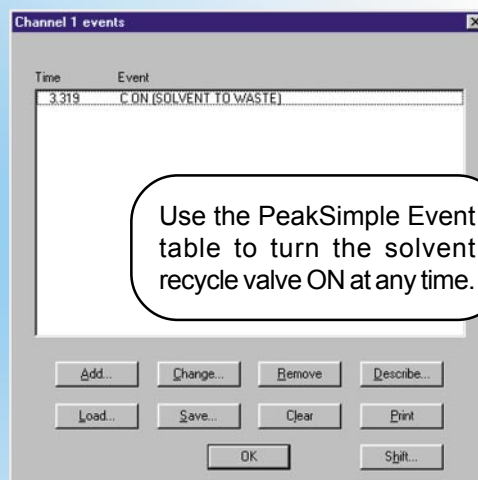
Model 210D HPLC System

The Model 210D column heater will accept most HPLC columns up to 25cm long. The heater is mounted on a vertical slide that conveniently holds it above the compartment for column installation or replacement. The temperature is adjustable from ambient to 100°C for a wide range of temperature-sensitive applications.



The column heater may be raised from the operating position for easy access.

The solvent recycling valve is a huge convenience that saves time, money, and disposal costs because it allows the user to recycle the solvent when no peaks are eluting. The solvent recycling valve can also be used as a single sample fraction collector. Using a PeakSimple Event table, the solvent recycling valve can be switched at any time during the analysis to divert the detector effluent from the waste bottle to a sample vial when the peak of interest exits the detector.



Use the PeakSimple Event table to turn the solvent recycle valve ON at any time.



A handy storage compartment built into the front of the 210D holds your injection syringe, priming syringe, spare parts, and a few vials securely during shipping. No longer will you have to worry about your syringe rolling off the bench onto the floor! Keep your HPLC tools with your HPLC.

SRI

Upgrade to Binary Gradient

Unlike other HPLC systems, the SRI Model 210D gradient upgrade can be performed by the user, in the field, in about an hour. All of the necessary wiring is already included with the base isocratic system. All the upgrade requires are just a few screws and plumbing connections to add the second pump head and circuit board.

Easy one-person transport in the field

12V



The SRI Model 210D HPLC System includes:

Single channel PeakSimple data system

Stainless steel pump head(s):

Flow from 0.1 to 5 mL/min

Piston flush for longer seal life

6000psi rating

Rheodyne injection valve with remote start

Prime / Purge valve

Pulse damper

Pressure gauge (0-6,000psi)

Broadband UV detector

Conductivity detector

Column heater (ambient to 100C)

Solvent recycle valve

Helium degas

All for \$6,495...Compare to \$12,000 elsewhere.

Upgrade and get a binary gradient system for under \$10,000

The 210D is completely field portable. The entire HPLC can run off the 12 volt power from the cigarette lighter in your vehicle. Whether you are performing analyses in the jungle, desert, or city, the 210D can go with you. It can be transported around the world, time and again, in the rugged, re-usable shipping container, which is small enough to travel as airline baggage.

0210D-1000	Model 210D Isocratic HPLC System with single channel serial PeakSimple data system	\$ 6,495.00
0210D-0300	Upgrade to Binary Gradient	\$ 3,495.00
0210D-1300	Binary Gradient HPLC System with single channel serial PeakSimple data system	\$ 9,990.00
0210D-4000	Model 210D Isocratic HPLC System with four channel serial PeakSimple data system	\$ 7,495.00
0210D-6000	Model 210D Isocratic HPLC System with six channel USB data system	\$ 7,695.00



GC-LC Innovations

PeakSimple Data Systems

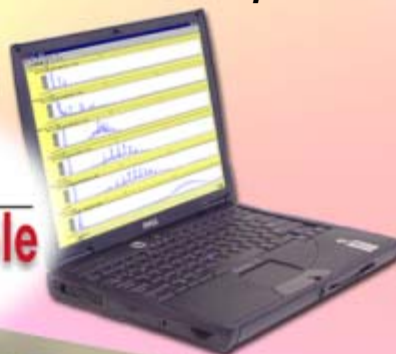
With 1, 4, or 6 Channels of Data Acquisition

**Standard in every SRI
GC and HPLC system**

For any Windows™ computer



PeakSimple



USB or serial port

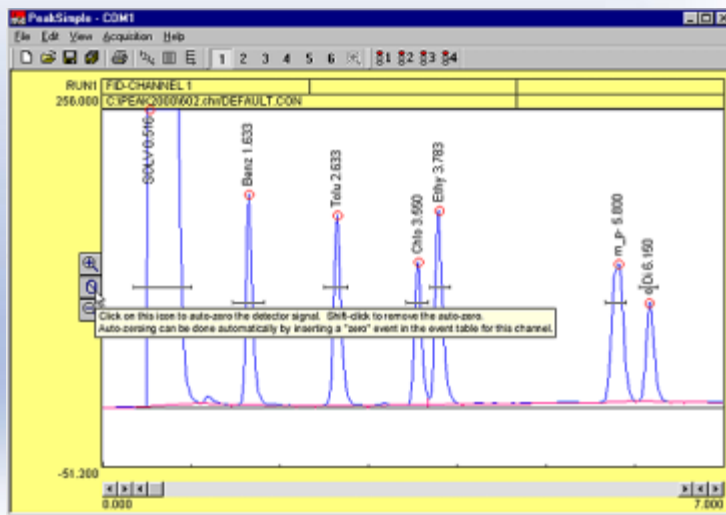


Available as a stand alone unit


SRI's PeakSimple Chromatography Data System is included with every SRI GC and HPLC system, and is also available as a convenient stand-alone data system for any other manufacturer's GC or HPLC. PeakSimple software has been continuously developed, refined and improved since 1988 by the same dedicated team of working chromatographers who use the software on a daily basis, and strive to simplify and enhance every aspect of PeakSimple so our customers will benefit. New features are added to PeakSimple several times per year and the latest version is always FREE to download online, along with helpful tutorials. Tech support at SRI is "old fashioned!" When you call, a knowledgeable technician will answer your questions right away. No complicated phone menus, and no waiting on hold!

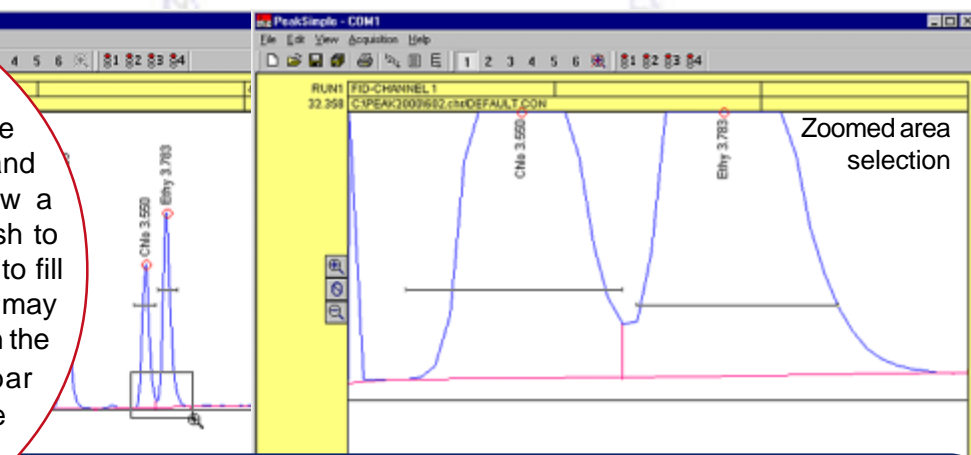
Easy to Learn, Easy to Use Software for all Windows™ Computers



Most PeakSimple functions are launched from the chromatogram window, and are so user friendly that most operators can produce results almost immediately. ToolTips makes learning your way around PeakSimple even easier—just hold your mouse cursor over any icon or checkbox to read the onscreen How-To instructions in one of many available languages.

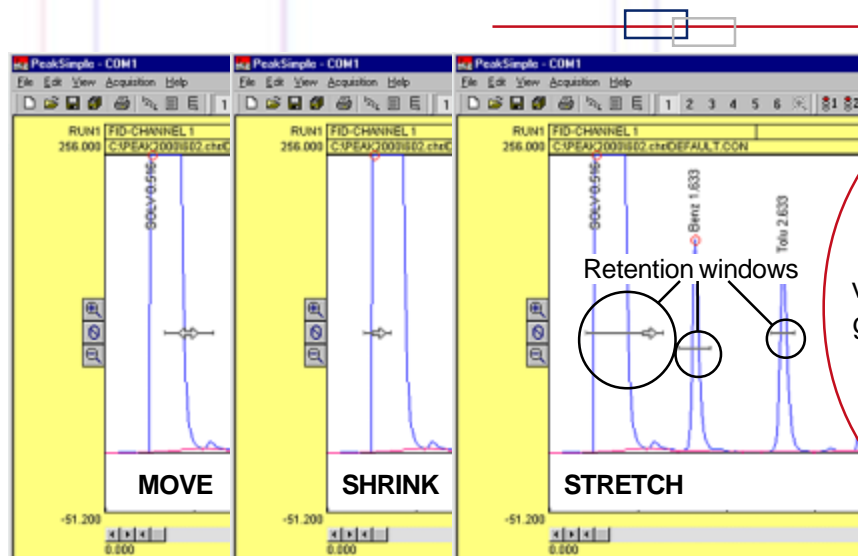


TAKE A CLOSER LOOK AT YOUR DATA

PeakSimple gives you two ways to closely examine data in the chromatogram window. Click and drag the mouse cursor to draw a rectangle around the area you wish to enlarge, and that area will expand to fill the chromatogram window. This may be done multiple times. Clicking on the Unzoom  icon in the toolbar unzooms one level at a time until you return to the original resolution.



A mouse click on one icon  vertically enlarges the peaks in the chromatogram, decreasing the y-axis display limits by a factor of two. A click on another icon  increases the y-axis display limits by a factor of two, which vertically shrinks the chromatogram peaks.



CLICK & DRAG RETENTION WINDOWS

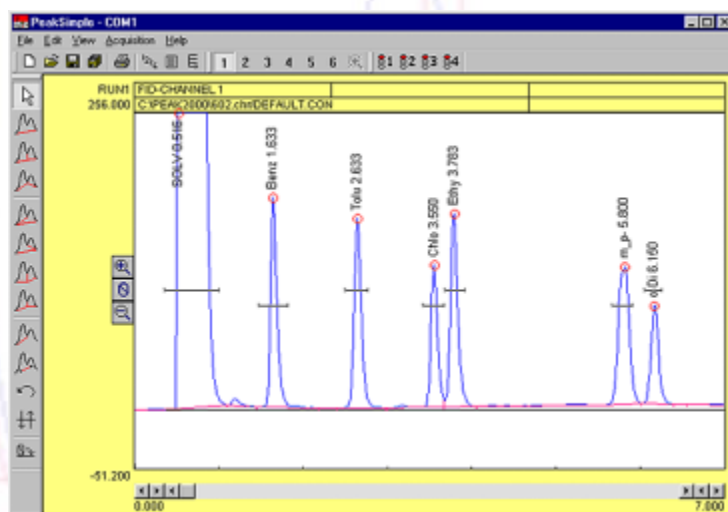
Retention window brackets are visible onscreen, and may be grabbed, dragged onto a peak, widened, or narrowed. The component table is automatically updated when a retention window is graphically moved or modified.

MANUAL INTEGRATION

Manual integration tools permit you to refine the integration method applied to any peak. The manual integration toolbox is available at a click of the mouse. Baseline projection may be “rubber-banded” from point to point, forced to a valley, dropped vertically, skimmed, etc.



The Manual Integration toolbox may be placed above (as shown at right) or to the left of the chromatogram window. It may also be dragged “off” the chromatogram window to float as an independent, move-able window.

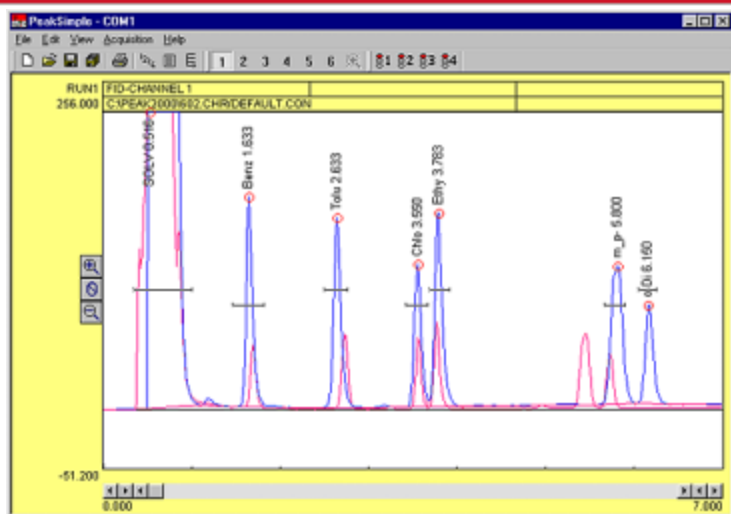


OVERLAY CHROMATOGRAMS

Overlay the data in any channel onto any other channel for retention time comparison or multi-detector correlation.



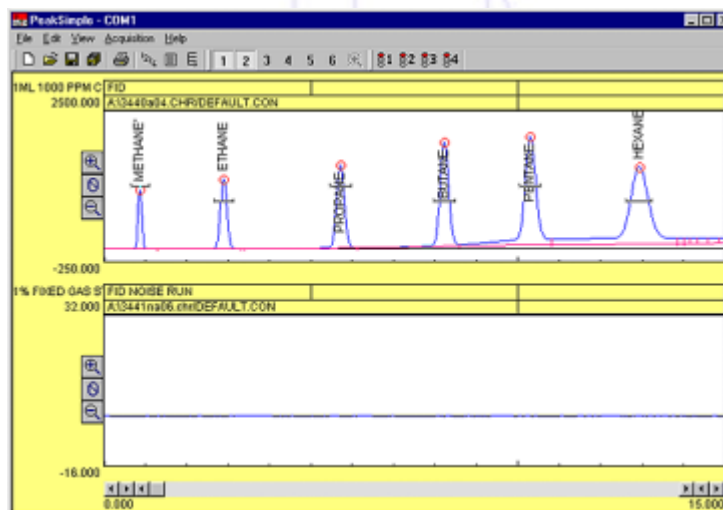
The Overlay Adjust feature lets you stretch and shift overlaid data to facilitate pattern matching.



BASELINE SUBTRACTION and DATA SMOOTHING

Blank baseline subtraction is useful to compensate for baseline drifting due to column bleed and temperature ramping. PeakSimple lets you subtract baselines in real time as data is collected or post run.

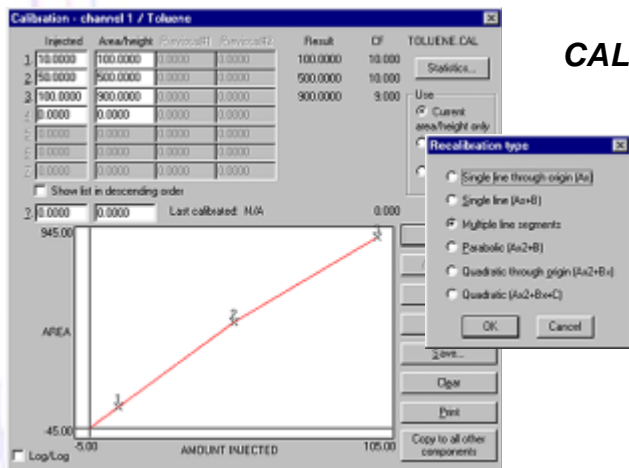
Noisy detector signals can be smoothed manually or automatically at the end of a run. Smoothing algorithms include Olympian, Moving Average, and Savitsky-Golay.



CALIBRATION

Multi-Level Calibration Curves

Calibrate peaks six ways (multi-line, quadratic, parabolic, etc.) using single or averaged data at up to seven concentration levels. Statistics for evaluating line fit quality, modification date audit trail, and curve printout help to ensure defensible results.



Calibration Averaging

PeakSimple allows up to three replicate calibration standards at seven levels of concentration to be averaged when constructing calibration curves.



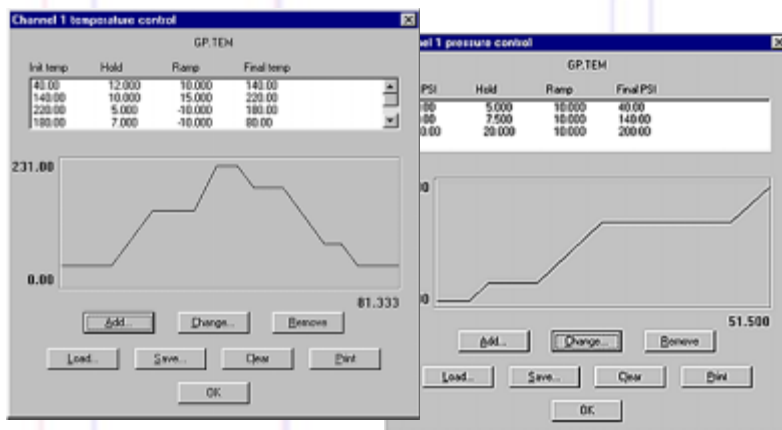
PeakSimple for Windows™ Software

CHANNEL DETAILS

Each channel has a Channel details dialog box which allows users to set parameters for that particular channel. From the Channel details dialog box, you can set your sampling rate and default millivolt display limits; choose temperature, pressure, or gradient control; subtract the baseline from another channel; overlay the data from another channel; turn Data-logger mode ON or OFF; designate a start time to compensate for relative retention shifts, and more.



TEMPERATURE PROGRAMMING



EPC & HPLC GRADIENT PROGRAMMING

“Temperature,” “Pressure,” and “Gradient” channel control options all use the same simple dialog box, and each may be programmed with unlimited ramps and holds. Program one or two SRI GC column ovens from ambient to 400°C with 0.01 degree resolution and negative programming. Program the carrier gas pressure on SRI GCs equipped with electronic pressure control. Form binary HPLC gradients for low-cost pump control.

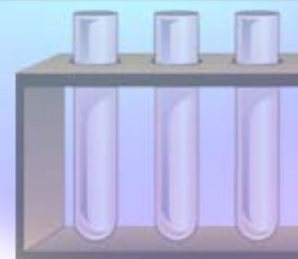
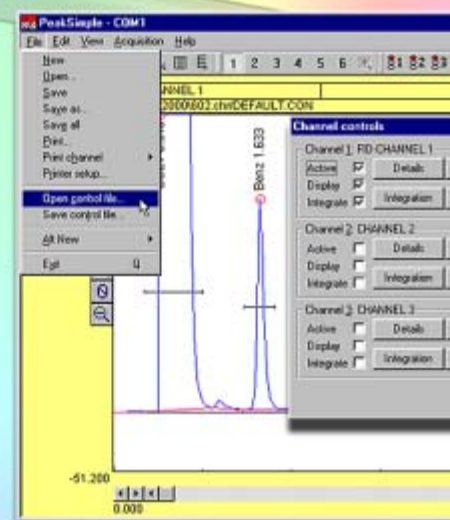
MANUAL/AUTOMATIC EXTERNAL EVENT CONTROL

In addition to performing timed integration events, control up to eight external contact closure relay outputs to actuate sampling valves, autosamplers, solenoids, pumps, or any external device using TTL or relay contact closure triggers.



CONTROL

Eliminate the need to repeat... simply by opening a control file. Maximize reproducibility—it does chromatograph because the control parameters. Save any change you make post-run actions, even color choices, to a control file for each method of analysis that you control files you can have is limited only by your



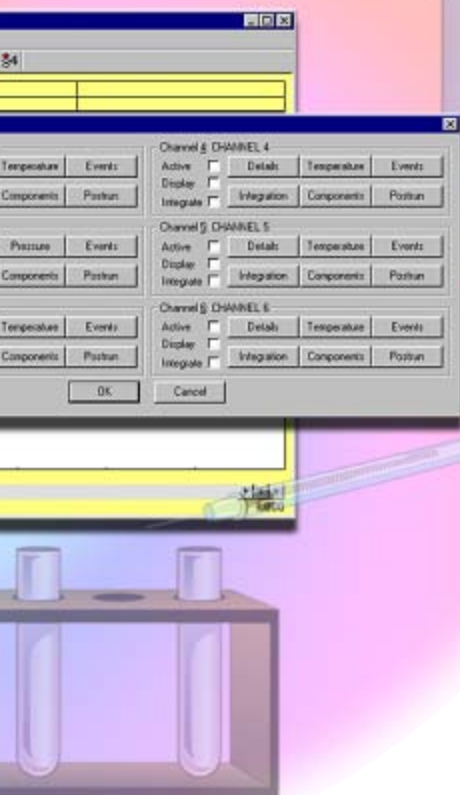


INTEGRATION

Use the Integration button to determine how PeakSimple integrates the data peaks in the chromatogram. Set peak detection sensitivity, area reject and standard weight. Specify a spike channel, merge results from another channel, and correct for sample weight and dilution.

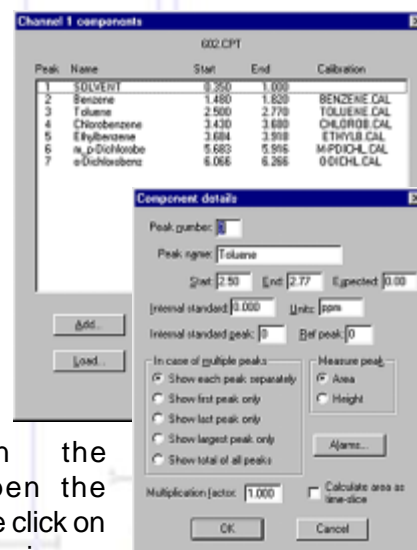
DL FILES

Specify run parameters before beginning an analysis. It doesn't matter who is operating the files contain all the necessary run parameters in the analysis, from channel details to control file and use it again and again. Create a file that your lab typically performs. The number of files on your disk space.



COMPONENTS

Create, save and edit component tables with an unlimited number of compounds. Enter expected retention times, control peak display, and more! Component details may be viewed and edited by double-clicking on any retention window in the chromatogram. Or, open the Component table and double click on any component in the list to view or edit that component's details.

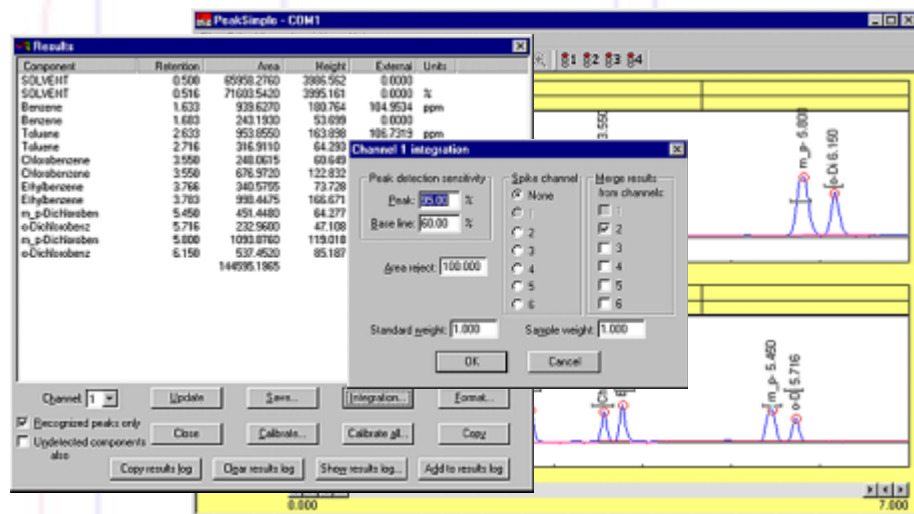
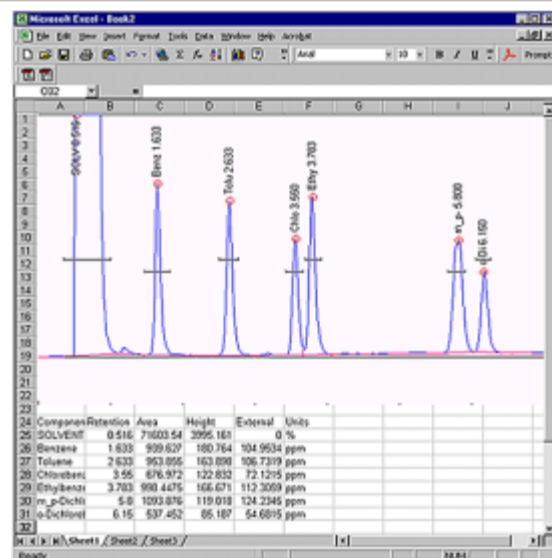


POSTRUN

PeakSimple can perform a variety of postrun actions to help you maintain and organize your data. Specify how data will be saved, and automatically add the results of the run to the results log for that channel. You can set PeakSimple to automatically print the results at the end of a run, and update your DDE link. Execute a command, specify a recalibration level, and restart the run after a given amount of time. You can even have PeakSimple smooth the data before copying it into another channel.

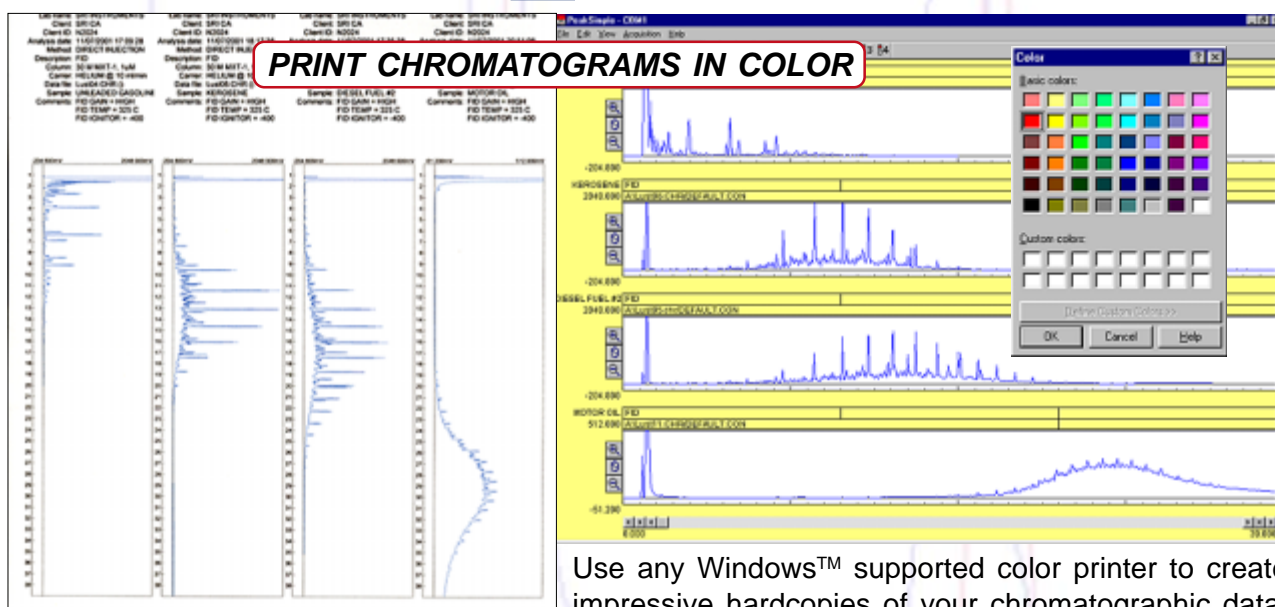
DYNAMIC DATA EXCHANGE

Link PeakSimple to your DDE compatible spreadsheet or word processor (Excel, Word, 123, etc.). Analytical results are automatically transferred after every run, or can be accumulated within PeakSimple and copied as a block of data. Use the Copy Picture option to paste the chromatogram itself into Excel, etc. along with the results.



MERGE RESULTS FROM MULTIPLE CHANNELS

PeakSimple lets you merge the results from any channel or all channels into one report. This feature is handy when you're combining results from different detectors into a single report for export to Excel or other data analysis programs.



Use any Windows™ supported color printer to create impressive hardcopies of your chromatographic data. Print multiple chromatograms per page for easy detector-to-detector comparisons and paperwork consolidation. Print overlaid data in contrasting colors with adjustable line weight.

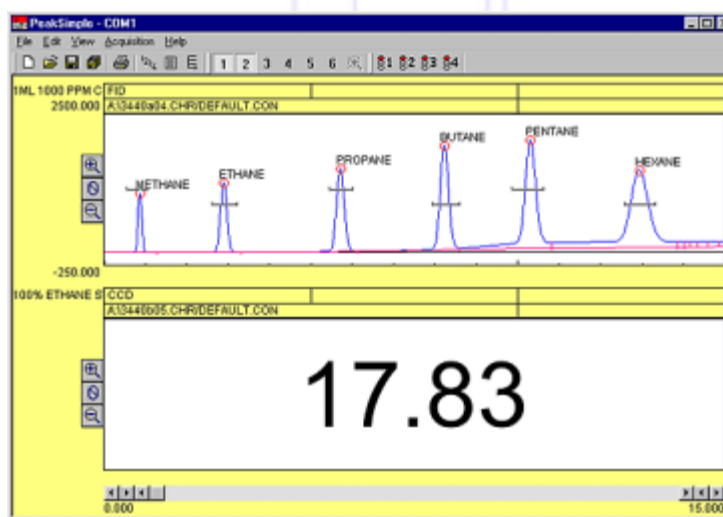


AUTOSAMPLER QUEUE and BATCH REPROCESSING

Create customized autosampler sequences for liquid injections, purge and trap autosamplers, gas sampling valves, and stream selectors including unique predefined sample information, auto-calibration and batch reprocessing of previously run samples.

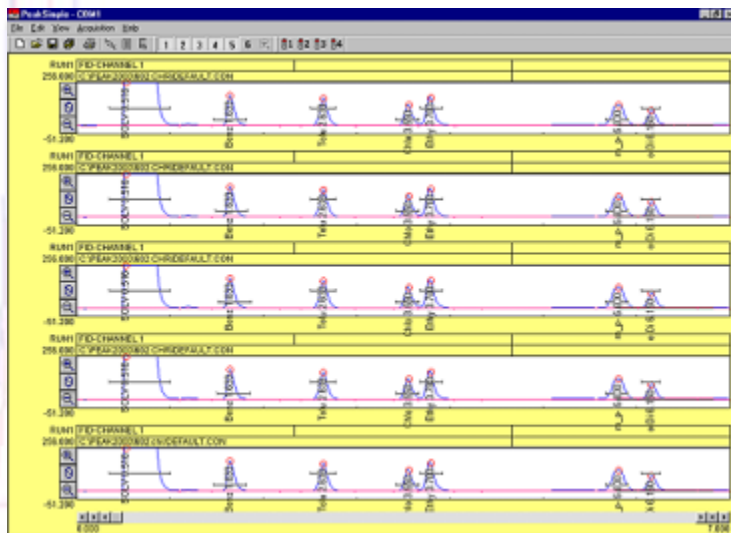
DATA LOGGER MODE

Peak Simple's Data Logger Mode allows you to display a scaled and calibrated result in large numbers instead of the usual strip chart data presentation. Data Logger Mode is especially useful when monitoring total hydrocarbons on one channel while performing a separation on another channel.



SELF-VALIDATING HARDWARE

PeakSimple will play back and re-acquire any chromatogram multiple times, establishing the precision and accuracy of the data system using real data, not "canned" chromatograms. PeakSimple's validation can be performed by the user anytime without extra hardware.



SRI PeakSimple Data Systems

Serial Port

Models 202 and 203 connect to your computer with a serial port cable. Windows™ computers with two available serial ports can operate dual **203** systems, a **202** and **203** together, or dual **202** systems for a total of up to eight data channels and four time bases. Temperature and pressure control outputs are available for connection to a GC or HPLC. PeakSimple software works with each of the following hardware options, serial or USB port, and is included with each unit.

Model 203 has one channel capable of acquiring data at up to 50Hz. Its eight TTL outputs can be optionally wired to a bank of eight single-pole, dual-throw mechanical relays with screw terminals for easy connection to any user device which operates from a contact closure. A remote start input allows run initiation from the user's GC or HPLC system. The 220VAC system is supplied with a UL, CSA, and CE/VDE approved universal voltage input which will operate on any 100-250 volt power supply.

Model 203



Approximately 8" wide x
8" deep x 1.75" high

Model 202 has four channels. Data can be acquired at up to 50Hz with one channel active, 10Hz with two channels, or 5Hz with all four channels activated. The four channels of data can be randomly assigned to one of two time bases to allow independent start and stop times for two entirely separate instruments. Two remote start inputs allow run initiation from the user's GC or HPLC system. Model 202 includes the bank of eight single-pole, dual-throw mechanical relays with screw terminals for easy connection to any device that operates from a contact closure.

Model 202

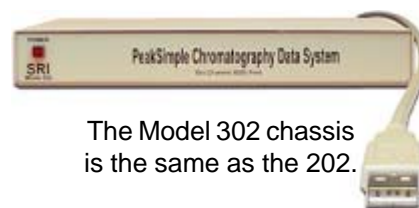


Approximately 15" wide x
11" deep x 2" high

USB

Model 302 is for analysts who prefer the hot-swappable, plug-and-play capabilities of Universal Serial Bus devices. Four remote start inputs allow run initiation from the user's GC or HPLC system. The six channels of data can be randomly assigned to one of four time bases which provides independent start and stop times for 4 entirely separate instruments. Data can be acquired at up to 50Hz per channel with 4 channels active, and up to 20Hz with all 6 channels activated and acquiring data. The Plug and Play peripheral connection of choice, USB is supported by Microsoft Windows 98, 98SE, ME, XP, and 2000.

Model 302



The Model 302 chassis
is the same as the 202.

8600-1055	Model 203 Single Channel Data System with PeakSimple software	\$ 1,395.00
8600-1255	Model 203 220VAC	\$ 1,495.00
8600-4055	Model 202 Four Channel Data System with PeakSimple software	\$ 2,395.00
8600-4255	Model 202 220VAC	\$ 2,395.00
8600-6055	Model 302 Six Channel USB Data System with PeakSimple software	\$ 2,595.00
8600-6255	Model 302 220VAC	\$ 2,595.00
