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www.agilent.com/chem.



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CP-4900 Micro-GC



User Manual

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Varian Analytical Instrument Warranty

HARDWARE PRODUCTS

All analytical instruments sold by Varian are warranted to be free from defects in material and workmanship for the periods specified and in accordance with the terms on the face of Varian's quotation or as otherwise agreed upon in writing between Varian and the Customer. The warranty period begins on the date of **shipment** from Varian to the original Customer. However, where installation is paid for by the Customer or included in the purchase price, the warranty period begins upon completion of installation. If the Customer schedules installation to start later than 30 days after delivery or if such delay is caused through the Customer's inability to provide adequate facilities or utilities or through failure to comply with Varian's reasonable pre-installation instructions or through other omissions by Customer, then the warranty period starts on the 31st day from date of shipment. Moreover Varian will charge the Customer for labor and other expenses involved in making multiple or follow-up installation service calls.

SOFTWARE PRODUCTS

Where software is provided within the frame of a license agreement concluded between the Customer and Varian, any warranty shall be strictly in accordance with the terms of such agreement.

In the absence of a license agreement and unless an alternate warranty period is agreed upon in writing between Varian and the Customer, the warranty period is as specified on the face of Varian's quotation. Varian warrants such software products, if used with and properly installed on Varian hardware or other hardware as specified by Varian to perform as described in the accompanying Operator's Manual and to be substantially free of those defects which cause failure to execute respective programming instructions; however, Varian does not warrant uninterrupted or error-free operation.

REMEDIES

The sole and exclusive remedy under hardware warranty shall be **repair** of instrument malfunctions which in Varian's opinion are due or traceable to defects in original materials or workmanship or, at Varian's option, **replacement** of the respective defective parts, provided that Varian may as an alternative elect to **refund** an equitable portion of the purchase price of the instrument or accessory.

Repair or replacement under warranty does not extend the original warranty period.

Repair or replacement under warranty claims shall be made in Varian's sole discretion either by sending a Customer Support Representative to the site or by authorizing the Customer to return the defective accessory or instrument to Varian or to send it to a designated service facility. The Customer shall be responsible for loss or damage in transit and shall prepay shipping cost. Varian will return the accessory or instrument to the Customer prepaid and insured. Claims for loss or damage in transit shall be filed by the Customer. To correct software operation anomalies, Varian will issue software revisions where such revisions exist and where, in Varian's opinion, this is the most efficient remedy.

LIMITATION OF WARRANTY

This **warranty does not cover** software supplied by the Customer, equipment and software warranted by another manufacturer or replacement of expendable items and those of limited life, such as but not limited to: Filters, glassware, instrument status lamps, source lamps, septa, columns, fuses, chart paper and ink, nebulizers, flow cells, pistons, seals, fittings, valves, burners, sample tubes, probe inserts, print heads, glass lined tubing, pipe and tube fittings, variable temperature dewars, transfer lines, flexible discs, magnetic tape cassettes, electron multipliers, filaments, vacuum gaskets, seats and all parts exposed to samples and mobile phases.

This **warranty shall be void** in the event of accident, abuse, alteration, misuse, neglect, breakage, improper operation or maintenance, unauthorized or improper modifications or tampering, use in an unsuitable physical environment, use with a marginal power supply or use with other inadequate facilities or utilities. Reasonable care must be used to avoid hazards.

This warranty is expressly in lieu of and excludes all other express or implied warranties, including but not limited to warranties of merchantability and of fitness for particular purpose, use or application, and all other obligations or liabilities on the part of Varian, unless such other warranties, obligations or liabilities are expressly agreed to in writing by Varian.

LIMITATION OF REMEDIES AND LIABILITY

The remedies provided herein are the sole and exclusive remedies of the Customer. In no case will Varian be liable for incidental or consequential damages, loss of use, loss of production or any other loss incurred.



Declaration of Conformity

We hereby Declare that the equipment listed below complies with the requirements of:

The Low Voltage Directive 73/23/EEC (93/68/EEC)

The EMC Directive 89/336/EEC (92/31/EEC and 93/68/EEC)

APPLICABLE STANDARDS

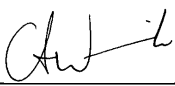
LVD	EN 61010-1 CSA 22.2 No. 1010.1-92	UL 3101-1
EMC	EN 61326-A1 47CFR part 15	ANSI C63.4-1992

Type of Equipment: Micro Gas Chromatograph **Model:** CP-4900

MANUFACTURER - EU

Print Name: G. A. Wassink

Company Name: Varian B.V.

Signed: 

Address: Herculesweg 8

Position: Quality Manager

P.O. Box 8033

Date: November 28, 2001

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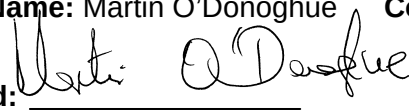
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Date: November 28, 2001

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VARIAN





Certificate of Compliance

Certificate: 1251818

Master Contract: 213137

Project: 1554252

Date Issued: May 5, 2004

Issued to: Varian B.V.
Herculesweg 8
4338 PL Middelburg
THE NETHERLANDS

*The products listed below are eligible to bear the CSA Mark shown
with adjacent indicators 'C' and 'US'*



Authorized by: O. Ewanchyna, P. Eng.

PRODUCTS

CLASS 2252 03 - PROCESS CONTROL EQUIPMENT

CLASS 2252 83 - PROCESS CONTROL EQUIPMENT - CERTIFIED TO U.S. STANDARDS

Gas-Chromatograph, Model CP-4900 Micro-GC, 12 Vdc, 130 W.

Accessories: Extension box CP740635

maximum ambient 40 degrees C, pollution degree 2.

Note: Four possible configuration: single, dual, triple or quad channel.

APPLICABLE REQUIREMENTS

CAN/CSA-C22.2 No.	1010.1-92	-	Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use, Part 1:
UL 61010C-1			General Requirements Process Control Equipment

The 'C' and 'US' indicators adjacent to the CSA Mark signify that the product has been evaluated to the applicable CSA and ANSI/UL Standards, for use in Canada and the U.S., respectively. This 'US' indicator includes products eligible to bear the 'NRTL' indicator. NRTL, i.e. National Recognized Testing Laboratory, is a designation granted by the U.S. Occupational Safety and Health Administration (OSHA) to laboratories which have been recognised to perform certification to U.S. Standards.

DQD 507WD 2002/03/01



Supplement to Certificate of Compliance

Certificate: 1251818

Master Contract: 213137

*The products listed, including the latest revision described below,
are eligible to be marked in accordance with the referenced Certificate.*

Product Certification History

Project	Date	Description
1554252	May 5, 2004	Report reissued. Adding DMD module instead of GC module and an Extension Box, editorial changes.
1251818	February 14, 2002	Original Certification.

Safety Information

INFORMATION

In accordance with Varian's commitment to customer service and safety, this instrument and its accompanying documentation (NEN 5509) complies with the CE specifications and the safety requirements for electrical equipment for measurement, control, and laboratory use (CEI/IEC 1010-1), ^cCSA_{US} and FCC-b.

This device has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications.

Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

To prevent any injury to the user or any damage to the instrument it is essential that you read the information in this chapter.

If this manual is not in your native language and if you have problems understanding the text, we advise you to contact your Varian office for assistance. Varian cannot accept responsibility for any damage or injury caused by misunderstanding of the information in this manual.

OPERATING INSTRUCTIONS

This instruction manual is provided to help you establish operating conditions, which will permit safe and efficient use of your equipment.

Special considerations and precautions are also described in the manual, which appear in the form of **NOTES**, **CAUTIONS**, and **WARNINGS** as described below (next page).

It is important that you operate your equipment in accordance with this instruction manual and any additional information, which may be provided by Varian. Address any questions regarding the safe and proper use of your equipment to your local Varian office.



NOTE

Information to aid you in obtaining optimal performance from your instrument.



CAUTION

Alerts you to situations that may cause moderate injury and/or equipment damage, and how to avoid these situations.



WARNING

Alerts you to potentially hazardous situations that could result in serious injury, and how to avoid these situations.

Warning Symbol



WARNING:
Shock hazard



WARNING:
Burn hazard



Instruction
Manual



Protective
Conductor terminal



Radioactive
hazard



Skin puncture



Static discharge
Warning



Do not touch

Warning Description

Indicates dangerous voltage: (terminals fed from the interior by voltage exceeding 1000V must be so marked).

Indicates parts that may cause burns when touched.

Indicates that the user should refer to the manual before operating the equipment.

For protection against electrical shock in case of a fault. Used with field wiring terminals to indicate the terminal, which must be connected to ground before operating equipment.

Indicates that the instrument contains radioactive components, which may cause personal injury when handled incorrectly.

Indicates sharp or suddenly moving parts such as injection needles that may cause injury.

Indicates instrument contains parts that can be damaged by electrostatic discharge. Take care for proper grounding before handling.

Touching this item may result in damage to the instrument or personal injury.

GENERAL SAFETY PRECAUTIONS

Follow these safety practices to ensure safe equipment operation.

- Perform periodic leak checks on all supply lines and pneumatic plumbing.
- Do not allow gas lines to become kinked or punctured. Place lines away from foot traffic and extreme heat or cold.
- Store organic solvents in fireproof, vented and clearly labeled cabinets so they are easily identified as toxic and/or flammable materials.
- Do not accumulate waste solvents. Dispose of such materials through a regulated disposal program and not through municipal sewage lines.

NOTICE: This instrument has been tested per applicable requirements of EMC Directive as required to carry the European Union CE Mark. As such, this equipment may be susceptible to radiation/interference levels or frequencies, which are not within the tested limits.



This instrument is designed for chromatographic analysis of appropriately prepared samples. It must be operated using appropriate gases and/or solvents and within specified maximum ranges for pressure, flows, and temperatures as described in this manual. If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.



It is the responsibility of the Customer to inform Varian Customer Support Representatives if the instrument has been used for the analysis of hazardous biological, radioactive, or toxic samples, prior to any instrument service being performed or when an instrument is being returned to the Service Center for repair.

CAUTIONS

1. Disconnect the instrument from all power sources before removing protective panels to avoid exposure to potentially dangerous voltages.
2. When it is necessary to use a non-original power cord plug, make sure the replacement cord adheres to the color-coding and polarity described in the manual and all local building safety codes.
3. Replace faulty or frayed power cords immediately with the same type and rating.
4. This instrument should be placed in a suitable location with sufficient ventilation to remove gases and vapors. Space around the instrument must be sufficient to enable cooling of the instrument.

5. Before plugging the instrument in or turning the power on, always make sure that the voltage and fuses are set appropriately for your local power source.
6. Do not turn on the instrument if there is a possibility of any kind of electrical damage. Instead, disconnect the power cord and contact your Varian office.
7. The supplied power cord must be inserted into a power outlet with a protective earth ground connection. When using an extension cord, make sure that the cord is also properly grounded.
8. Do not change the external or internal grounding connections as this could endanger you and/or damage the instrument.
9. The instrument is properly grounded when shipped. You do not need to make any changes to the electrical connections or to the instrument chassis to ensure safe operation.
10. When working with this instrument, follow the regulations for GLP (Good Laboratory Practice). Take care to wear safety glasses and appropriate clothing.
11. Do not place containers with flammable liquids on this instrument. Spillage of the liquid over hot parts may cause fire.
12. This instrument may use flammable or explosive gases e.g. hydrogen under pressure. Be sure to be familiar with and to follow accurately the operation procedures prescribed for those gases before operating the instrument.
13. Never try to repair or replace any component that is not described in this manual without the assistance of a Varian service engineer. Unauthorized repairs or modifications will result in rejection of warranty claims.
14. Always disconnect the AC power cord before attempting any type of maintenance.
15. Use proper tools when working on the instrument to prevent danger for you and/or damage to the instrument.
16. The customer should not attempt to replace battery(s) or fuse(s) in this instrument other than specified in the manual.
17. Damage can result if the instrument is stored under unfavorable conditions for prolonged periods (e.g., subject to heat, water, etc.).
18. Do not shut off column flow when the oven temperature is high this may damage the column.
19. This unit has been designed and tested in accordance with recognized safety standards and designed for use indoors.
20. If the instrument is used in a manner not specified by the manufacturer, the protection provided by the instrument may be impaired.
21. Substituting parts or performing any unauthorized modification to the instrument may result in a safety hazard.
22. Changes or modifications not expressly approved by the responsible party for compliance could void the user's authority to operate the equipment.

SPARE PARTS AVAILABILITY

It is the policy of Varian to provide operational spare parts for any instrument and major accessory for a period of five (5) years after shipment of the final production run of that instrument. Spare parts will be available after this five (5) year period but on an *as available* basis. Operational spare parts are defined as those individual electrical or mechanical parts that are susceptible to failure during their normal operation. Examples include relays, lamps, temperature probes, detector elements, motors, etc. Sheet metal parts, structural members or assemblies and castings, printed circuit boards, and functional modules are normally capable of being rebuilt to like-new condition throughout their useful life and therefore will be supplied only on an *as available* basis after the final production run of the instrument.

SERVICE AVAILABILITY

Varian provides a variety of services to support its customers after warranty expiration. Repair service can be provided by attractively priced service contracts or on a time and material basis. Technical support and training can be provided by qualified personnel on both a contractual or as-needed basis.

Varian Analytical Instruments Sales Offices

For Sales or Service assistance and to order Parts and Supplies, contact your local Varian office.

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<http://www.varianinc.com/>

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Introduction



Congratulations and thank you for purchasing the Varian, Inc. CP-4900 Micro-GC. The CP-4900 Micro-GC is a powerful single or dual or quad channel high speed Micro GC suited for analyses of gaseous samples. This instrument is tailored to meet your needs. The columns are installed and the instrument as a whole has been thoroughly tested at our factory. The CP-4900 Micro-GC incorporate technical advancements in **Micro electronic gas control (EGC)**. The unique advantages of the CP-4900 allow column head pressure settings to become part of the GC method and can be programmed electronically. The Varian, Inc. CP-4900 Micro-GC with Micro EGC allows you to optimize your analysis. Apart from the constant pressure mode, the Micro EGC in the CP-4900 allows you also to program the pressure over your column. Pressure programming improves not only the speed of the analysis, but it will give you the opportunity to run new and more extended applications. The CP-4900 Micro-GC analytical channels can optionally be equipped with backflush and Micro-Gasifier capabilities thus optimizing the analysis even further.



NOTE

For problems or questions about your CP-4900 Micro-GC, please contact your nearest Varian, Inc. subsidiary or Varian, Inc. representative.

Pre-installation requirements

In order to assure a quick, safe and uncomplicated installation, we kindly request you to make provisions as stated below before our Varian, Inc. service engineer will install your instrument(s).

Environmental requirements

- Pollution degree: 2.
- Humidity: 0% to 95% RH.
- Temperature: +0° to +50°C operating.
- The CP-4900 Micro-GC is intended for indoor use and certified for operation up to an altitude of 2000 meter.
- The CP-4900 Micro-GC should be protected from corrosive chemicals or gases, dust/particulate accumulation, and direct venting of air conditioners, heaters, furnaces or fans.

Space requirements

- Allow sufficient bench space to permit installation of workstations, integrators and other Micro-GC equipment. The table below lists the physical dimensions and weight of the CP-4900 Micro-GC and the peripheral instruments which may be installed near it.
- Allow 10-20 cm of space at the sides and rear of the CP-4900 Micro-GC to permit free air circulation.

<i>Instrument</i>	<i>Height</i>		<i>Width</i>		<i>Depth</i>		<i>Weight</i>	
	Inch.	Cm	Inch.	Cm	Inch.	Cm	Lb.	Kg
CP-4900 Micro-GC 2-CH	11	28	6.5	16	12	30	14	6
CP-4900 Micro-GC 4-CH	11	28	6.5	16	21.5	55	22	10
Power supply 2-CH	2.5	6.4	4	9.5	7	17.8	2	1
Field case 2-CH	15	38	12	30	16	41	35	16
Field case 4-CH (with trolley)	18.5	47	15	38	28.5	73	68	30
Chromatography Workstation (computer with monitor, approximate values)	17	43	17	43	21	53	35	16

Power source

- Voltage of 12 VDC.
- Installation Category (overvoltage category) II.
For more details refer to the Micro-GC CP-4900 power supply user manual (CP501267).

Gas supply

Gas quality specifications are listed in the reference document “Pre-Installation requirements CP-4900 Micro-GC CP501289”.

- **External gas supply**
 - **Carrier gas pressure:** Gas bottle provided with a proper working two-stage pressure assembly to adjust the carrier gas pressure to 550 ± 10 % (80 ± 10 %).
 - **DMD Transport Gas(es):** DMD (Differential Mobility Detector) transport gas(es) only Nitrogen or Zero Air. Gas bottle provided with a proper working two-stage pressure assembly to adjust the carrier gas pressure to 550 ± 10 % (80 ± 10 %).



WARNING

Never use Helium as DMD Transport Gas(es), this will damage the detector permanent.

- **Safety regards**
Gas bottles must be fixed to a table or to a wall.

GAS SAMPLES

- Do not introduce liquid samples into your CP-4900.
- Type of samples: non-condensing gas
- Samples other than non-condensing gases (wet, vapors, particles and polymers) must be filtered in advance.
- Sample conditions: Non condensing gas between 0 and 110°C.
- Sample pressure between 0 and 100 kPa (1 bar, 15 psi)
- Outlet of sample container must fit to a stainless steel capillary of 1/16" outside diameter, provided with a Swagelok® female nut.

CP-4900 Micro-GC Installation

INSPECTION

The CP-4900 Micro-GC will arrive packed in one large box and one or more smaller cartons. Inspect the cartons carefully for damage or signs of rough handling. Report damage to the carrier and to your local Varian office.

UNPACKING

Unpack the CP-4900 Micro-GC and accessories carefully and transfer to the work area, using proper handling techniques. Inspect the CP-4900 Micro-GC and accessories carefully for damage or signs of rough handling. Report damage to the carrier and to your local Varian office.



WARNING

Avoid back strain or injury by following all safety precautions when lifting (heavy) objects.



CAUTION

The instrument has been protected during shipment by protection caps. Prior to operating, remove:

- At the back of the system all (plastic) caps (see picture below).



PACKING LIST

CP-4900 Micro-GC

Check the packing list to see if you have received all that you require.

Item	Part number
External sample filter kit	CP736729
Filters 5x for external filter assy.	CP736467
CD-ROM user manual CP-4900 Micro-GC	CP505532
Cable Dsub9 Male-Female 3 meter	CP177138
Locking nut	CP420200 x 4
Male Luer	CP420100 x 4
Front and back ferrule 1/16" SS x 2	CP4417
Capillary tubing SS 1/16" x 1.0 mm, 10 cm	CP4008
Power supply 110V or	CP49PWR110
Power supply 220V or	CP49PWR220
Power supply 240V	CP49PWR240



Accessories

Item	Qty	Part number
Spare filters (5 pieces) for external filter	5	CP736467
Manual CP-4900 Micro-GC (hard copy)	1	CP501265
Manual CP-4900 Micro-GC power supply (hard copy)	1	CP501267
Heated sample inlet elbow with frit	5	CP740434
Ethernet crossover cable 10 meter	1	CP740293
Ethernet crossover cable, 2 meter	1	CP740292
Combo card (Ethernet and Com ports), including 3 meter crossover cable (not for HUB)	1	CP740292
Aux power car cigarette lighter DC adapter	1	CP740291
Charger for CP-4900 battery pack	1	CP740427
Battery pack NiMH (rechargeable)	1	CP740328
Micro Gasifier 110 Volt	1	CP740431
Micro Gasifier 220 Volt	1	CP740432
Micro Gasifier 240 Volt	1	CP740433
Genie 170 BTU filter complete	1	CP739535
Genie 101 BTU filter complete	1	CP739534
Genie 170 standard filter complete	1	CP739536
Genie 170 BTU membrane	1	CP739531
Genie 170 standard membranes	5	392590004
Genie 101 BTU standard membranes	5	392590005

INSTALLATION

Install Gas Regulators and Set pressures

Carrier gas supplied from cylinders should have a two-stage pressure assembly to adjust the carrier gas pressure to 550 ± 10 % (80 ± 10 %). Set cylinder regulator pressure to match the CP-4900 Micro-GC gas inlet pressure (see [Carrier gas connection on page 17](#)).

Carrier gas

The most commonly used carrier gas for the CP-4900 Micro-GC is either He or N₂. The recommended purity for carrier gas is 99.995% minimum. See [Carrier gas connection on page 17](#)

Connect to Power

First, connect the power connector to the CP-4900 Micro-GC, then plug the power cord into an appropriate source of power.

Connect data handling peripherals

The CP-4900 Micro-GC must be connected to an external Workstation both to set up the method and to acquire data.

Workstations and other data handling devices are connected to the cable connectors inside the CP-4900 Micro-GC (see [Cable connectors on page 16](#) for more details).

- If CP-Maître Elite Workstation software with CP-4900 Micro-GC control is being installed, follow the software installation instructions in the Workstation section of this manual (see [Workstation software on page 57](#)).
- Hardware connection between the Workstation (computer) and CP-4900 Micro-GC may be made via serial (RS232, standard) or Ethernet (optional). For additional information, follow the links: [Communication setup on page 67](#) and [Cable connectors on page 16](#).

Sample

Connect the sample to the CP-4900 using the sample-in connector situated at the front of the instrument ([see front view on page 14](#)).

Read [chapter Sample Gas on page 18](#) for more important information!

Heated Sample line

To connect heated sample lines refer [to Heated Sample line chapter on page 20](#).

Turn power ON

Turn on the CP-4900 Micro-GC using the power switch on the lower front of the instrument. The “READY” LED should light (after two minutes) when ready. (see [Front view on page 14](#)).

Factory default states and settings

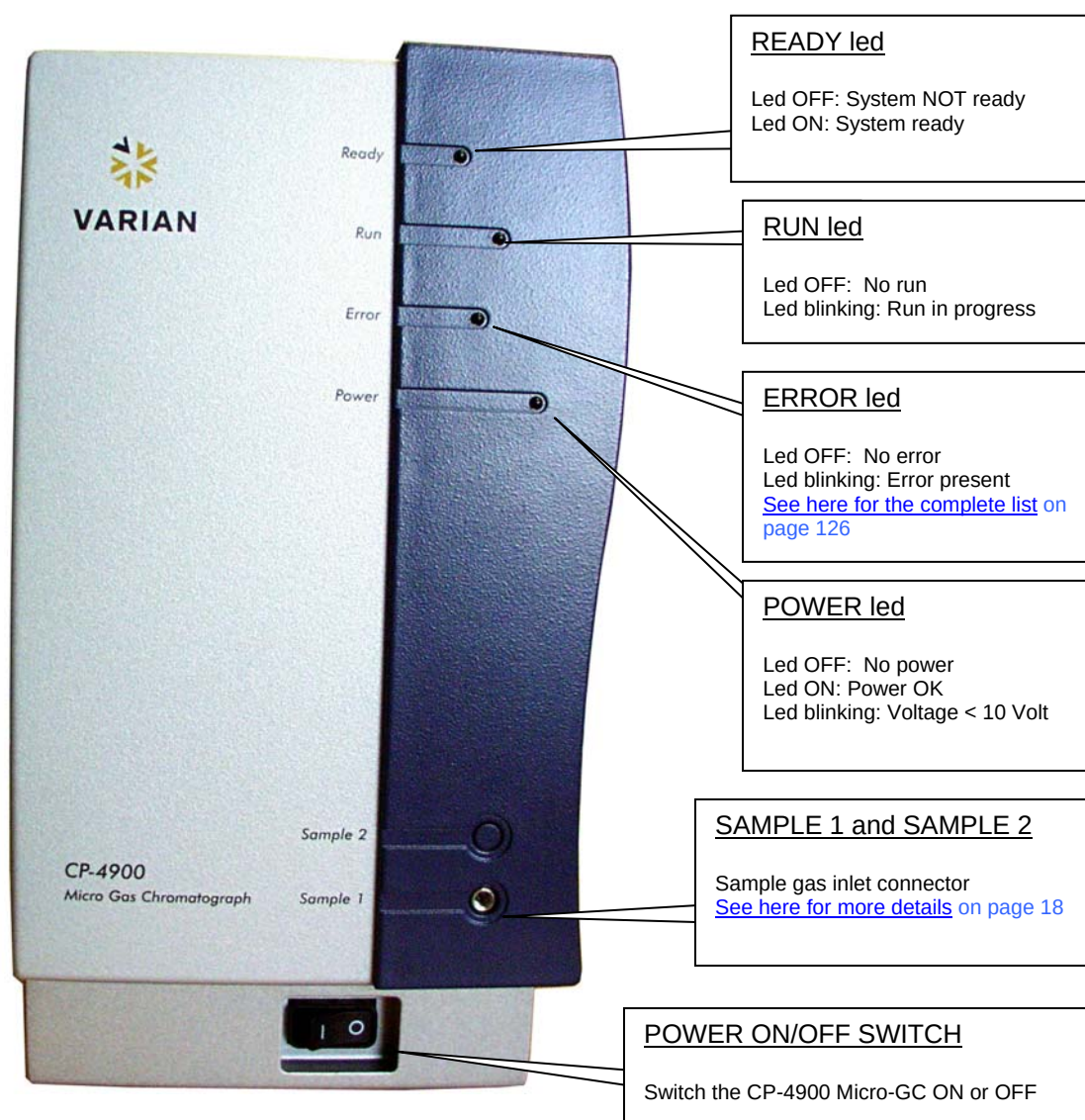
Your CP-4900 Micro-GC is shipped from the factory with default settings. The following is relevant information on the factory default states and settings:

- When the CP-4900 Micro-GC is turned on, the power LED will light up and the system will begin the Flush cycle procedure. The Flush cycle is a 2-minute cycle in which the various valves are activated and deactivated in order to flush the entrapped air from the manifold, valves, and tubing.
- After the flush cycle is finished, the method (the default method in this case), which was last active before the instrument was shutdown, is activated:
 - All heated zones will be set at 30°C.
 - The Detector filaments will be set to OFF.

If your system is supplied with a DMD (Differential Mobility Detector) detector all settings are factory installed. The complete DMD method for the instrument (customer) specific application is tested and installed inside the DMD.

INSTRUMENT OVERVIEW

FRONT VIEW



BACK VIEW

VENTS



CAUTION

It is possible to connect long vent lines to these fittings in order to safely guide hazardous fumes to a fume hood or other appropriate vent.

DMD CONNECTOR

In DMD channel used as connector for transport gas.

[See here for more details on page 8](#)



CARRIER 1 CONNECTOR

Carrier gas input connector
[See here for more details on page 17.](#)

POWER CONNECTOR

Power IN connector (male).
[See here for more details on page 22](#)

INSIDE VIEW

Open the cover and the cable connectors will be visible.

ASSIGN IP-ADDRESS BUTTON

Holding down this button during power-up will set the "assign IP-address mode"
See [Assign new IP address on page 70](#)

ETHERNET

Ethernet RJ45 connector for Ethernet installations.
[See here for more details on page 60](#)

COM 2 & COM 3

Optional RS232 (2-wire) and RS485 (4-wire)- communication interface, only available if Combo card is present.
[See here for more details on page 39](#)

COM 1

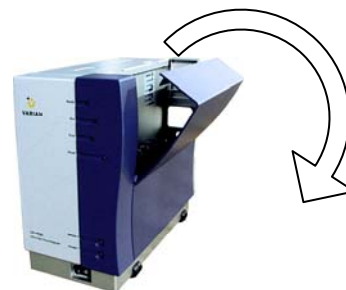
RS232-communication interface.
[See here for more details on page 39](#)

ANALOG I/O

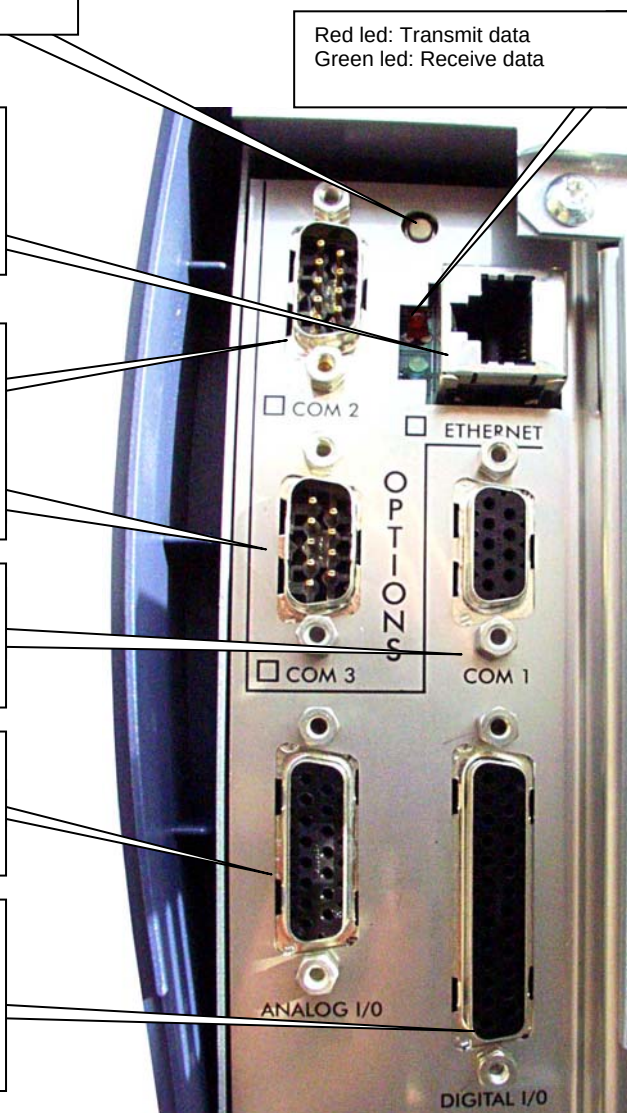
External Analog I/O signals.
[See here for more details on page 40](#)

DIGITAL I/O

Digital in and output signals, like start_stop, ready_out, start_in and much more.
[See here for more details on page 38](#)



Red led: Transmit data
Green led: Receive data



CARRIER GAS CONNECTION

The carrier gas line is connected from a carrier gas connection to the CP-4900 Micro-GC at the rear panel **CARRIER GAS 1 or 2** port.



Do not use any kind of plastic tubing since air will diffuse through the tubing, which may cause noisy baselines and decreased sensitivity. The metal tubing should be clean for GC use. Buy either flamed or chromatographically clean tubing.

Specifications for the carrier gas used on CP-4900 Micro-GC:

Pressure:	550 ± 10 % (80 ± 10 %)
Purity:	99.995% minimum
Dry and free of particles:	CP-Gas Clean filters are recommended

CP-Gas Clean filters are recommended to remove any traces of moisture and oxygen. For low-level analysis a better grade of carrier gas should be considered. The type of analysis you want to perform determines the type of carrier gas used. The difference between the relative thermal conductivity of the carrier gas and the sample components should be as high as possible. Refer to the table for several relative thermal conductivities.

Hydrogen	47.1	Ethane	5.8
Helium	37.6	Propane	4.8
Methane	8.9	Argon	4.6
Oxygen	6.8	Carbondioxide	4.4
Nitrogen	6.6	Butane	4.3
Carbon monoxide	6.4		



Your CP-4900 Micro-GC is configured either for carrier gas He (or H₂) or it is configured for N₂ (or Ar). Make certain that the carrier gas selection in the controlling Workstation corresponds to the carrier gas connected to your CP-4900. Use carrier gas corresponding this configuration. Changing type of carrier gas must only be carried out using the mandatory procedure in the [Workstation software on page 74](#)



If you are using hydrogen as carrier gas, pay particular attention to possible leaks at connections inside and outside the CP-4900 Micro-GC (use an electronic Leak Tester).



CP-Gas Clean filters are filled with nitrogen. If you are not using nitrogen as the carrier gas, flush filters and gas lines after installation of a new filter.

SAMPLE GAS

The CP-4900 Micro-GC is an analyzer built for the analysis of gases and vapors only. You are advised to prepare a non-condensing gaseous samples standard sample for routine check up of the instrument. Sample pressure should be between 0-100 kPa (0-15 psi), the temperature between 0 and 40°C $\pm$ 5°C of the analyzer ambient temperature and it must be filtered, preferably through a 5 μ m filter. Varian, Inc. ALWAYS recommends the use of the external filter kit part number CP736729. Click here for more [details about the heated sample line on page 20](#).



WARNING

Liquids will seriously damage the instrument and should be avoided!

Handling a sample

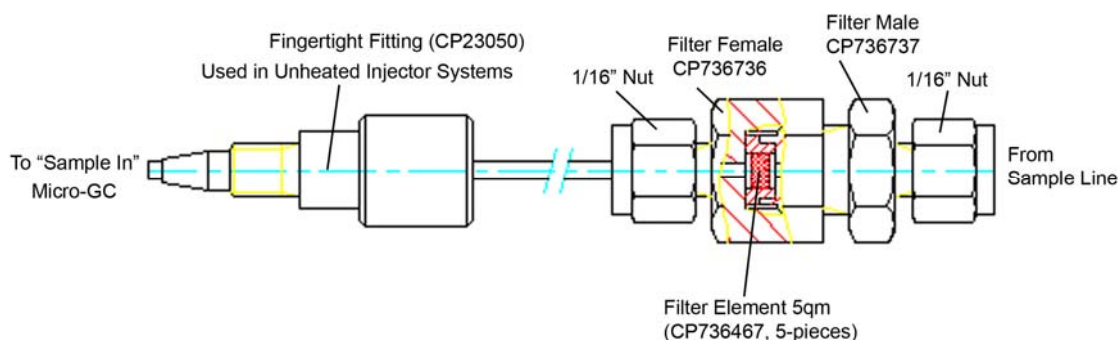
If possible, filter and dry the sample before introducing it to the Micro-GC. It is advised to use an External Sample Filter Unit between the injector and the sampling device. The Filter, male must be hand tightened into the Filter Female, followed by a 1/8th turn with a 7/16" wrench. The arrow on the Filter Female should be directed towards the Fingertight Fitting. [Replace the External Filter Unit on page 11](#) at regular intervals.



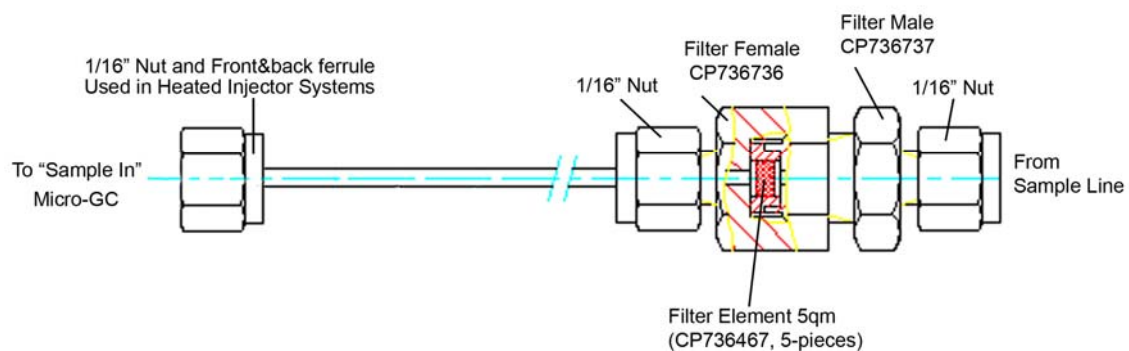
NOTE

Whenever possible remove moisture from samples introduced to the CP-4900 Micro-GC.

Unheated Injector Systems



Heated Injector Systems



HEATED SAMPLE LINE

A heated sample line is always combined with a heated injector.

A heated injector and sample line is an option for a channel unit and is chosen in case condensable samples need to be analyzed and condensation in the sample lines needs to be prevented.

The heated sample and injector can be controlled between 30°C and 110°C (see also [CP-Maitre Elite](#) on page 98 Workstation).

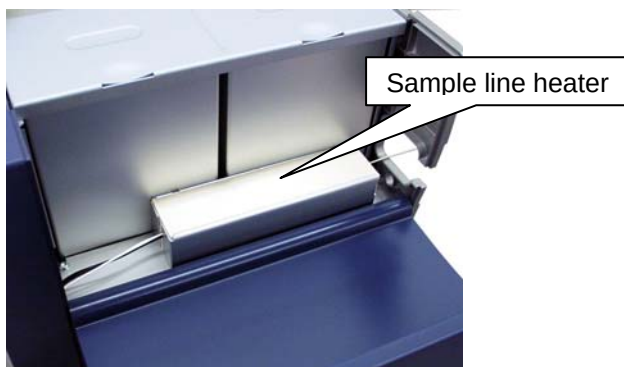
Connect a heated sample line



WARNING

Before connecting a heated sample line, allow the sample line heater to cool down to ambient temperature. The metal surfaces of the sample line heater are very hot and could burn your skin.

- Open the side panel, the heater will be visible.



- Remove the insulation.



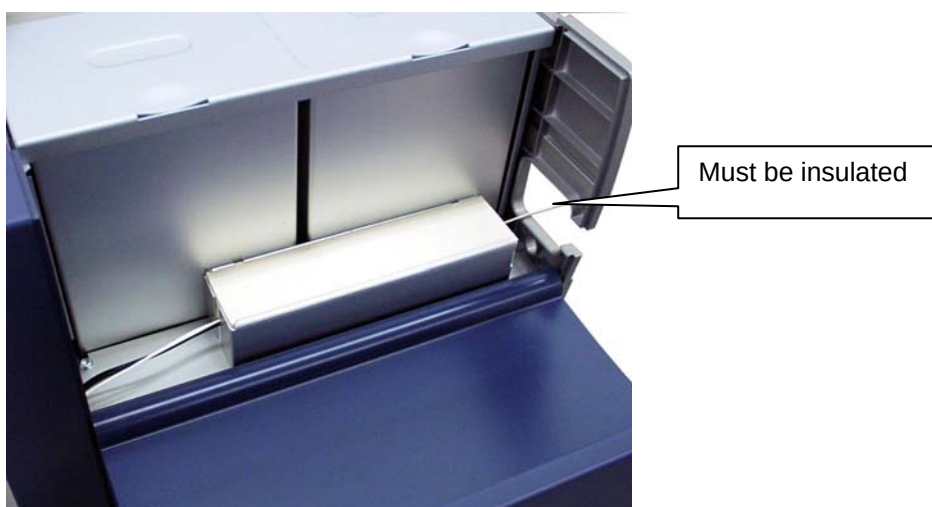
- The sample line connector will be visible.



- Connect the sample line.



Insulate the sample line coming into the CP-4900, this to prevent damage to the in/out coming cables.



POWER

The CP-4900 Micro-GC requires 12.0 VDC, 130W maximum.
Refer to the User manual power supply for more information part number CP501267.



Only use the power supply that has been supplied with the instrument.

SHUT DOWN PROCEDURE



**When the instrument is shut down for more then a few days please,
carry out the procedure mentioned below**

Create a method for all channels with the following settings:

- Filaments switched OFF.
- Column temperature set at 30°C.
- Injector temperature set at 30°C.
- Pressure set at 50 KpA.
- Wait until the temperature of the column and injector is < 40°C (to protect the column), before switching off the Micro-GC.
- Remove the carrier gas tubing and plug all the vents/carrier gas connections with 1/8" brass nut or plastic cap.
- When the instrument is going to be used again then follow the procedure [on page 23](#)

LONG STORAGE RECOVERY PROCEDURE



Follow the recovery procedure below if your CP-4900 Micro-GC has been stored for a long period of time

- Remove the 1/8" brass nuts & plastic caps from all the vents/carrier gas connections.
- Connect carrier gas tubing and apply pressure on the CP-4900 Micro-GC, according the pre-installation requirements.
- Wait, at least 10 minutes, before switching ON the Micro-GC.
- Check immediately if the detector filaments are switched OFF, switch OFF if necessary (see [Method_setup on page 90](#) for more details).
- Set the column(s) temperature to the maximum allowed temperature (160 °C or 180 °C depending on the column module).
- Condition the column module, preferably overnight. This will ensure that all the water has been removed from the column module and no damage will occur to the TCD filaments.

INITIAL OPERATION

A test method has been provided. This method has been designed to determine if the instrument is functioning properly and comes together with test chromatograms on which the test conditions are stated.



If you ordered a Molsieve column, make sure it is conditioned before use. See [conditioning_Molsieve_columns on page 31](#) for parameters.

INITIAL RUN

SETTING UP THE TEST METHOD

To enter the method parameters, refer to the [method set-up portion on page 90](#) of the data-handling package manual.

Send the instrument parameters from the data-handling package software to the Micro-GC. You can watch the CP-4900 Micro-GC status in the [instrument status tab on page 85](#).

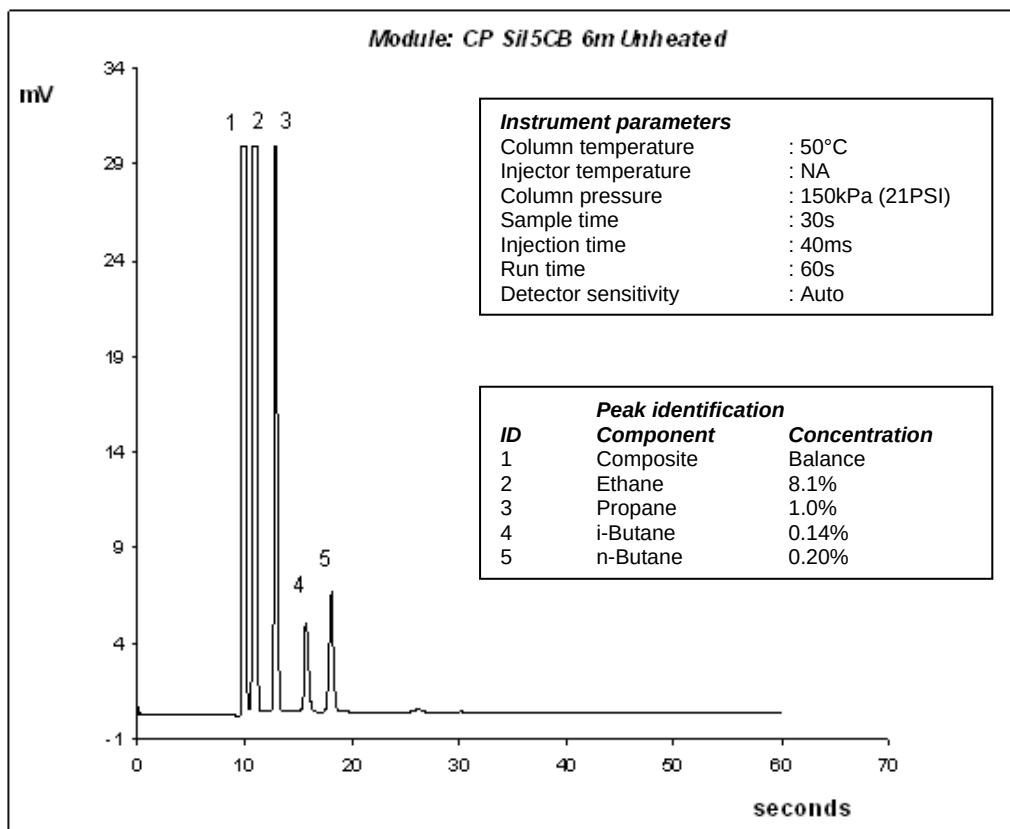
INJECTING THE SAMPLE

Connect the sample by means of a 1/16" line to the CP-4900 Micro-GC. You are advised to put an external 5 μ m filter between the sample and the CP-4900 Micro-GC for additional filtering (see [Sample Gas on page 18](#) for more details).

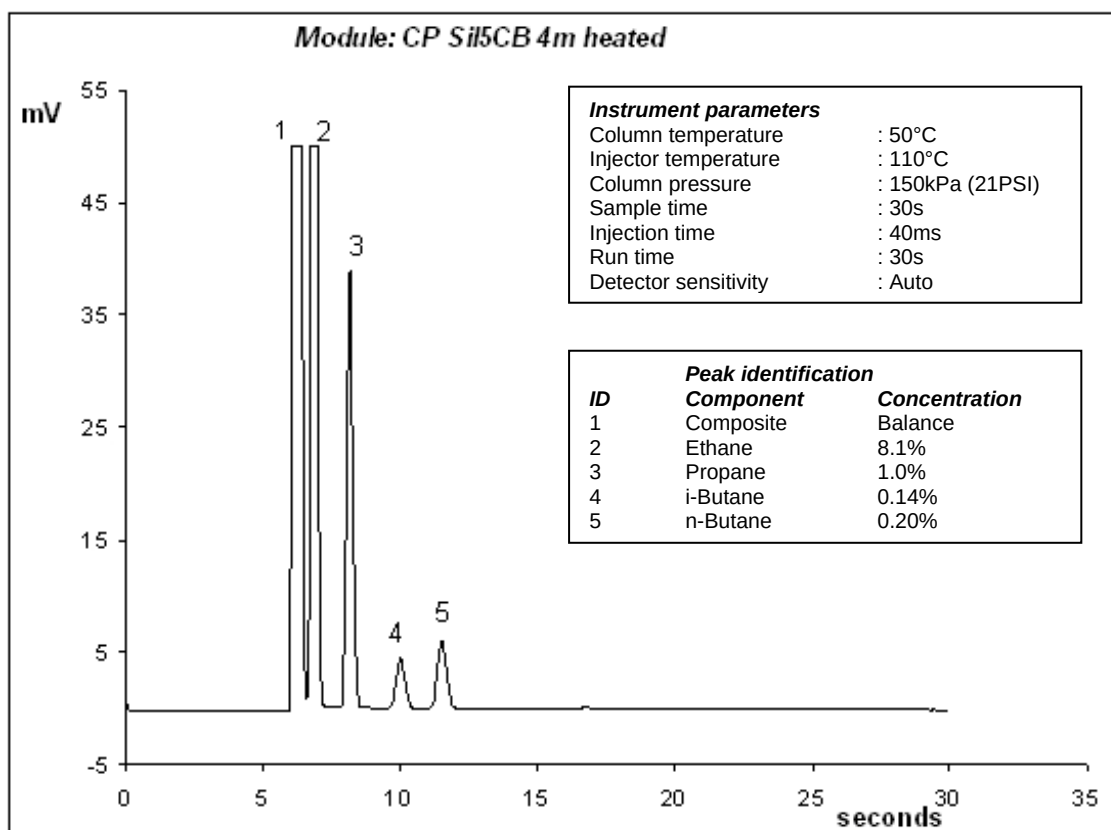
Press the START button to begin analysis.

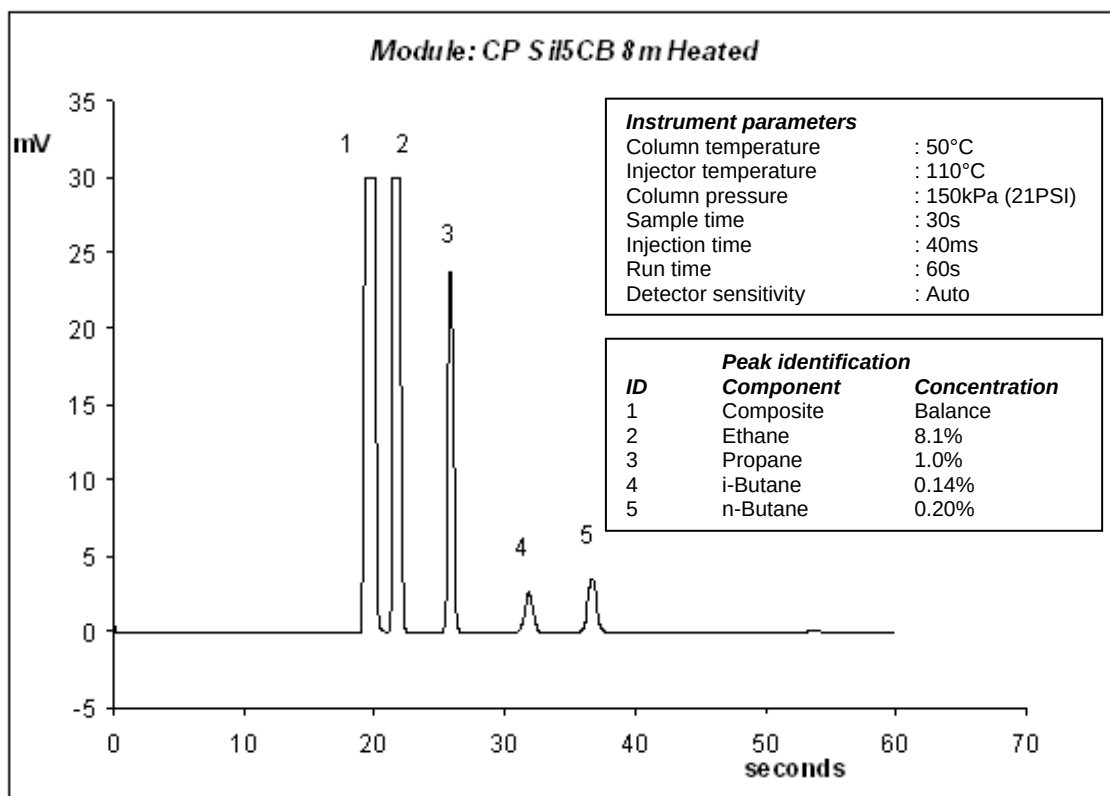
Following are a few results on commonly used columns. CP-Sil 5 CB and CP-Sil 19 CB, HayeSep A and Molsieve. The sample is natural gas, which provides a convenient standard for testing the instrument in any configuration of these columns.

N ₂	0.77 %	Nitrogen
CH ₄	89 %	Methane
C ₂ H ₆	8 %	Ethane
C ₃ H ₈	1 %	Propane
IC ₄ H ₁₀	0.14 %	Isobutane
NC ₄ H ₁₀	0.2 %	N-butane
IC ₅ H ₁₂	0.007 %	Isopentane
NC ₅ H ₁₂	0.001 %	N-pentane

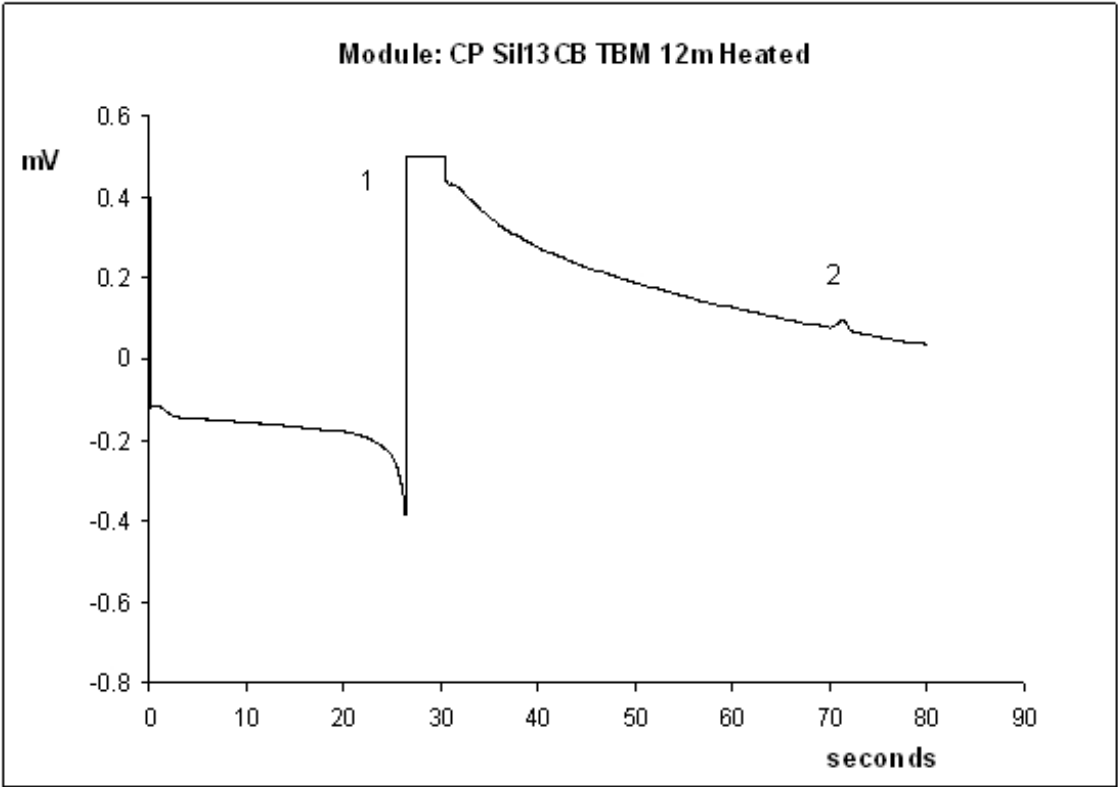
COLUMN CP-SIL 5 CB 6 METER UNHEATED

The natural gas components, mostly hydrocarbons, separate in the same order on the non-polar and medium-polar CP-Sil CB columns. Nitrogen, methane, carbon dioxide, and ethane are not separated on these columns. They produce a composite peak. For separation of these components a HayeSep A column is advised.

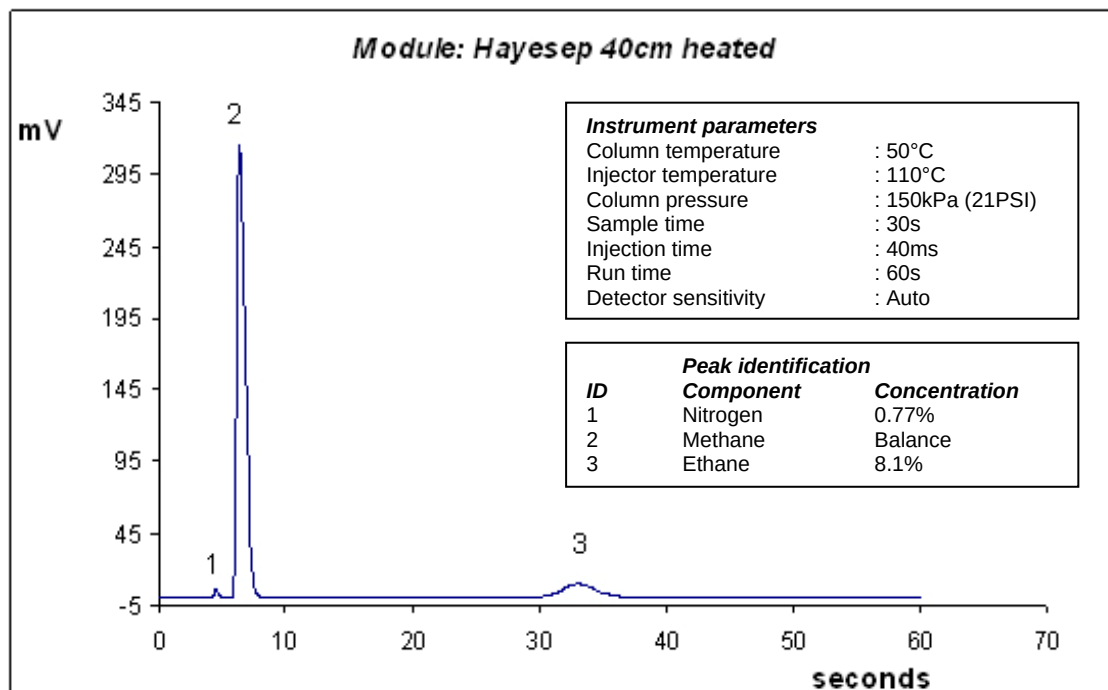
COLUMN CP-SIL 5 CB 4 METER HEATED

COLUMN CP-SIL 5 CB 8 METER HEATED

COLUMN CP SIL13CB TBM 12 METER HEATED



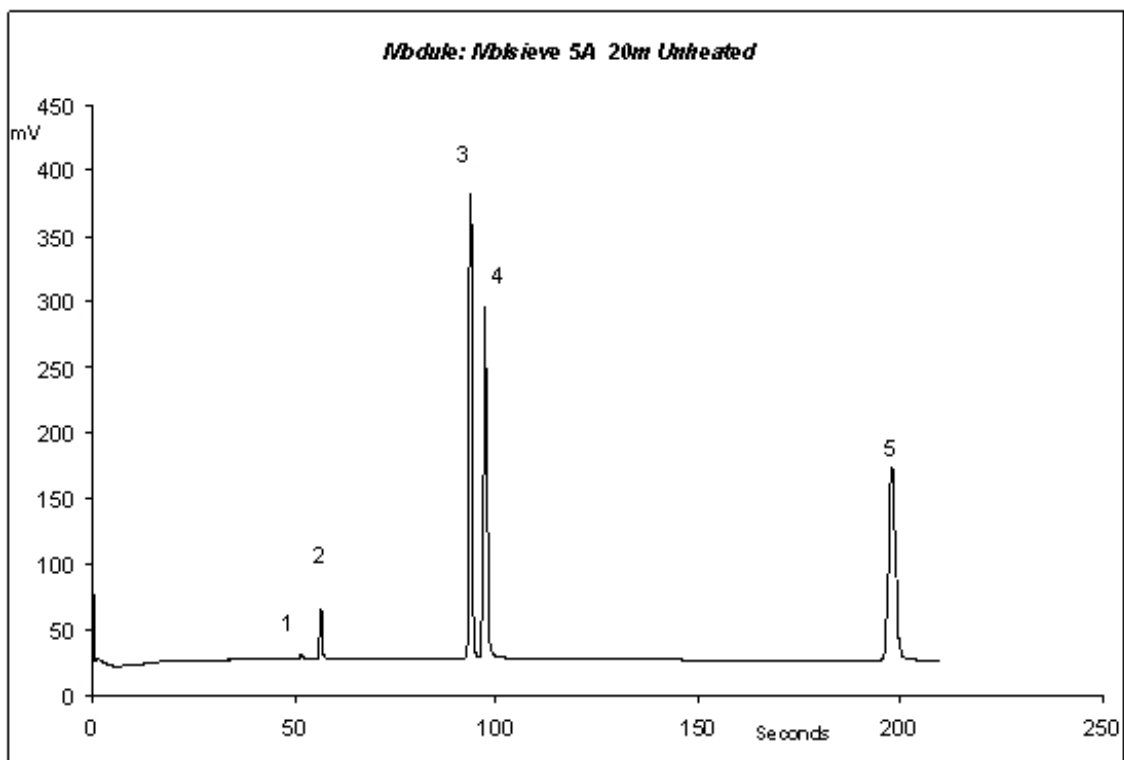
Instrument parameters		Peak identification		
Column temperature	: 40°C	ID	Component	Concentration
Injector temperature	: 50°C	1	Methane	Balance
Column pressure	: 250kPa (38PSI)	2	TBM	6.5ppm
Sample time	: 30s			
Injection time	: 255ms			
Run time	: 80s			
Detector sensitivity	: Auto			

COLUMN HAYESEP 40CM HEATED

The HaySep A column separates oxygen, methane, carbon dioxide, ethane, acetylene, ethylene, and selected sulfur gases. Nitrogen coelutes with oxygen. Components with a higher molecular weight than propane have long retention times on this column.



Maximum allowable column temperature: 160 °C

COLUMN MOLSIEVE 5Å 20 METER UNHEATED**Instrument parameters**

Column temperature	: 40°C
Injector temperature	: NA
Column pressure	: 200kPa (28PSI)
Sample time	: 30s
Injection time	: 40ms
Run time	: 210s
Detector sensitivity	: Auto

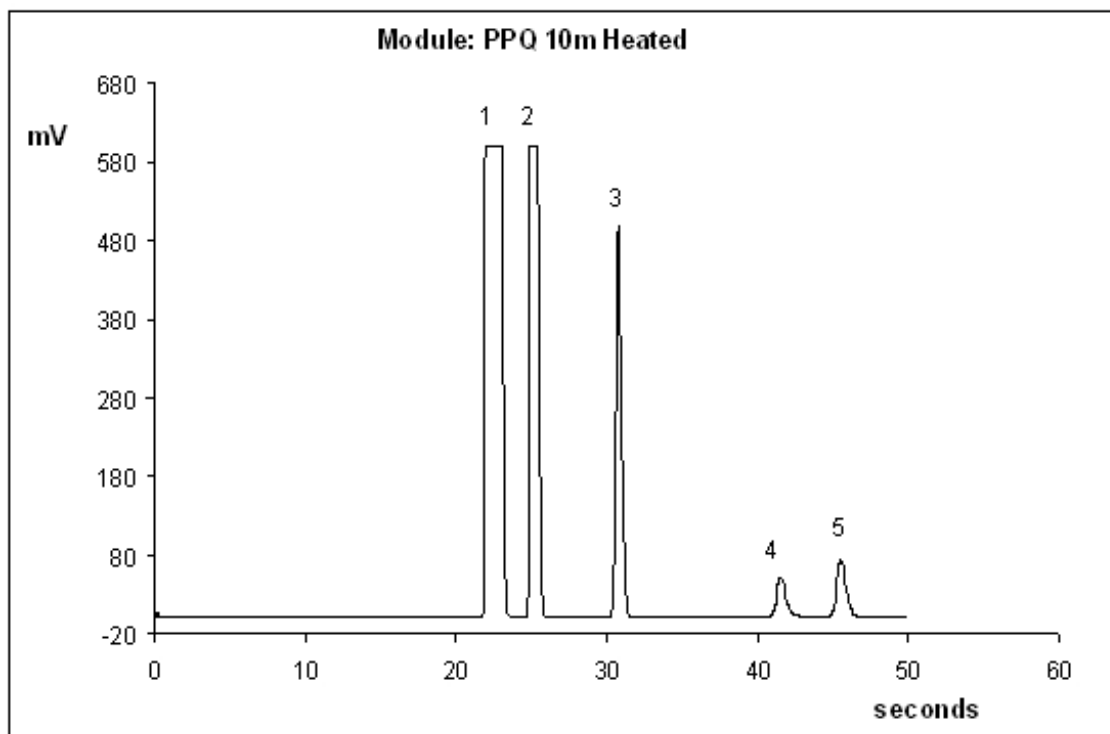
Peak identification

ID	Component	Concentration
1	Neon	18ppm
2	Hydrogen	1.0%
3	Argon	0.2%
4	Oxygen	0.2%
5	Nitrogen	0.2%

The Molsieve 5Å column is designed to separate: hydrogen, carbon monoxide, methane, nitrogen, oxygen, and some noble gases. Higher molecular weight components have much higher retention times on this column.

Conditioning of Molsieve columns

On a properly activated column nitrogen and oxygen will be very well separated. However, in time you will find that these two peaks will start to merge together. This is caused by water, present in the sample or carrier gas, adsorbing to the stationary phase. To restore the columns efficiency it will suffice to raise the oven temperature to 180 °C (max. column oven temperature) and, with the normal operating pressure on the column head, leave it to condition for about an hour. You are advised to switch the detector filaments off during this period. After reconditioning you can test the column performance by injecting plain air. If you have a proper separation between nitrogen and oxygen again the column separation power has been restored. If the CP-4900 Micro-GC's frequency of use is very high, you might adopt a standard reconditioning procedure of leaving the instrument with the oven temperature at 180°C overnight. The longer the re+onditioning period the better the column performance without damage.

COLUMN PPQ 10 METER HEATED**Instrument parameters**

Column temperature	: 150°C
Injector temperature	: 110°C
Column pressure	: 150kPa (21PSI)
Sample time	: 30s
Injection time	: 40ms
Run time	: 50s
Detector sensitivity	: Auto

Peak identification

ID	Component	Concentration
1	Composite	Balance
2	Ethane	8.1%
3	Propane	1.0%
4	i-Butane	0.14%
5	n-Butane	0.20%

REFERENCE

INSTRUMENT DESCRIPTION

CARRIER GAS

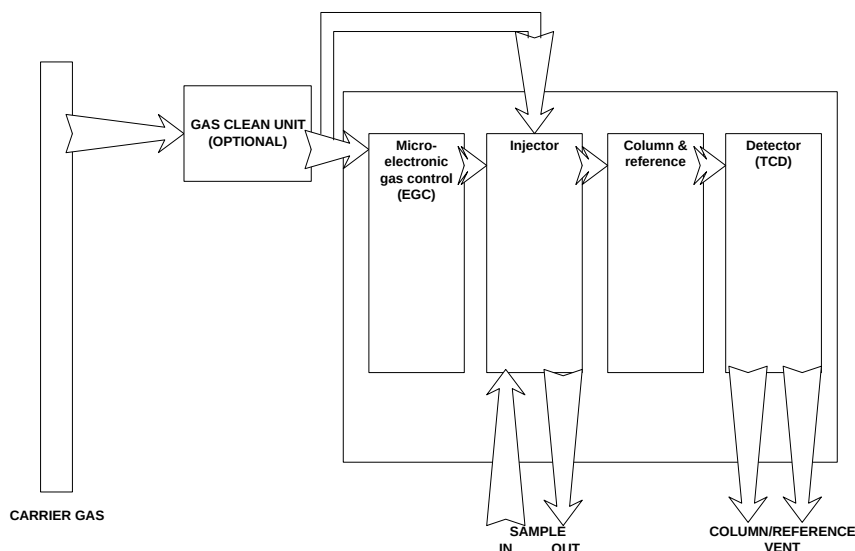
The Varian, Inc. CP-4900 Micro-GC is configured for the use with either He (or H₂) or N₂ (or Ar).

Having chosen one option definitely rules out the use of the other without the instrument undergoing internal changes prior to any switching of carrier gas type.

It is recommended to use gases with a minimum purity of 99.995%. Since the injection valve is operated pneumatically, there is a limit of 550 ± 10 % (80 ± 10 %) to the main gas supply.



Your CP-4900 Micro-GC is configured either for carrier gas He (or H₂) or it is configured for N₂ (or Ar). Use the carrier gas type, for which your instrument is configured, otherwise the detector filaments can be damaged.



MICRO ELECTRONIC GAS CONTROL (EGC)

The CP-4900 Micro-GC has built-in Micro EGC regulators that can be adjusted to get a constant or programmed pressure control, which result in a constant or programmed flow through the injector, column and detector. The pressure range of the Micro EGC is between 50-350 kPa (7 - 49 Psi). This pressure sets a continuous flow of carrier gas of about 0.2-4.0 mL/min.

A typical pressure rise is 200 kPa/min, which will give a significant pressure increase during the run, without excessive baseline disturbance. In most cases baseline subtraction may improve the quality of chromatograms that suffer from baseline drift.

INJECTOR

The injector has a built-in 10 μ L sample loop that is filled with the gaseous sample. The pressure of the sample should be between 0-100 kPa (0-15 psi) and the sample temperature within 5-40 °C $\pm$ 5 °C of the analyzer.

By activating the START option within the data-handling package, a vacuum pump will draw the gas sample through the loop and then the injector will inject the gas sample from the sample loop into the gas stream. The minimum pressure required by the injector is 550 $\pm$ 10 % (80 $\pm$ 10 %). A typical injection time is 40 milliseconds (ms). This equals an average injection volume of 200 nL. Injection time will be rounded to a multiple of 5 ms. A practical minimum value is 40 ms.



In most cases a value of 0 - 20 milliseconds will result in no injection.

COLUMN

A variety of column configurations are possible on the CP-4900. The columns you require for your specific analysis have been installed at our factory. Other configurations are, of course, possible, but changing the column modules is a delicate matter that can only be handled by one of our service engineers. Table I shows several standard columns as supplied in the CP-4900 Micro-GC and selected applications. Other columns are available by contacting Varian, Inc.

Column	Main applications
Molsieve 5Å PLOT	Hydrogen (H ₂), oxygen (O ₂), nitrogen (N ₂), methane (CH ₄), carbon monoxide (CO), noble gases (Kr, Xe, Ne)
HayeSep A	Air, methane (CH ₄), carbon dioxide (CO ₂), ethylene (C ₂ H ₄), ethane (C ₂ H ₆), acetylene (C ₂ H ₂), natural gas
CP-Sil 5 CB	Can separate all components analyzed on the CP-Sil 19 CB stationary phases. Has higher capacity and is ideally suited for natural gas analyses.
CP-Sil 19 CB	Natural gas, vapors of common solvents, EPA volatile priority pollutants. Separation primarily by boiling point where the last eluting compound has the highest boiling point.
CP-WAX 52 CB	Polar compounds such as alcohol's. Separation based on polarity. Also for aromatic compounds

Table I **Some Varian, Inc columns and applications**



All columns except the HayeSep A and MES (TCEP) column can be used up to 180 °C, the maximum temperature of the column oven. The HayeSep A will deteriorate above 160 °C. Exceeding this temperature will cause the column to lose efficiency instantly and the column module will need replacement.

DETECTOR

TCD

The CP-4900 Micro-GC is equipped with a thermal conductivity detector (TCD). This detector responds to the difference in thermal conductivity between the carrier gas and the sample components. The construction of a TCD is such that the changing thermal conductivity of the carrier gas stream, due to components present, is compared to the thermal conductivity of a constant reference gas stream.

DMD

The Differential Mobility Detector, DMD, is fully integrated into a CP-4900 Analytical channel.

Differential Mobility Detection is an advanced form of Ion Mobility Spectroscopy (IMS). It uses a drift tube under atmospheric and thermally constant conditions. See for more details chapter [The difference mobility detector on page 42](#).

IN/OUTPUTS

The CP-4900 Micro-GC has several in/output ports accessible inside the instrument for interfacing with external devices.

Open the cover.



At the front of the CP-4900 Micro-GC, the external device connectors will be visible.

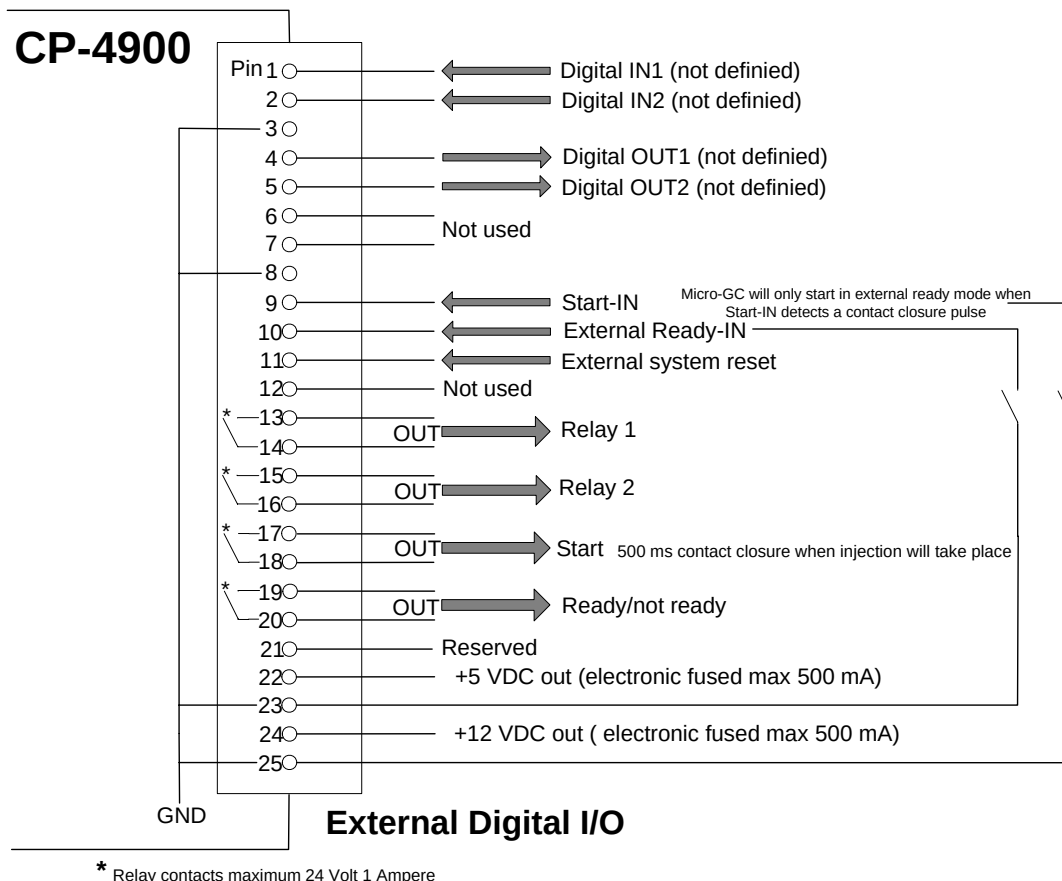


NOTE

Close the cover after connecting the cables!

EXTERNAL DIGITAL I/O

Connection between CP-4900 Micro-GC and external devices is made with the appropriate cable to the External Digital I/O port (see also [External devices on page 117](#)).



Ready/not ready signal

The Instrument Ready/not Ready output will follow instrument status (Ready LED in the front of the instrument).

Difference between Workstation Software packages, [click here on page 41](#).

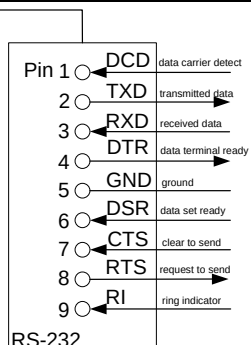
COMMUNICATION PORTS (COM)

CP-Maître Elite workstation is a software package for data collection and CP-4900 Micro-GC control. All instrument parameters can be adjusted from CP-Maître Elite workstation. The instrument communicates serially with the computer via an RS-232 port (COM1) accessible inside the instrument. (see also [Serial communication on page 59](#)).

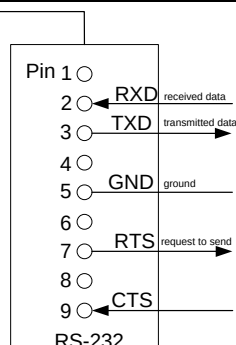
In the table below an overview is given of the communication possibilities.

Function	Standard (without I/O-card)	Optional COM-card placed	Optional Ethernet-card placed	Optional COMBO-card placed
COM1	RS-232-interface	RS-232-interface	RS-232-interface	RS-232-interface
COM2	-	RS-232-interface	-	RS-232-interface
COM3	-	RS-485-interface	-	RS-485-interface
Ethernet	-	-	10Mbit	10Mbit
Video output	-	-	-	VGA (not used)

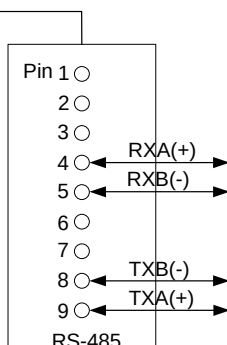
COM 1



COM 2



COM 3

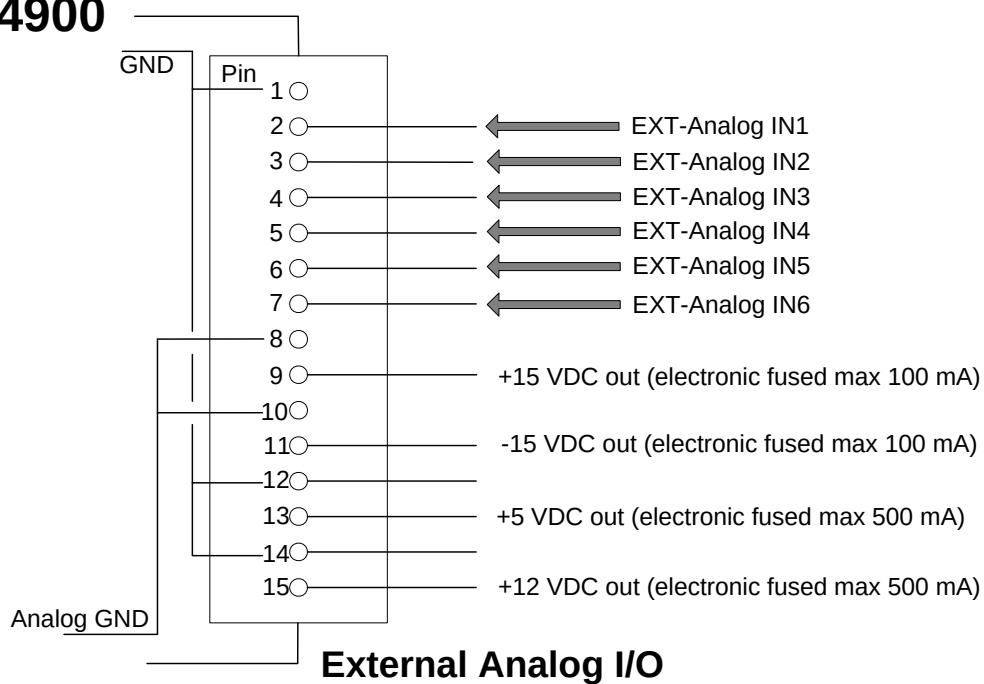


Difference between Workstation Software packages, [click here on page 41](#).

EXTERNAL ANALOG I/O

This external analog I/O port can handle six (6) analog inputs (input 0-10 Volt)
The User Interface receives this analog information, and translates this information into actions to be taken by the local user interface and/or events/data to be shown/stored in the remote user interface (see also [External devices on page 117](#)).

CP-4900



DIFFERENCE BETWEEN WORKSTATION SOFTWARE PACKAGES

	CP-Maitre Elite	Galaxie
Communication	Ethernet and RS232	Ethernet only
IP Settings	BootP/RS232	BootP/RS232
Com-1	RS232	Not available
Com-2	Stream selection on Com-2	Stream selection on Com-2 *
Com-3	Not available	Not available
Analog I/O	Capturing	Not available
Digital I/O	External start in: Yes External Ready: Yes	External start in: Yes External Ready: Yes
Relay Control	Timed Relay: Yes Alarm Relay: Yes Extension Box: Yes	Timed Relay: Yes Alarm Relay: Yes Extension Box: No

* Only one Vici valve possible in Galaxie

THE DIFFERENTIAL MOBILITY DETECTOR

GENERAL



**WARNING:
RADIATION SOURCE**

This detector contains a Ni^{63} beta-emitting radioactive isotope plated onto a metallic foil for ionization of the carrier gas.

For details about procedures governing the handling, leak testing, repair, storage, shipping and maintenance of records for the Ni^{63} DMD detector as a radioactive sealed source please refer to the Ni^{63} Radiation Safety Manual.

General functionality

Varian has extended its CP-4900 Micro Gas Chromatography product line with a new detector. The Differential Mobility Detector, DMD, integrated into the CP-4900 chassis is a joint development of Sionex Corporation and Varian Instruments.

Differential Mobility Detection is an advanced form of Ion Mobility Spectroscopy (IMS). It uses a drift tube under atmospheric and thermally constant conditions. The advantage over IMS is that DMD uses additional sets of RF modulation voltages, which results in selective performance, which is tuneable depending on the compounds of interest and the matrix.

Ions generated by a Ni^{63} radioactive ionization source are transported through a drift tube by means of a high velocity transport gas, usually Zero-Air or Nitrogen. The drift tube basically consists of two parallel plates, approximately 500 microns apart. Over these plates a RF modulated electric field is applied by setting a fixed Voltage of 2-500 Volts/cm and a Scanning Voltage (or Compensation Voltage). The RF modulation frequency is 1.3 Megahertz.

Isolation results from the interaction between the ion and the net applied field that alternates between high and low electric field strength. Trajectory of the target ions will be tuned so that the ions of interest straight through the filter without colliding with the electrode plates, when they would be neutralized and not detected. The Compensation Voltage is used for 'tuning' the trajectories of ions in order to get the 'desired' ions towards the detector.

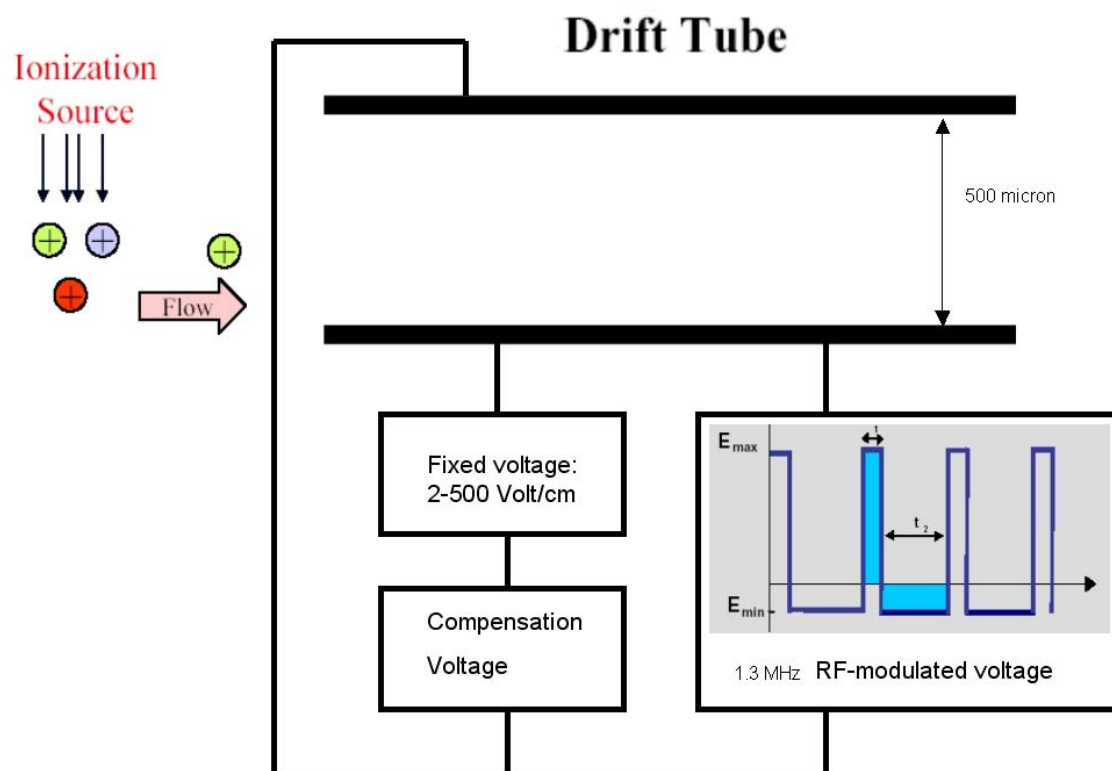


Figure: DMD set-up showing different voltages applied.

As illustrated in Figure 1, the net voltage applied results from three independent settings:

1. A fixed voltage, or RF-Voltage,
2. A scanning voltage, also referred to as Compensation Voltage,
3. A RF modulated voltage.

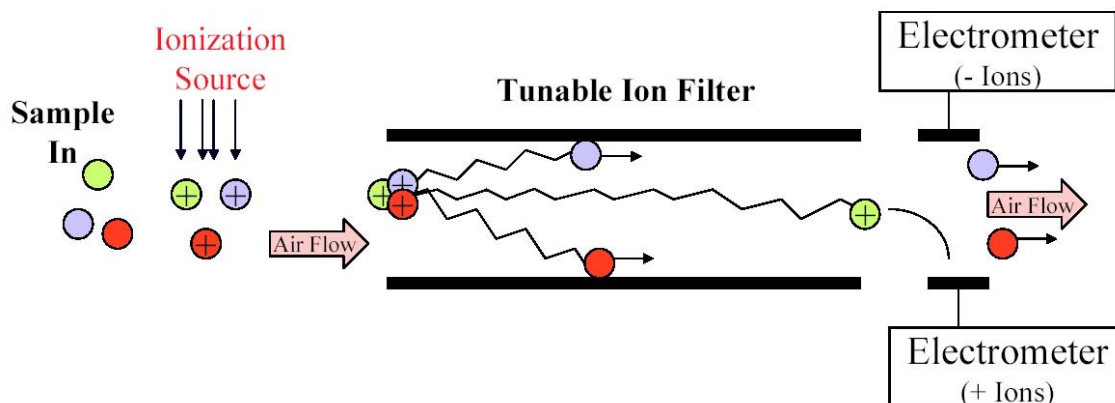
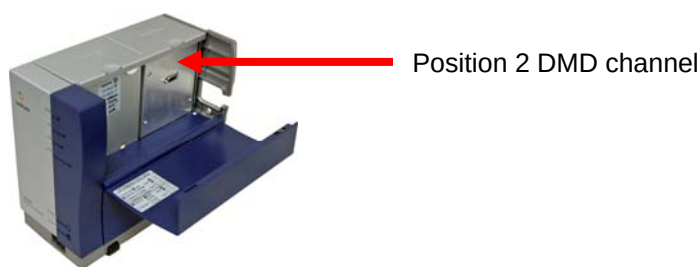


Figure 2: Separation principle of DMD

As illustrated in Figure 2, the DMD is equipped with two detectors, one for positive ions and one for negative ions. Yet, the data produced by the DMD show a 'normal' two-dimensional representation as the system will be 'tuned in time' to detect certain species by setting compensation voltages to accommodate transmission of the compound of interest in that particular part of the chromatogram. This 'time-segmented' detection thus leads to maximum selectivity for the application of interest as the matrix is eliminated. The application specific method is saved inside the DMD hardware.

CP-4900 Micro-GC DMD Channel

The DMD channel is always located in the last position (against the backpanel)



The CP-4900 firmware recognises the DMD channel as a detector only, and automatically sets the controls accordingly.

A complete instrument, the CP-4900 DMD consists of a basic cabinet, a column module with its pneumatic system, its standard μ -TCD and an additional DMD. The standard channel's μ -TCD output is in series with the DMD inlet via a heated transfer line. The temperature of this heated transfer line is controlled from the DMD electronics.

From a control point of view, the DMD has no control of a column temperature or column head pressure or the optional injector temperature as needed for the GC channel. No carrier gas type needs to be selected in the configuration. Furthermore, the DMD method is factory tuned and ready to perform the appropriate application. This requires the Micro-GC method to be identical throughout its use with respect to chromatographic column and settings.

GENERAL OPERATION

Within the workstation package, the DMD will be handled as a separate channel. With respect to the operation of the DMD note the following:

- In instrument configuration, selection of carrier gas type and heated injector has been removed.
- In method development for the DMD channel, GC-channel specific information has been left out. Instead, the Transfer line temperature and the detector tuning capabilities are added.
- In instrument status for the DMD channel, GC-channel specific information has been left out. Instead, the Transfer line temperature and the detector tuning capabilities are added.

Tuning the DMD

The complete DMD method for the instrument specific application has been tested and is loaded inside the DMD. Generally no modification or changes are required in case the factory-supplied method is used throughout.

In case of a suspected misalignment of the method, where retention time or compensation voltage may be out of tune, a tuning run may be needed.

Please contact for more information your local Varian Inc. subsidiary or Varian, Inc. representative.

Networking Basics

This section will help you to understand networking in a global way.

THE NETWORKING MODELS

Peer-to-peer

- Also known as the Workgroup Model.
- Computers are referred to as Workstations.
- Workstations share one or more resources in a decentralized way.
- There are no servers in peer networking.
- Workstations are all equal on the Network.
- Easy and inexpensive to maintain.
- Ideal for the small lab, office with 2-10 computers.

Client/Server

- One or more Servers that run a Network Operating System (NOS).
- A NOS is a requirement for high volume or highly secure networks.
- Users must authenticate on the network before resources are made available.
- Difficult and expensive to maintain.
- Used for larger office networks 10+ Computers.

Different types of networks

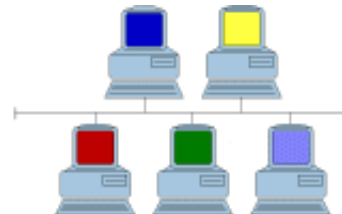
Star Topology

- Nodes are connected by branches.
- Central Device is usually a hub or Switch.
- Central Device controls the communication of each node.



Bus Topology

- All Nodes are connected to a central link.
- Information is placed upon the link by any given node.
- Sender and recipient information is broadcasted to all attached devices.



Ring Networks

- Known as "Token Ring" or "Passing Ring".
- The media forms a closed loop.
- Each node checks the data as it passes by.



DIFFERENT CABLE TYPES

The chosen cable type depends on the required distance, speed, interference and security.

Coaxial

- Single Copper connector enclosed by protective braided copper shield.
- Widest implementation is broadband access to cable TV.
- Must have a terminator at each end.



Coaxial RG-58

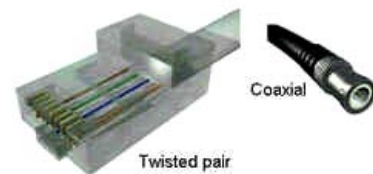
- 10Base2, also known as Thin-net.
- Maximum Speed is 10Mbps.
- Maximum Length is 185 meters.
- The Network card is usually directly connected to the 10Base2 cable with a T-Connector.
- T-Connector is also known as BNC (British Naval Connector).

Twisted Pair

- Flexible and easy to work with.
- 4 pairs of twisted wire inside a PVC or plenum Jacket.
- RJ45 connectors on each end.
- Plenum cable is recommended when running in ceiling or walls.



When connecting two nodes with a single twisted pair cable, it must have the transfer and receive lines crossed. This is referred to as a crossover cable.



There are several different categories of twisted pair, both unshielded (UTP) and Shielded (STP) - category 5 is recommended:

<i>Category</i>	<i>Cable type</i>	<i>Application</i>
1	UTP	Analog voice-telephone
2	UTP	Digital voice- 1 Mbps data
3	UTP/STP	16 Mbps data
4	UTP/STP	20 Mbps data
5	UTP/STP	100 Mbps data
6	UTP/STP	155 Mbps data (proprietary)
7	UTP/STP	1000 Mbps data (proprietary)

PROTOCOLS

A protocol is a set of rules that govern how computers send and receive information.

Different Types of Protocols:

AppleTalk, ATM, Banyan Protocols, CDPD, DECnet Protocols, Frame Relay, **GPRS**, H.323, IBM Protocols, **ISDN**, ISO Protocols, LAN Data Link Layer Protocols, MPLS, Novell Protocols, PPP Suite, Bridge/Router Internetworking Protocols, SNA, SS7, Suite Sun Protocols, Tag Switching Protocols, **TCP/IP Suite**, **UMTS Telephony**, V5, Voice over IP#(VoIP), WAP, X.25, XNS

The Internet Protocol Suite

- Developed to allow cooperating computers to share resources across a network.
- TCP and IP are the two best-known protocols in the Internet Protocol Suite.
- Other protocols / services are FTP, Remote Login (Telnet), Mail, SMTP.

IP Addresses

- Uniquely identify a computer on the Network / Internet.
- Are made up of four 8-bit numbers and each of these numbers are separated by a point.
- Each of the 8-bit numbers can represent a decimal value of 0-255.
- Each part of an IP address can only be in that range (e.g., 198.12.253.98).

The Internet protocol suite

Starting IP	Ending IP	Subnet Mask	Type
0.0.0.0	255.255.255.255	N/A	Public
10.0.0.0	10.255.255.255	255.0.0.0	Private
172.16.0.0	172.31.255.255	255.255.0.0	Private
192.168.0.0	192.168.255.255	255.255.0.0	Private

Note: never use 0.0.0.0. or 255.255.255.255

NETWORKING DEVICES (HUBS, SWITCHES, AND ROUTERS)

Hubs and switches are...

- Different types of network equipment that connect devices.
- Different in the way that they pass on the networking traffic they receive.
- Often used in one network where the hubs provide more ports, and the switch divides the network into smaller, less congested sections.

Hubs

- Pass on (repeats) all the information it receives to all other attached devices.
- Can be used to extend the network.
- Pass on traffic to the network regardless of the intended destination.
- Result in a lot of redundant and unnecessary traffic sends across a network.
- Ideal for smaller networks (less than 30 devices).



Switches

- Control the flow of network traffic based on the address information in packets.
- Learn which devices are attached to its ports switches. This allows simultaneous connections across the switch improving speed.
- Reduces the amount of unnecessary traffic.
- Is in fact a “Smart” device, which is able to learn.
- Is a necessity when networks get larger (more than 50 users).



Routers

- Connect different networks together.
- Used to provide a link between networks with different physical connections (cables).
- Provide a link between networks with a different logical connection (protocols).
- Consist of at least two network interface cards.
- Don't have to be a black box, but could also be a regular PC with routing software.



CP-4900 MICRO-GC AND NETWORKS

Network Requirements of the CP-4900 Micro-GC

- Customer Cable type should be Cat3 or Cat5 UTP / STP.
- Customer network should comply with Standard Ethernet (IEEE 802.3).
- The network must have either 10BASE-T or 10/100BASE-TX compatible HUB or Switch.
- TCP-IP should be used on the network.

FAQ (FREQUENT ASK QUESTIONS)

Q: Can I connect the Micro-GC to my Network?

A: Yes, if the network is standard Ethernet and uses TCP-IP with UTP cabling.

Q: I'm using a DHCP server; can I use this to assign the GC with an IP-Address?

A: No, The GC works with static IP-addresses only, so an IP-address will have to be reserved on the DHCP server and marked as static.

Q: How do I assign the GC with an IP-address?

A: Connect the GC via a UTP crossover cable to the pc running Workstation software. Then define the network-settings, and restart the GC with the Service button pushed.

Q: Are the network settings saved if the GC is restarted, or with loss of power?

A: Yes, the Network Settings of the GC are stored in Flash Memory, and will not be erased at loss of power.

Q: Can I control my Micro-GC from anywhere in the world via the Internet?

A: Yes, if the customer network is designed for this, and has Internet access or remote access facilities (the ports 4900,4901 and 4902 must be open).

GLOSSARY OF NETWORK TERMS

The following brief glossary of terms may be useful:

BNC connector

This is a bayonet style connector used for a two-conductor style hardware connection. BNC connectors are used with the CP-3800 GC.

Crossover Cable

A cable is used to connect two, and **only two**, Ethernet devices together.

Domain

This is one of several settings that reside within the TCP/IP configuration that identifies paths that are used to establish connections with Ethernet devices. The Domain is an IP address.

Ethernet Address

This is a unique identifier that every Ethernet communication device has assigned to it. Typically, the Ethernet address cannot be changed and is the permanent way of identifying a particular hardware device. The Ethernet address consists of 6 pairs of hexadecimal digits.

Gateway

This is one of several settings within the TCP/IP configuration that identifies paths that are used to establish connections with Ethernet devices. The Gateway is assigned an IP Address.

Host name

The host name is an alternate way of identifying a device that is friendlier to people. Frequently the host name and the IP address may be used interchangeably.

Hub

A device that allows many Ethernet devices to be interconnected. Several hubs may be interconnected to increase the number of Ethernet connections. For 10Mbps/second network connections (10BaseT), no more than four (4) hubs may be connected in series. For 100M bits/seconds network connections (100BaseT), no more than two hubs may be connected in series.

IP Address

This is a unique number for each Ethernet device within the set of connected devices. Two PCs may have identical IP addresses so long as they are not interconnected to each other either through the Internet. The IP Address consists of a series of four sets of decimal numbers (between 1 and 255) that provide routing information used by the TCP/IP protocol to establish a reliable connection. Without the IP Address, communications would be bogged down trying to establish connections to Ethernet addresses at unknown locations.

Patch Cable

A cable that is used to connect Ethernet devices to hubs, switches, or your company network.

RJ45 Connector

This is a telephone jack style connector used for a Universal Twisted Pair (UTP) hardware connection for 10/100BaseT Ethernet connections.

RJ45-style connectors are used by the CP-4900 Micro-GC.

TCP/IP

An international standard protocol used by the Internet. We use this protocol for communication to the CP-4900 Micro-GC. You may find several network protocols, such as IPX/SPX and NetBEUI, installed on your computer.

Workstation software

CONTROL INSTRUMENT

The CP-4900 Micro GC is standard equipped with a RS232 port for [serial control on page 59](#) of the instrument.

[Ethernet control on page 60](#) (TCP/IP) is optional and requires an extra Ethernet card inside the CP-4900.

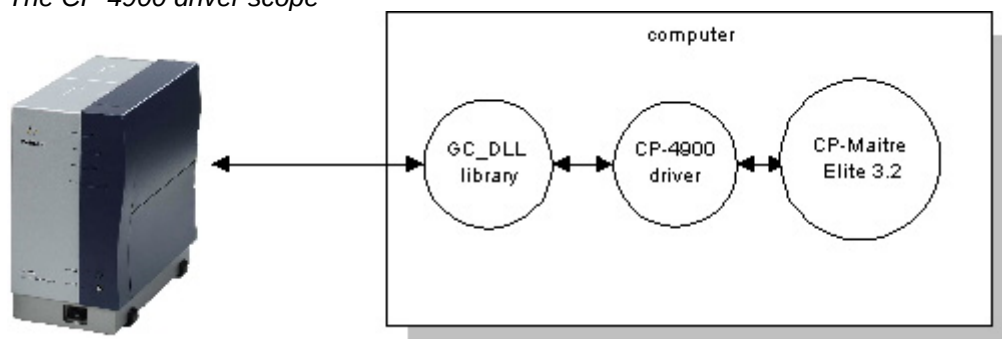
Even if the instrument is equipped with Ethernet it is possible to control the instrument serially. In that case the instrument will accept the first incoming connection type (serial or Ethernet) and will lock the other connection type. There can never be a connection on the two different ports at the same time.

CP-MAITRE ELITE

CP-Maitre Elite cannot control two CP-4900 micro GCs with different connection types. Multiple CP-4900s must be controlled serial or Ethernet, not a mixture of these two.

The maximum number of CP-4900s controlled by serial communication is two. For Ethernet this is limited by your license.

The CP-4900 driver scope



SERIAL COMMUNICATION

To control the CP-4900 Micro-GC via serial communication, just connect the serial cable (supplied with the instrument) to a free serial port of your computer configured as RS232, and plug the other side into port COM1 of the CP-4900 (see [Inside View on page 16](#)).



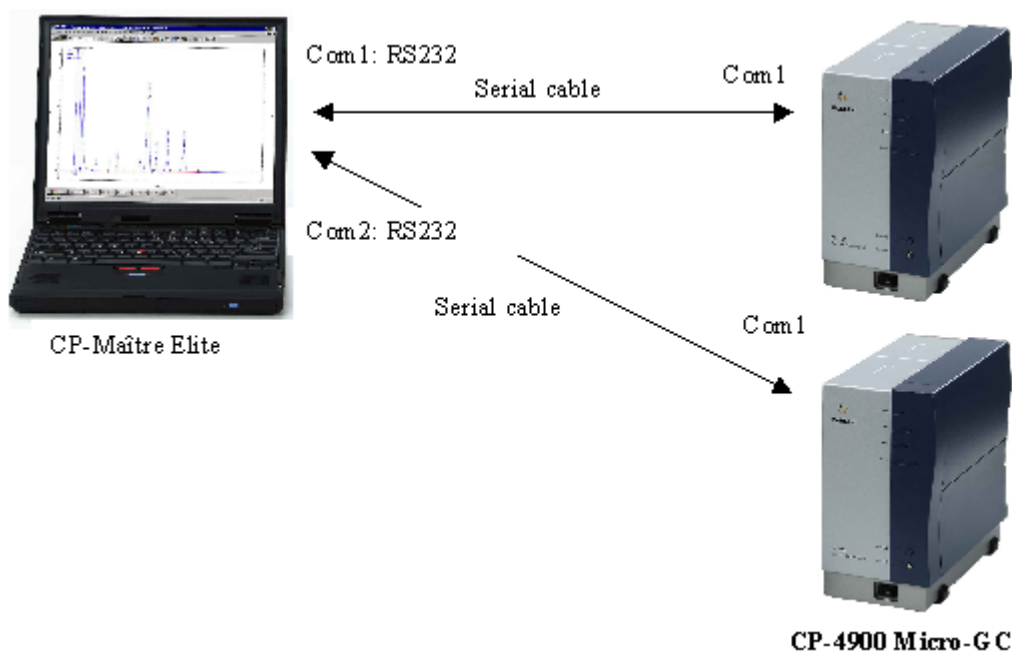
NOTE

Avoid cable lengths longer than 15 meter while this can cause communication problems due to high communication speed (baud rate 115200 bits/sec).



NOTE

The maximum number of CP-4900 Micro-GCs controlled by serial communication is two. Choose Ethernet communication in case more than two CP-4900s must be controlled by one computer or setup a second computer with CP-Maitre Elite installed. If RS485 is required, an RS232-RS485 converter (optional) must be used. RS485 is only possible via two RS232-RS485 converters, one on Workstation (computer) side and either one at CP-4900 side on Com1.



ETHERNET COMMUNICATION

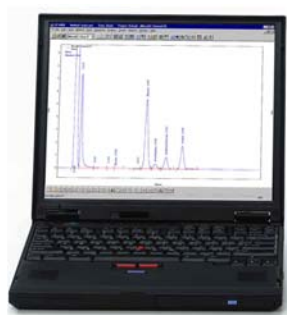
An Ethernet crossover cable (RJ-45 connector) is included with the Ethernet option. The crossover cable must be used to control the CP-4900 Micro-GC in a peer-to-peer communication (see [Inside View on page 16](#)).

This requires IP addresses in the same range for computer and Micro-GC. Only the most right IP segment must be different.

In case both the computer as well as the CP-4900 are connected to a (local) network this cable cannot be used for control of the Micro-GC.

However this crossover cable must be used if a new IP address has to be assigned to the Micro-GC. Once the IP address is assigned you can disconnect the crossover cable and connect computer and Micro-GC both to a (local) network.

Peer-to-peer: single instrument



Workstation

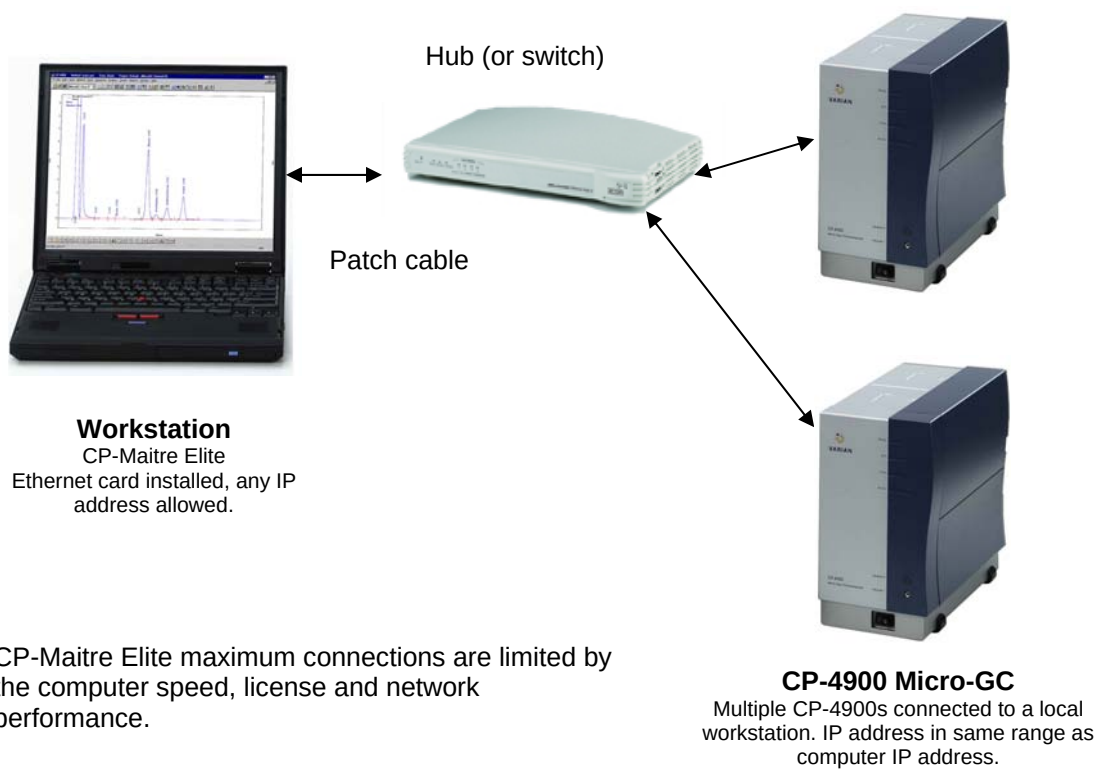
CP-Maitre Elite
Ethernet card installed, any IP
address allowed.

← Crossover cable →

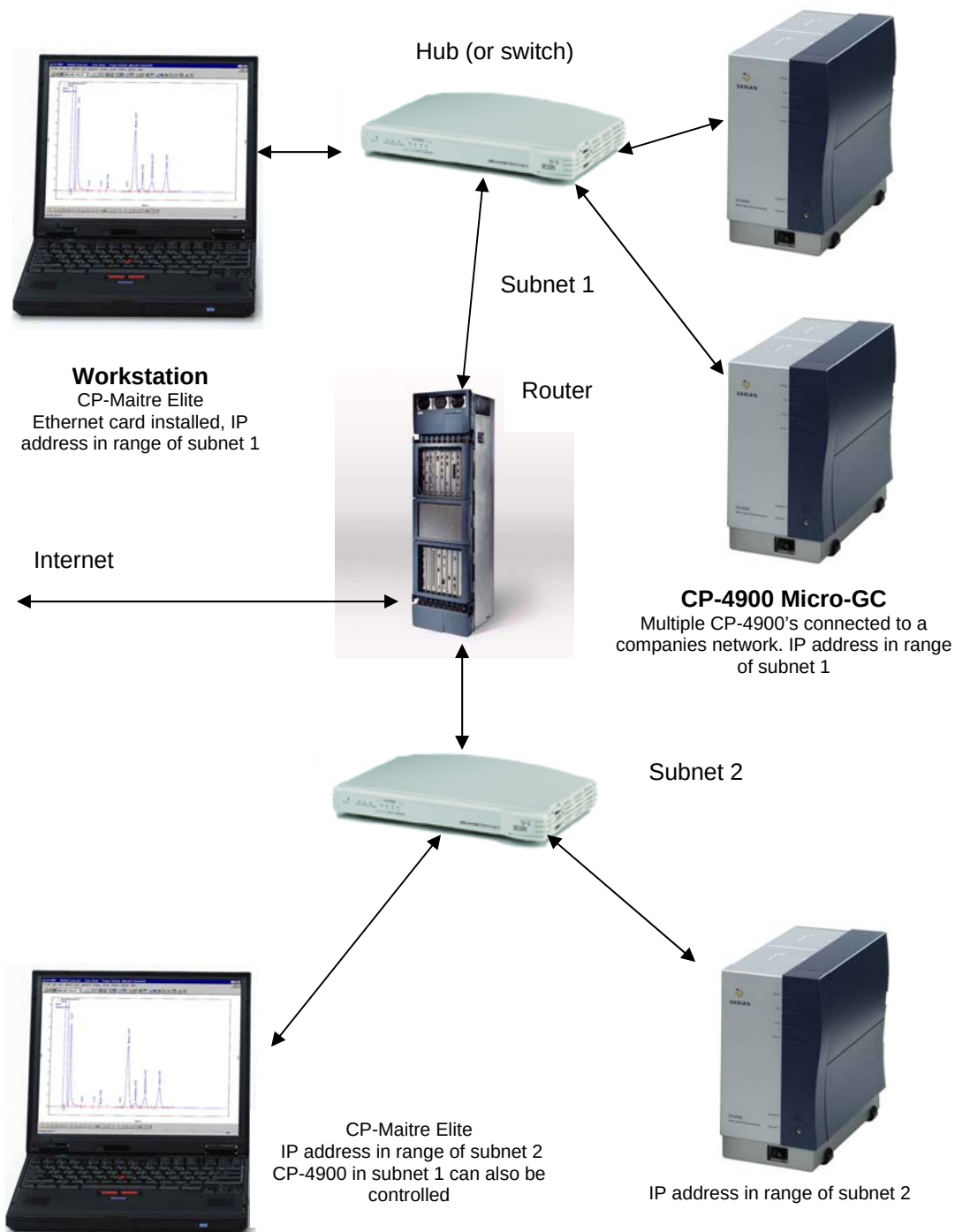


CP-4900 Micro-GC

One CP-4900 connected to a
workstation. Multiple connections not
allowed. IP address in same range as
computer IP address.

Multiple instrument (local network)

Global network: Multiple instruments



INSTRUMENT CONFIGURATION

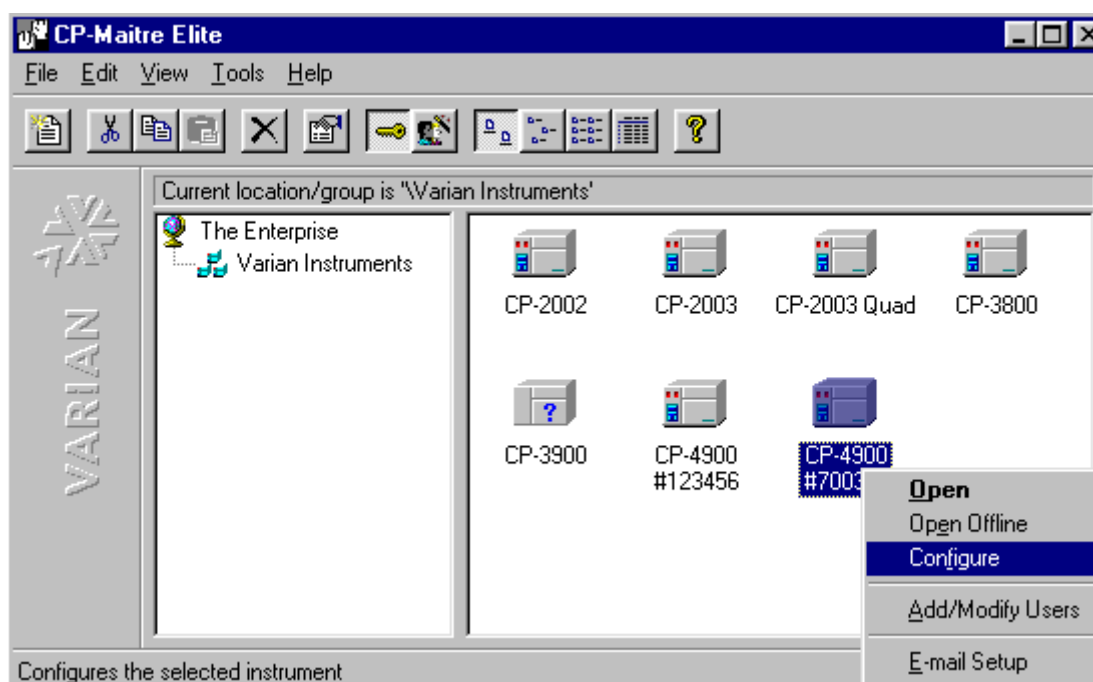
Configuration of instruments and detectors is done from the Main Menu of CP-Maitre *Elite*. To access instrument configuration, either select an instrument by clicking it to highlight it, then select the **File/Configure...** command. Or, click the instrument with the right-hand mouse button and select **Configure...** from the popup menu.

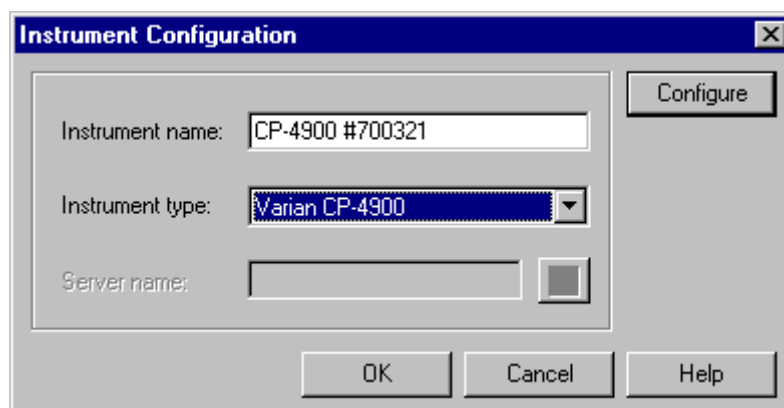


NOTE

You must have system administration privileges in order to configure instruments.

When you select the **Configure** command for a Varian CP-4900, a configuration dialog box will appear where you start your CP-4900 Micro-GC configuration.



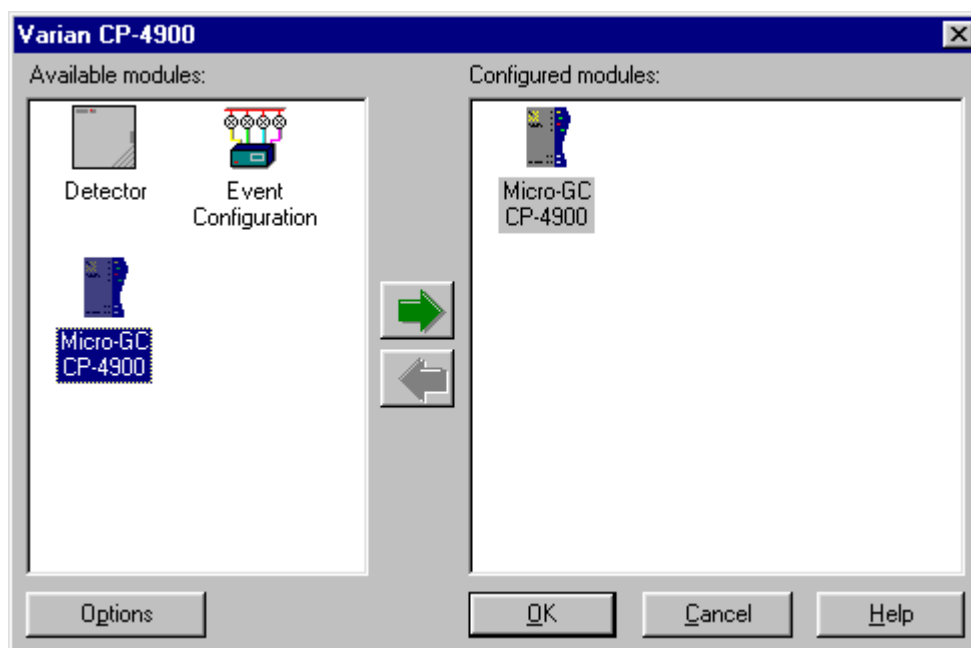


Enter an identification name for the instrument in the **Instrument Name** field. This name will appear adjacent to the instrument icon in the Main Menu, and at the top of this instrument's application window, as well as in other areas of the software that refer to this specific instrument (such as System Administration Wizards).

Select the **Varian CP-4900** as **Instrument Type** from the drop-down list. Then click the **Configure** button to continue with the Micro-GC configuration. A dialog will appear where you can complete the configuration of the Micro-GC.

MODULES CONFIGURATION

A Varian Micro-GC icon is displayed in the **Available Modules** box on the left. To add the module for configuration, click the icon in the left box, and then click the Green button to move it to the **Configured Modules** box on the right, or double-click on the icon. The **Analysis Options** button is used to initiate any optional analysis software for this instrument.



Double-click the **CP-4900 Micro-GC** icon to configure the instrument. This brings you to the [Micro-GC Configuration Setup](#) on page 66.

MICRO-GC CONFIGURATION SETUP

To configure The CP-4900 Micro-GC, setup the communication first, see topic [Communication Setup on page 67](#).

Once the communication type is configured the CP-4900 Micro-GC configuration must be uploaded from the instrument. Press the “Upload” button to upload the hardware configuration to the computer. The uploaded configuration consists of user settings and all kind of information about software versions, etc. Once the configuration is uploaded to the computer all the settings in the “Hardware” tab will be locked.

Find more information in topic [Upload Instrument Configuration on page 72](#).

If there is no CP-4900 Micro-GC connected do not press the “Upload” button but manually select the hardware settings which match a virtual connected CP-4900 Micro-GC. This can be useful for method development on a computer without having a CP-4900 Micro-GC connected.

The next step is to setup the user settings parameters (carrier gas, number of flush cycles, etc) and download these to the Micro-GC, see topics [User Settings Tab on page 74](#) and [Download User Settings](#).

CP-Maitre Elite settings must be setup in the [Maitre Elite Tab. on page 75](#).

In the [Automation Tab on page 76](#) the external devices must be configured.

The configuration setup contains three services: [Update MPU firmware on page 82](#), [Pressure sensor calibration on page 83](#) and [Reset MPU CP-4900 on page 83](#).

CP-4900 Micro-GC Configuration

Communication

☐ Serial

☒ Ethernet

Ethernet setup

IP Address: 10 . 190 . 65 . 130

Host name this PC: jidewitte

Setup IP address

Services

Update MPU firmware

Calibrate pressure sensors

Reset MPU CP-4900

Configuration

Hardware | User settings | Maitre Elite | Automation | Info

	GC Channel	Heated Injector	Backflush to vent	Max. column temp. (°C)	Detector
Channel 1:	☒ Installed	☒ Installed	☐ Installed	180	TCD
Channel 2:	☒ Installed	☐ Installed	☐ Installed	180	DMD
Channel 3:	☐ Installed	☐ Installed	☐ Installed	180	
Channel 4:	☐ Installed	☐ Installed	☐ Installed	180	

Common: ☒ Heated sample line

Instrument serial number: 4910701

Upload Reset

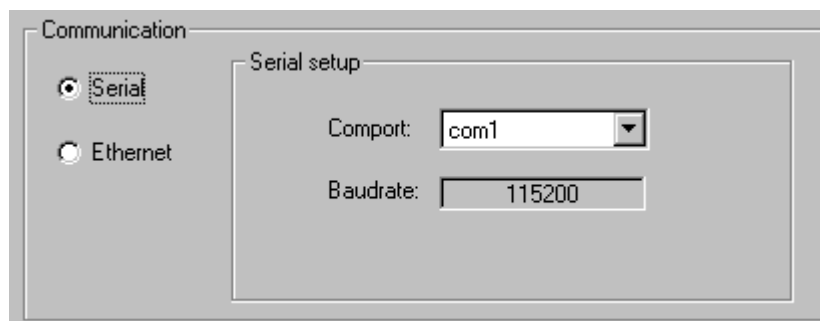
OK Cancel Help

COMMUNICATION SETUP

In the CP-4900 Micro-GC window select the type of communication for instrument control. Ethernet can only be selected if the instrument is equipped with an Ethernet card.

Serial communication

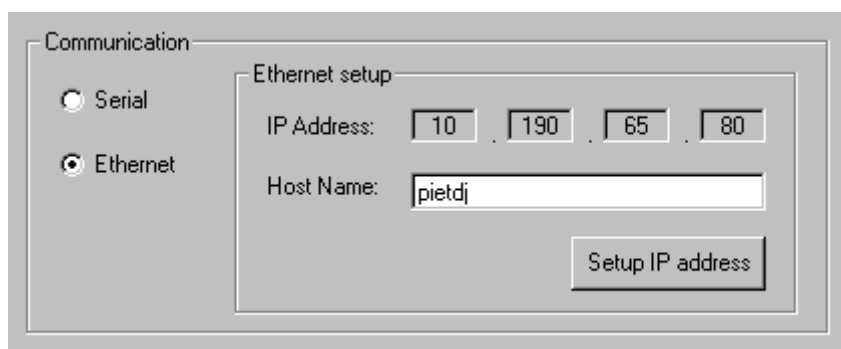
For serial communication select a free serial port on your computer which is configured as RS232. You need an RS485-RS232 converter to control the instrument via RS485. Com1 on the CP-4900 is fixed configured as RS232. The baud rate is fixed at 115200 bit/sec.



The screenshot shows the 'Communication' dialog box. On the left, there are two radio buttons: 'Serial' (which is selected) and 'Ethernet'. On the right, under the 'Serial setup' tab, there are two fields: 'Comport:' with a dropdown menu showing 'com1', and 'Baudrate:' with a text box containing '115200'.

Ethernet communication

For Ethernet communication select the Ethernet radio button, followed by the "Setup IP address" button in order to setup the IP address for the instrument. If the IP address is already known (and in the right subnet range) only the IP address has to be typed in, see topic [Setup Ethernet Connection on page 68](#). It's also possible to change the IP address and to view all the CP-4900 Micro-GCs connected to the subnet. Find more information in topics [Find Instruments on the net on page 69](#) and [Assign new IP address on page 70](#).



The screenshot shows the 'Communication' dialog box with the 'Ethernet' radio button selected. On the right, under the 'Ethernet setup' tab, there are two fields: 'IP Address:' with four text boxes containing '10', '190', '65', and '80' separated by dots, and 'Host Name:' with a text box containing 'pietd'. At the bottom right, there is a button labeled 'Setup IP address'.

ETHERNET CONNECTION SETUP

If this computer and the CP-4900 Micro-GC are both connected to the same subnet, click on the “Find CP-4900’s on the net” button. This will view all the Micro GC’s connected to the subnet, see topic [Find Instruments on the net on page 69](#). Select the Cp-4900 Micro-GC you want to control or type in the IP address manually. If the CP-4900 Micro-GC is not connected to the same subnet, only type in the IP address and exit the “Setup Ethernet Connection” window. It is assumed that the CP-4900 Micro-GC has the right IP address if it is not part of this subnet, otherwise assigned first a new IP address, see topic [Assign new IP address on page 70](#). The “Ping” button is a helpful tool to test if the network connection is correct.

Setup Ethernet Connection

Select IP address

IP Address: 10 190 65 10 Ping Close

Assign new static IP address

Subnet Mask: 255.255.255.0
Gateway: 10.190.65.1 Assign IP address
Domain:
Host name: CP-4900

To assign a new IP address, make sure the instrument is started in BOOTP mode.

Detected CP-4900 Micro-GC's

#	IP address	serial number	controlled by workstation
1.	10.190.65.80	101000	free
2.	10.190.65.167	111	10.190.65.191
3.	10.190.65.250	108	free
4.	10.190.65.182	102	10.190.65.198
5.	10.190.65.85	111	10.190.63.143
6.	10.190.65.188	104	10.190.65.194

Find CP-4900's on the subnet

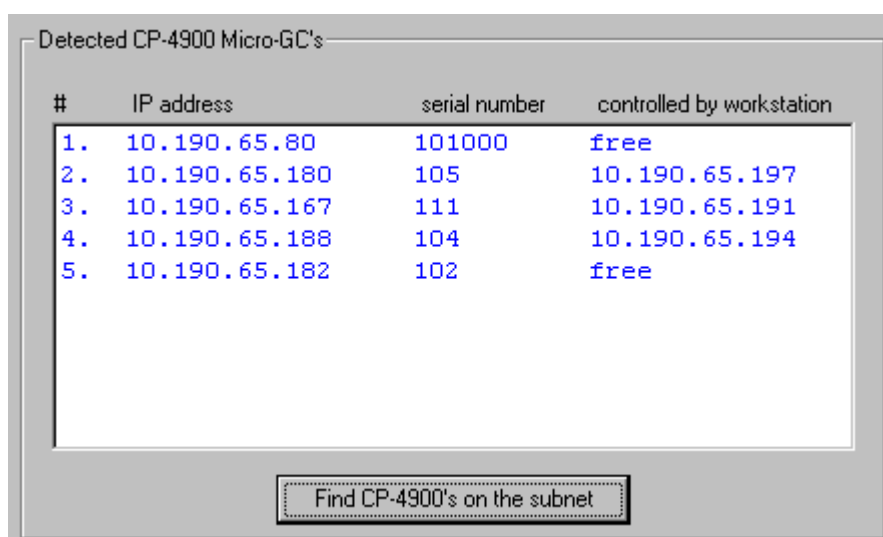
FIND INSTRUMENTS ON THE NETWORK

The “Find Instruments on the net” is used to view all the CP-4900 Micro-GC on the local subnet. For each CP-4900 Micro-GC detected the IP address, instrument serial number and status is displayed.

If the instrument is already controlled from another computer, the IP address of that computer will be displayed. If not, the status “free” is displayed.

This can be helpful if the IP address of an instrument is forgotten or unknown. From Micro-GCs with a wrong IP address the instrument serial is not displayed. This is because Ethernet connection on a local network (subnet) is not allowed if the IP address is not in the range of IP addresses of that local network.

The “Find Instruments on the network” feature is using is a connection-less protocol (UDP). This is the reason why invalid IP addresses of instruments connected to the same subnet are detected.



#	IP address	serial number	controlled by workstation
1.	10.190.65.80	101000	free
2.	10.190.65.180	105	10.190.65.197
3.	10.190.65.167	111	10.190.65.191
4.	10.190.65.188	104	10.190.65.194
5.	10.190.65.182	102	free

Find CP-4900's on the subnet

ASSIGN NEW IP ADDRESS VIA ETHERNET CONNECTION

If for the network the CP-4900 Micro-GCs IP address is unknown or invalid, a new IP address must be assigned.

To assign a new IP address the following steps are required:

1. Make sure this computer and the CP-4900 Micro-GC are connected to the same subnet or use the supplied Ethernet crossover-link cable to connect computer and CP-4900 Micro-GC (peer to peer connection).
2. Setup the IP address for the computer in case the computer wasn't connected to a network before. For a global network, the system administrator must be contacted.
3. Enter the IP address that must be assigned to the CP-4900 Micro-GC. This IP address must be in the same range as the computers IP address. The three left IP segments must be identical.
4. Enter the Subnet Mask. This will be in most cases 255.255.255.0.
5. Enter the Gateway IP address if this is required. In most small local network this is not required.
6. Enter the Domain if this is required. In most local network this is not required.
7. Enter a Host name for the CP-4900 Micro-GC.
8. Do now reboot the CP-4900 in the assign IP-address mode. Hold down the [push button located just above the Ethernet RJ-45 connector in the Micro-GC on page 1](#) and power up the Micro GC. Hold down this button till the instrument is started. This will take approximately 1 minute. The CP-4900 is now in assign IP-address mode and starts broadcasting on the net "Waiting for IP address assignment". There is a BOOTP/DHCP server running in the Micro GC when it is started in service mode.
9. Press now the "Assign IP address" button. The CP-4900 driver does now assign the defined IP address to the first received BOOTP/DHCP request. This will take maximally 2 minutes.
10. Reboot the CP-4900 Micro-GC.



Never startup two CP-4900 Micro-GCs in the assign IP-address service mode at the same time. This to avoid assigning an IP address to the wrong CP-4900 Micro-GC.

Setup Ethernet Connection

IP address assignment

IP Address: 10 190 65 80

Subnet Mask: 255.255.255.0

Gateway: 10.190.65.1

Domain:

Host name: CP-4900

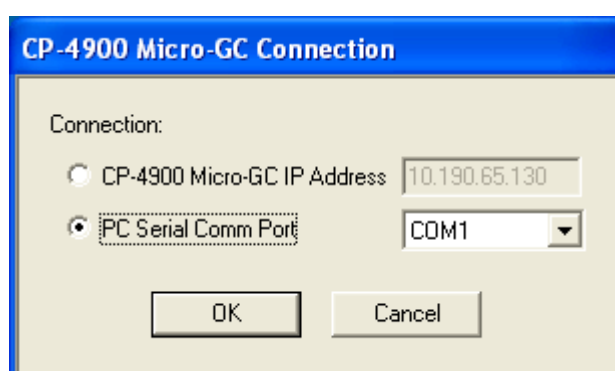
Assign IP address

Close

To assign a new IP address, make sure the instrument is started in service mode.

ASSIGN NEW IP ADDRESS VIA SERIAL CONNECTION

1. Make sure this computer and the CP-4900 Micro-GC are connected via a serial RS232 cable (peer to peer connection).
2. Start the CP-4900 configuration in Serial mode ([see communication setup](#)) on page 67
3. Click on the button “Serial Setup IP-address”, the “Serial Setup Ethernet Settings” window appears.
4. Enter the IP address that must be assigned to the CP-4900 Micro-GC. This IP address must be in the same range as the computers IP address. The three left IP segments must be identical.
5. Enter the Subnet Mask. This will be in most cases 255.255.255.0.
6. Enter the Gateway IP address if this is required. In most small local network this is not required.
7. Click now on the button “Assign IP address” of the “Serial Setup Ethernet Settings” window.
8. Reboot the CP-4900 Micro-GC.
9. Change the CP-4900 configuration from Serial mode to Ethernet mode and proceed as described in the section [Ethernet communication](#) on page 60.



UPLOAD INSTRUMENT CONFIGURATION

Press the “Upload” button in the CP-4900 Micro-GC Configuration window to automatically setup the configuration for that particular instrument. The instrument hardware settings, user settings, the instrument serial number and general information like software versions numbers, etc. will be uploaded from the CP-4900 Micro-GC and viewed in the Configuration tabs [“Hardware”](#) below, [“User settings”](#) on page 74 and [“Info”](#) on page 81.

HARDWARE TAB

The Hardware Tab contains the hardware settings of the CP-4900 Micro-GC. These can be uploaded from the instrument by pressing the Upload button.

The following hardware settings of the CP-4900 Micro-GC are showed:

- The number of GC channels and their locations.
- GC channels equipped with the heated injector option.
- GC channels equipped with the backflush to vent option.
- GC channels maximum allowed column temperature. In the CP-Maitre Elite method column temperatures will be compared and checked with the maximum column temperature setting.
- Heated sample line option installed.



If the configuration is not uploaded from the instrument but manually selected, control of the instrument will never be possible! Manual configuration can be useful for method development on a computer without having a CP-4900 Micro-GC connected.

Update MPU firmware

See [Remote firmware update on page 82](#)

Calibrate pressure sensors

See [Pressure sensor calibration on page 83](#)

Reset MPU CP-4900

Allow you to restart the CP-4900 MPU remotely. This can be useful in case of Ethernet communication and long distance between computer and CP-4900 Micro-GC.

In the configuring page [Detector] will automatically select “DMD”, upon uploading the configuration for a CP-4900 DMD instrument. At the same time the checkbox for heated injector on Channel 2 disappears.

CP-4900 Micro-GC Configuration

Communication

☐ Serial

☒ Ethernet

Ethernet setup

IP Address:

Host name this PC:

Services

Configuration

Hardware | User settings | Maitre Elite | Automation | Info

	GC Channel	Heated Injector	Backflush to vent	Max. column temp. [°C]	Detector
Channel 1:	☒ Installed	☒ Installed	☐ Installed	180	TCD
Channel 2:	☒ Installed	☐ Installed	☐ Installed	180	DMD
Channel 3:	☐ Installed	☐ Installed	☐ Installed	180	
Channel 4:	☐ Installed	☐ Installed	☐ Installed	180	

Common: ☒ Heated sample line

Instrument serial number:

USER SETTINGS TAB

The User settings tab contains user selectable parameters.

CP-4900 Micro-GC Configuration

Communication: ☐ Serial ☐ Ethernet setup
IP Address: _____

Carrier Gas
Select the carrier gas which is required for the application. Changing carrier gas requires a special procedure, which must be followed. The CP-4900 driver will guide you through the special procedure.

Channel disabled
Disable an installed channel. Once an installed channel is disabled, the CP-4900 Micro-GC will ignore this channel.

Download User Settings
Press the "Download User settings" button in order to download the settings "Channel disabled", "Carrier gas", "Continuous flow", "Peak simulation" and the "Number of flushcycles" to the CP-4900 Micro-GC.
NOTE: Only the parameters from the "user Settings tab are downloaded.

User settings

Channel disabled: Channel 1: ☐ Disabled Channel 2: ☐ Disabled Channel 3: ☐ Disabled Channel 4: ☐ Disabled

Carrier gas: Helium Helium Helium Helium

Common: ☐ Continuous flow ☐ Peak simulation

Flush cycles: 1 cycle

Instrument serial number: 101000

Download User settings

Upload Reset

OK Cancel Help

Continuous Flow
Select continuous flow in case this is required.

Peak simulation
Peak simulation can be used for demonstration and communication testing. If it is selected all the GC channels will generate a default chromatogram.

Flush cycles
The number of flush cycles is configurable. Select between "None", 1, 2 and 3 flush cycles. The Flush cycle is invoked at startup of the instrument or when pressure is restored after a low-pressure error.

CP-MAITRE ELITE TAB

The CP-Maitre Elite tab contains only CP-Maitre Elite related settings.

CP-4900 Micro-GC Configuration

Communication

☐ Serial

☒ Ethernet

Ethernet setup

IP Address:

Host Name:

Services

Configuration

Hardware | User settings | **Maitre Elite** | Automation | Info

Channel description

The channel descriptions are uploaded from the Electronic Data Sheets (EDS) of the GC channels each time the [Upload configuration on page 72](#) button is pressed. This will be always the description of the column installed. The descriptions will appear on top of each chromatogram window in Instrument control. Replace this channel description by any other text if this is desired, for instance the application name (hydro carbons, permanent gasses, etc)

Description:

Channel 1:

Channel 2:

Channel 3:

Channel 4:

Common: Pressure units:

Instrument serial number:

Pressure units

Select between kPa and PSI. The column and ambient pressures status will be displayed in the selected pressure units in the [Method Setup on page 90](#) and [Instrument Control on page 85](#) window of instrument control.

AUTOMATION TAB

The Automation tab contains mainly settings for control of external devices.

CP-4900 Micro-GC Configuration

Communication: ☐ Serial ☐ Ethernet setup
 IP Address: 10 190 65 130

Instrument#
 Select for each instrument connected a unique instrument identity (see [Instrument](#) on page 77).

Remote access CP-4900 status
 Select this setting to store the instrument status into the UserDataStore library (see [Remote access CP4900](#) on page 77).

CP-4900 and AutoSampler external started
 Select this setting if an auto sampler is selected and the entire system is external started by another device (see [CP4900 Autosampler external started](#) on page 79).

Automation Tab Settings:

- Instrument #:** 1
- ☐ Remote access CP-4900 status (UserDataStore)
- ☐ Remote control external relays
- ☐ Acquire auxiliary traces
- ☐ Extension box connected
- Instrument serial number: 4910701
- External devices control (pre-run phase):**
 - Auto sampling: None
 - Maximum streams: 2
 - ☐ CP-4900 and Auto-sampler external started
 - ☐ Wait starting CP-4900 till external 'Ready In'

Remote access external relays
 Select this setting to enable external relay control (see [Remote control external relays](#) on page 96).

Auto Sampling
 The CP-4900 supports a number of Auto sampling devices (see [Auto Sampling](#) on page 78).

Maximum streams
 Select here the maximum streams for the auto sampler configured above (see [Maximum streams](#) on page 79).

Extension box connected
 Select this setting to activate the connected [Extension Box](#) on page 77.

Acquire auxiliary traces
 Select this setting to activate acquiring auxiliary traces (see [Acquire auxiliary traces](#) on page 77).

Wait starting CP-4900 till Ready In
 This setting can be used to synchronize another device with the CP-4900 Micro-GC (see [Wait starting CP4900 external Ready IN](#) on page 79).

Instrument

Select for each CP-4900 Micro-GC connected a unique instrument identity. This setting is used for the UserDataStore library (a common shared database for data exchange between applications) in which all kind of results, status, etc information is stored. Set the instrument number on one for the first instrument, two for the second, etc.

Remote access CP-4900 status (UserDataStore)

Select this setting to store the instrument status into the UserDataStore library. In instrument control the status is continuously stored into the UserDataStore library. The instrument status will become accessible for other applications like the Varian userlink applications PCI1000Com, Mlink32, I/O-Control or any other self-written program. Also the instrument status as stored into the UserDataStore database can be used for external relay setup, see item "Remote control external relays".

Remote control external relays

Select this setting to enable control of the two integrated relays and extended "Extension Box" relays (optional). If activated, extra relays switch conditions will appear in the Alarms-Events Tab of Instrument Method Setup.. Relays already configured in Auto sampler setup cannot be used, see item "Auto sampling". Relays can be used for alarming and relay programming purposes.

Acquire auxiliary traces

Select this setting to activate acquiring auxiliary traces. Auxiliary traces consists of [six external analog inputs, ambient temperature and pressure on page 40](#) from the sensors located on the mainboard of the CP-4900 Micro-GC. CP-Maitre Elite can draw plots of these traces; see topic [Auxiliary traces on page 91](#) in the Instrument method setup. In the [Aux Traces Tab on page 103](#) of the Instrument method setup scaling factors and offsets can be defined for the six analog input signals.

Extension box connected

The driver automatically selects this option when the configuration is uploaded. So better never select it manually, but press the "Upload" button and check if this option is selected. Make sure always to reboot the CP-4900 when an "Extension box" is connected. The CP-4900 only checks at startup if an Extension Box is connected!

Auto Sampling

The CP-4900 supports a number of Auto sampling devices.

Choose between the following auto sampler types:

- VICI com2
- VICI com2 + Relay1
- Relay 1 (external pump)
- Relay 1+2 (solenoids)
- Run Delay only
- Extended relays 5-8 (solenoids), Only when Extension Box connected
- Extended relays 1-8 (solenoids), Only when Extension Box connected

VICI electric actuated multi positional valves can be controlled via Com2 of the CP-4900 Micro-GC (RS232). Make sure the VICI valves are configured, [see topic VICI Valve, on page 80](#). Both external relays can be used to control two solenoids in order to control a two-stream selector.

Relay 1 can be used for control of an external pump or other device, which will be activated during the pre-run phase.

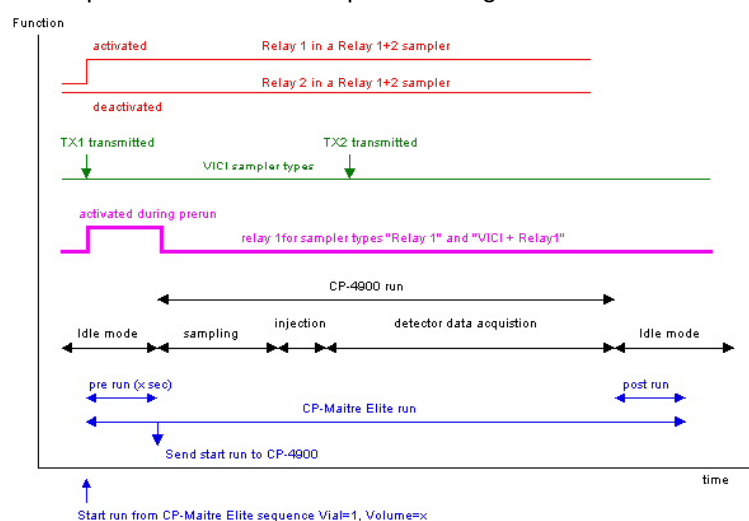
In case an auto sampler is configured there will be always a pre-run phase before the actual start of the CP-4900. This pre-run does only exist in the CP-4900 driver.

The length of the prerun time is determined by the Volume setting (seconds) in the Single Run or Sequence Edit window. The Vial setting from the [Single Run on page 87](#) or [Sequence Edit on page 89](#) window determines the stream number.

For VICI defined valves this will be the record of the table in the [Sampler Tab on page 102](#) in Instrument Method setup. The Tx1 and Tx2 command from that record will be send to the valve. For a "Relay 1 + 2" defined valve, Relay 1 will be activated and relay deactivated in case the Vial is set to one. Vial number two result in Relay 2 activated and Relay 1 deactivated.



Make sure to select "External Trigger" in the [Trigger Tab on page 92](#) of Instrument Method Setup in case an auto sampler is configured.



Maximum streams

Select here the maximum streams for the auto sampler configured above. In case a “Relay 1 + 2 (solenoids)” sampler is configured, select two streams which is fixed for this type of sampler. In case a VICI sampler is configured select the number of streams of the valve or the number of total positions for multiple valves. In case a “Relay 1 (external pump)” is selected the Stream number is not used. Relay 1 in sampler type “VICI + relay 1” has the same function as “Relay 1 (external pump)” sampler.

CP-4900 and Auto sampler external started

Select this setting if an auto sampler is selected and the entire system is external started by another device (Flow computer, PLC, etc), See topic [External Start on page 106](#).

Wait starting CP-4900 till external ‘Ready In’

This setting can be used to synchronize another device with the CP-4900 Micro GC. If selected the CP-4900 driver will postpone the start of the CP-4900 till the Ready-In signal is true.

VICI VALVE

In order to control a VICI electric actuated multi positional valve, the valve identity for this valve must be known.

By default the VICI valve, as shipped by Varian, has not an identity. In case only one VICI valve is controlled by the CP-4900 driver, a valve identity is not required, you can skip this chapter.

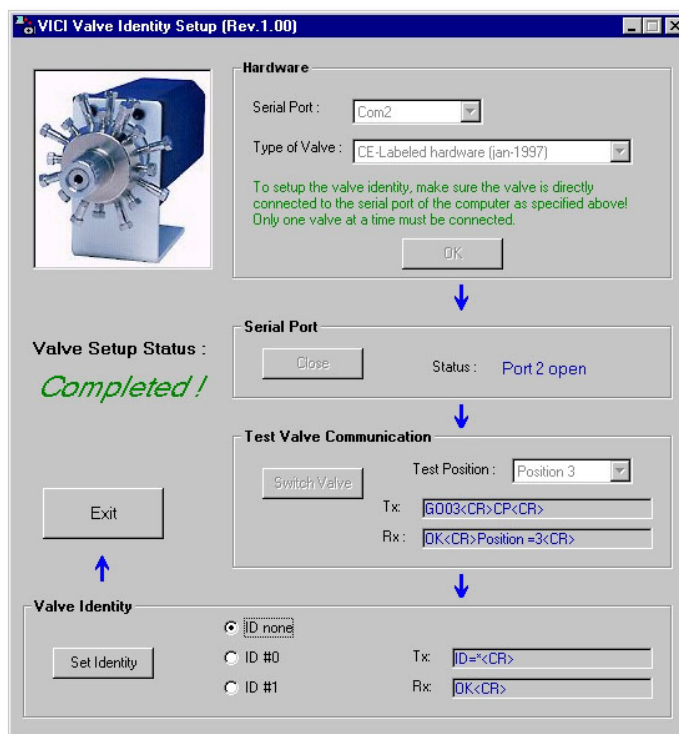
Setup Valve Identity

In case multiple valves needs to be controlled, every single valve must have its own unique identity. Make sure you have selected "VICI Valve" during the CP-4900 control driver installation!

To setup the identity for a single VICI valve, connect only the specified VICI valve to a free serial port of your computer (do not connect to the external serial port of the CP-4900). Run the ValveSetup.exe program (Windows Start bar – Programs – Chromatography – ValveSetup).

From the ValveSetup program the following steps must be taken:

1. Select the serial port to which the VICI valve is connected.
2. Press OK button.
3. In the "Serial port" frame, select "Open port".
4. Select a valve position in the "Test position" box.
5. Press the "Switch Valve" button. The valve should switch now to the required position. If it doesn't, check if the right port was selected.
6. In the "Valve Identity" frame, select the required valve identity.
7. Press "Set Identity" button. The required identity will now be set.
8. Press "Exit" to exit the program.



INFO TAB

The Info tab contains information about software versions, serial numbers and part numbers uploaded from the CP-4900 when [“Upload”](#) on [page 72](#) configuration button pressed.

CP-4900 Micro-GC Configuration

Communication: ☐ Serial ☐ Ethernet setup

Services:

Configuration: Hardware | User settings | Maitre Elite | Automation | **Info**

	Software version	Firmware I/O Ext.	Serial# Analy. Module	Part number#
CP-4900 driver	1.10 build 94	Channel 1: 1.00	170	170
GC_DLL:	1.20 build 020	Channel 2: 1.00	8684736	750003
MPU:	1.30 build 001	Channel 3: -	-	-
I/O Controller:	1.14	Channel 4: -	-	-

Instrument serial number: 101000

Buttons: Upload, Reset, OK, Cancel, Help

CP-4900 driver
Software version of the CP-Maitre Elite CP-4900 driver.

GC_DLL
Software version of the GC_DLL.dll library used by the CP-4900 driver. This library contains the communication and protocol layer.

Part number#
Part number of each GC channel.

MPU
Software version of the GC application (GC.exe) in the MPU of the CP-4900.

I/O Controller
Software version of the I/O Controller, a micro controller in the CP-4900.

Firmware I/O Ext.
Software version of the I/O Extenders, a micro controller in the CP-4900 on every GC channel.

Serial# Analytical Module
Serial numbers of the analytical module part of the GC channel.

REMOTE FIRMWARE UPDATE

The Remote Firmware Update window can be selected by clicking on the service button “Update MPU firmware” in the [Micro GC CP-4900 Configuration on page 66](#) window. The CP-4900 Micro-GC as well as the CP-Maitre Elite CP-4900 driver supports remote update of the firmware in the CP-4900. The firmware consists of a number of files. Only the main GC application (GC.EXE) can be updated.

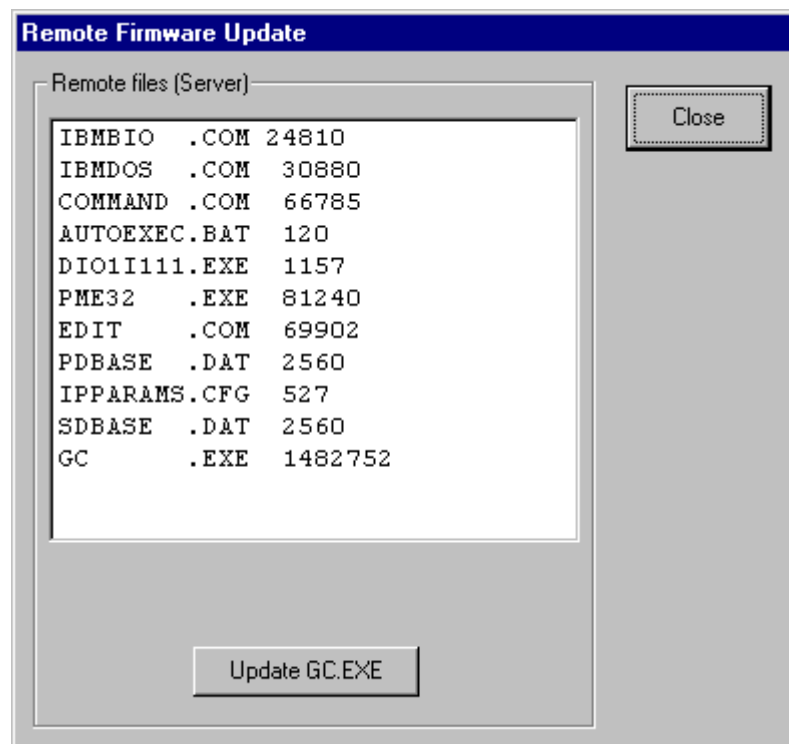
To update, make sure you have the new GC.EXE file available.

Click on the “Update GC.EXE” button and browse to the GC.EXE application on the local computer. If that file is located and selected, click “OK” and the GC.EXE file will be copied to the CP-4900 flash disk.



NOTE

The file is first stored as GC.NEW on the CP-4900 flash disk. Reboot the CP-4900 and the GC.NEW will be renamed to GC.EXE. The old GC.EXE will be removed.



PRESSURE SENSOR CALIBRATION

Select this service if the pressure sensors have to be calibrated.



Calibration must only be carried out if there is any reason to disbelieve the actual column pressure as showed in the [Instrument Status on page 85](#) window.



It's important to follow exactly the instructions given by the CP-4900 Micro-GC. Prior to the calibration, disconnect the carrier gas tubing.

- Allow the CP-4900 to stabilize (2 minutes).
- The TCD filaments will automatically switch off when low carrier gas pressure has been detected.
- Press the OK button.
- Reboot the CP-4900 Micro-GC.

RESET MPU-CP-49000

The "Remote Reset CP-4900" service allows you to restart the CP-4900 MPU remotely. This can be useful in case of Ethernet communication and long distance between computer and CP-4900 Micro-GC.

UPLOAD METHOD

This command transports the current method parameters from your CP-4900 Micro-GC into the Instrument Setup screen.

The uploaded method updates only the "[Channel tabs](#)" on page 98 and "[Common tab](#)" on page 93.

DOWNLOAD METHOD

Once you have completed the Instrument Setup for your CP-4900 Micro-GC, you can transfer the method using the **Control/Download Method** command. Only the settings from the "[Channel tabs](#)" on page 98 and "[Common tab](#)" on page 93 are downloaded to the CP-4900.

DOWNLOAD METHOD TAB

This function is identical to the [Download Method](#) above

INSTRUMENT STATUS

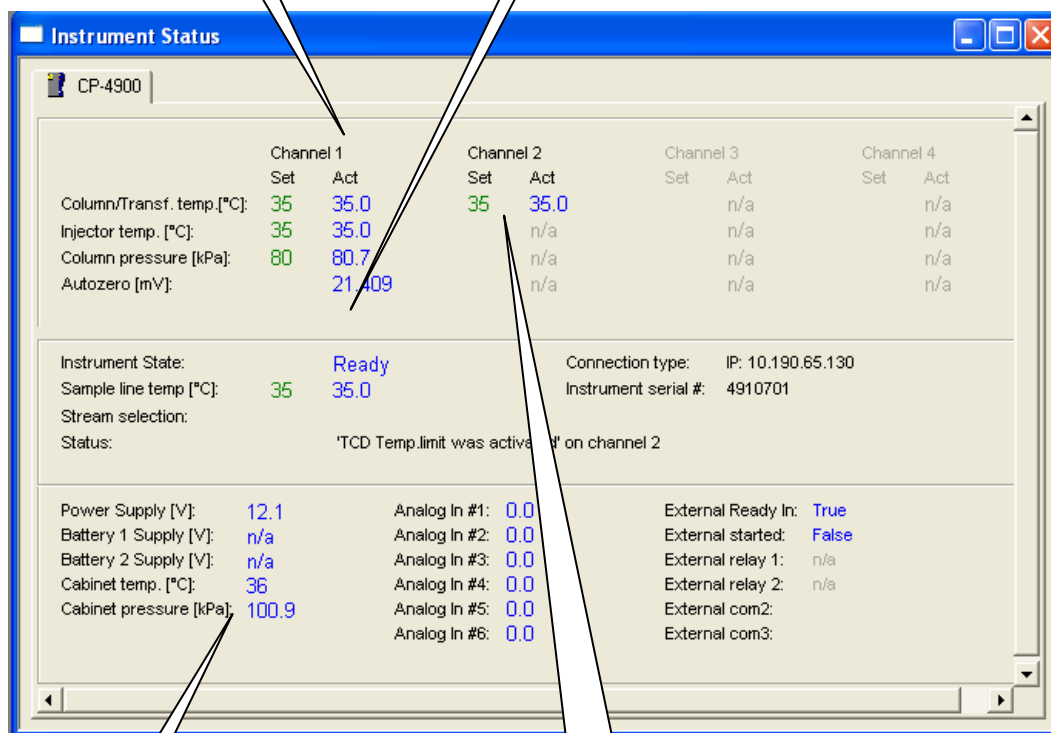
The **Control/Instrument Status** command is used to bring up a real-time status screen for your Varian CP-4900 Micro-GC. The instrument method settings ("Set" column) will only appear if a method is up or downloaded from/to the CP-4900 Micro-GC.

Channel status

The channel status consist of settings and actual. Status data is colored **blue** if the actual are within the settings window. The actual are colored **red** if they are outside the settings windows.

Instrument status

Instrument state, heated sample line actual, stream selection (auto sampler) and error status actual values are visible.



Enhanced status

Status of Power supply, battery supplies, ambient pressure and temperature of the instrument, external analog input (corrected by scaling factor and offset value set in the aux traces tab), external Ready In, External Start event, external relay status and external serial device Tx and Rx data transmission.

DMD instrument status

In Channel 2 of 2 and 4 of 4 for a dual and quad configuration with DMD detector respectively, the column transfer displayed is the actual transferline temperature between GC and DMD Channel. Injector Temperature, Column Pressure and Autozero value for a DMD Channel position is not displayed.

Extension Box status (optional)

This shows the states of the eight-extended relays of the Extension box.

The screenshot displays the CP-4900 software interface. At the top, the title bar reads 'CP-4900'. The main window is divided into several sections. The top section shows parameters for four channels (Channel 1 to Channel 4), each with 'Set' and 'Act' values. The middle section displays 'Instrument State' as 'Ready', 'Sample line temp' as 'n/a', 'Stream selection' as 'n/a', and 'Status' as 'n/a'. The bottom section shows 'Extension Box' status, including 'relays alarming 1-4, sampler 5-8', and 'External Ready In' as 'n/a'. The bottom right corner features a small icon.

	Channel 1		Channel 2		Channel 3		Channel 4	
	Set	Act	Set	Act	Set	Act	Set	Act
Column temp. [°C]:	51	51.0	54	54.0	50	50.0	50	50.0
Injector temp. [°C]:		n/a		n/a	50	50.0	50	50.0
Column pressure [kPa]:	100	100.0	100	100.3	60	59.4	100	99.5
Autozero [mV]:		-45.528		-56.639		1.355		-1.626

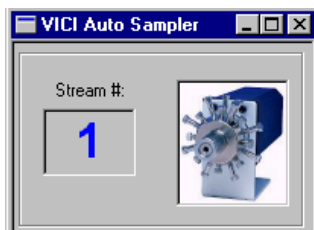
Instrument State:	Ready	Connection type:	IP: 10.190.65.80
Sample line temp [°C]:	n/a	Instrument serial #:	116
Stream selection:			
Status:			

Extension Box: relays alarming 1-4, sampler 5-8		External Ready In: n/a
Ext. relay 1: Deactivated (0.000)	Ext. relay 5: Deactivated	External started: False
Ext. relay 2: Deactivated (0.000)	Ext. relay 6: Deactivated	External relay 1: Deactivated (0.000)
Ext. relay 3: Deactivated (0.000)	Ext. relay 7: Deactivated	External relay 2: Deactivated (0.000)
Ext. relay 4: Deactivated (0.000)	Ext. relay 8: Deactivated	External com2:
		External com3:

SHOW AUTOSAMPLER TRAY

This window shows the current Vial parameter as specified in the [Single Run](#) below or [Sequence Edit on page 77](#) window.

Ignore this window if no auto sampler configured.



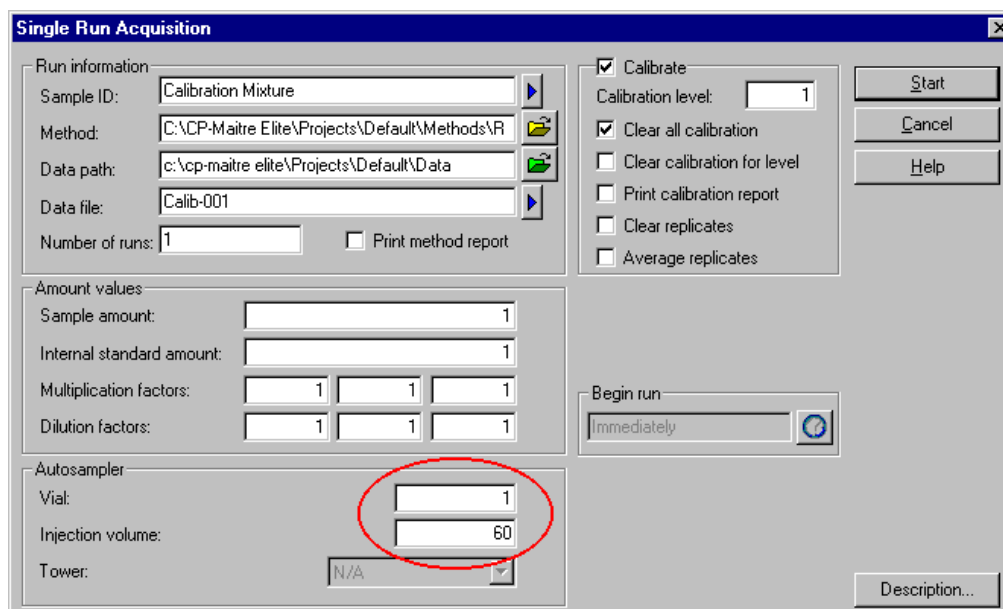
START SINGLE RUN

In case an Auto Sampler is configured, the Single Run columns "Vial" and "Volume" must be filled in.

The Vial value represents the stream number (or sampler record number) from the Method Sampler Tab.

The Volume value represents the pre-run time or flush time. This is the time between start request and the actual start of a run.

If no Auto Sampler configured the "Vial" and "Volume" parameters must be ignored.



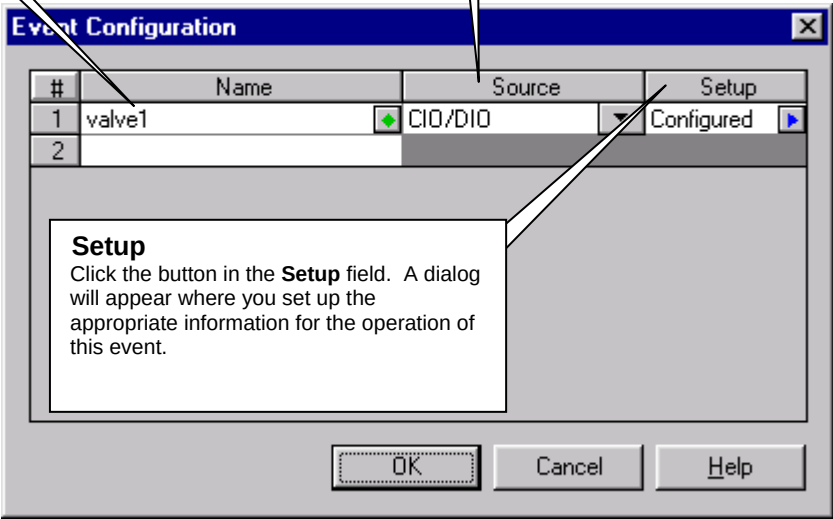
EVENT CONFIGURATION

When you double-click the Event Configuration icon, the following spreadsheet will appear where you configure the events.

Name
If you are configuring a Trigger or Ready line, click the button in the "Name" field and select either Trigger or Ready from the list. If you are configuring a valve or other external event, simply click on the "Name" field and then type in the name of your event.

Source
In the **Source** field, click the button and select the source of the event (the hardware from which the event comes).

Setup
Click the button in the **Setup** field. A dialog will appear where you set up the appropriate information for the operation of this event.



#	Name	Source	Setup
1	valve1	+ CIO/DIO	Configured
2			

Continue the external event configuration until all events for this instrument are configured. Programming of the external events into your method is done in the **Instrument Setup** section of the method, and is described in the Method Development section.



NOTE

The external events tab in Instrument Setup will not be available unless you have configured your instrument with one or more external events.

START SEQUENCE

In case an Auto Sampler is configured, the sequence columns “Vial” and “Volume” must be filled in.

If no Auto Sampler configured the “Vial” and “Volume” parameters must be ignored.

Vial

The Vial value represents the stream number (or sampler record number) from the Method Sampler Tab.

Volume

The Volume value represents the pre-run time or flush time. This is the time between start request and the actual start of a run.

The screenshot shows a software interface window titled "Sequence: Meteor.seq". It contains a table with the following columns: Run #, Status, Run Type, Level, Vial, Volume, and Sample ID. The table has four data rows. A red circle highlights the "Vial" and "Volume" columns for the first three rows. Two callout boxes are present: one for "Vial" pointing to the first row, and one for "Volume" pointing to the first row. The "Vial" column contains values 1, 1, and 2 for the first three rows. The "Volume" column contains values 60, 30, and 30 for the first three rows. The "Sample ID" column contains "Calib Mix", "Calib Mix", and "Stream 1" for the first three rows. The "Run #", "Status", and "Run Type" columns contain values 1-4, empty cells, and "Unknown" respectively for the first three rows. The "Level" column contains values 0, 0, and 0 for the first three rows.

Run #	Status	Run Type	Level	Vial	Volume	Sample ID
1		Unknown	0	1	60	Calib Mix
2		Unknown	0	1	30	Calib Mix
3		Unknown	0	2	30	Stream 1
4						

PREVIEW RUN

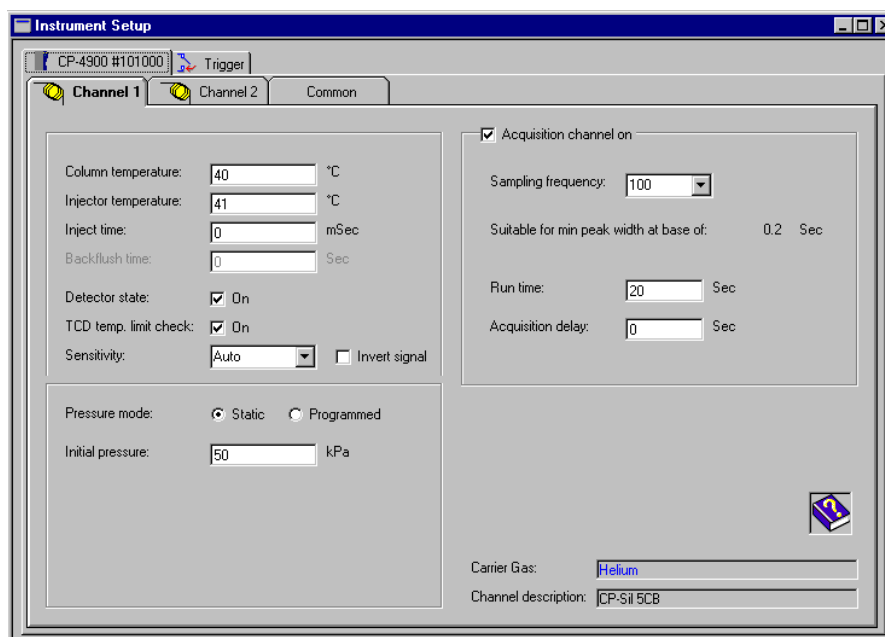
Start a Preview Run in order to view a plot of the detector signal in instrument idle mode.

A preview run does not start an injection or run on the instrument, it only acquires detector data while the auto zero function is switched off.

A Preview Run is not time limited. The user has to stop it manually by pressing the Stop icon.

MICRO-GC METHOD SETUP

Before you can make a run with your CP-4900 Micro-GC, you must set up the instrument and data acquisition parameters for one or both channels of the instrument. To access the Instrument Setup dialog, click the Instrument Setup icon on the toolbar, or select the Method/Instrument Setup command from the menu. The following dialog appears.



CP-4900 TAB

The CP-4900 Tab consists of the sub tabs: "Channel", "Common", "Sampler" and "Aux Traces". For each single channel installed in the CP-4900 a separate channel tab will appear. Installed channels, which are disabled in the configuration, won't appear.

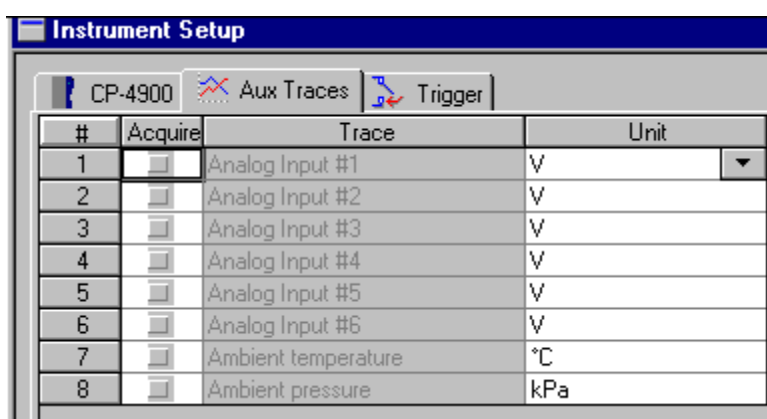
The "Sampler" tab does only appear if a sampler is configured in the configuration setup. The "Aux Traces" tab does only appear if "Acquire auxiliary traces" is selected the configuration setup.



AUX TRACES MAIN TAB

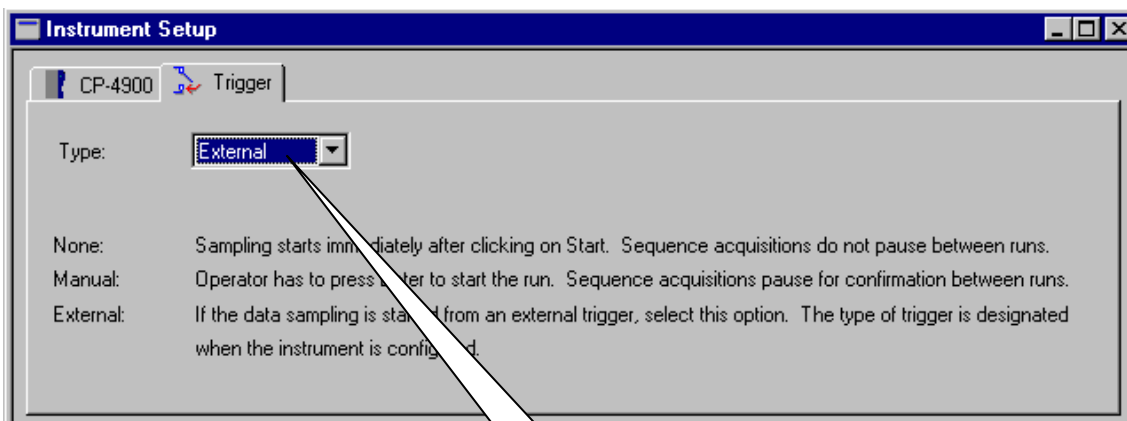
Select the traces you want to acquire together with the detector data. Each trace selected will appear in a separate chromatogram window identical to the analysis traces (chromatogram windows).

The displayed units for analog inputs are only correct if in the [Aux Traces Tab on page 103](#) the scale factor is set to one and the offset to zero. It is not possible to change these units.



TRIGGER TAB

In the Trigger tab select the type of triggering.
Three types of triggering: “External”, “Manual” and “None”.



None

Select none in case no auto sampler is selected in the [Automation Tab on page 76](#) of the CP-4900 configuration and the CP-4900 is started by CP-Maitre Elite immediately if a [single run on page 87](#) or [sequence is started on page 89](#).

External

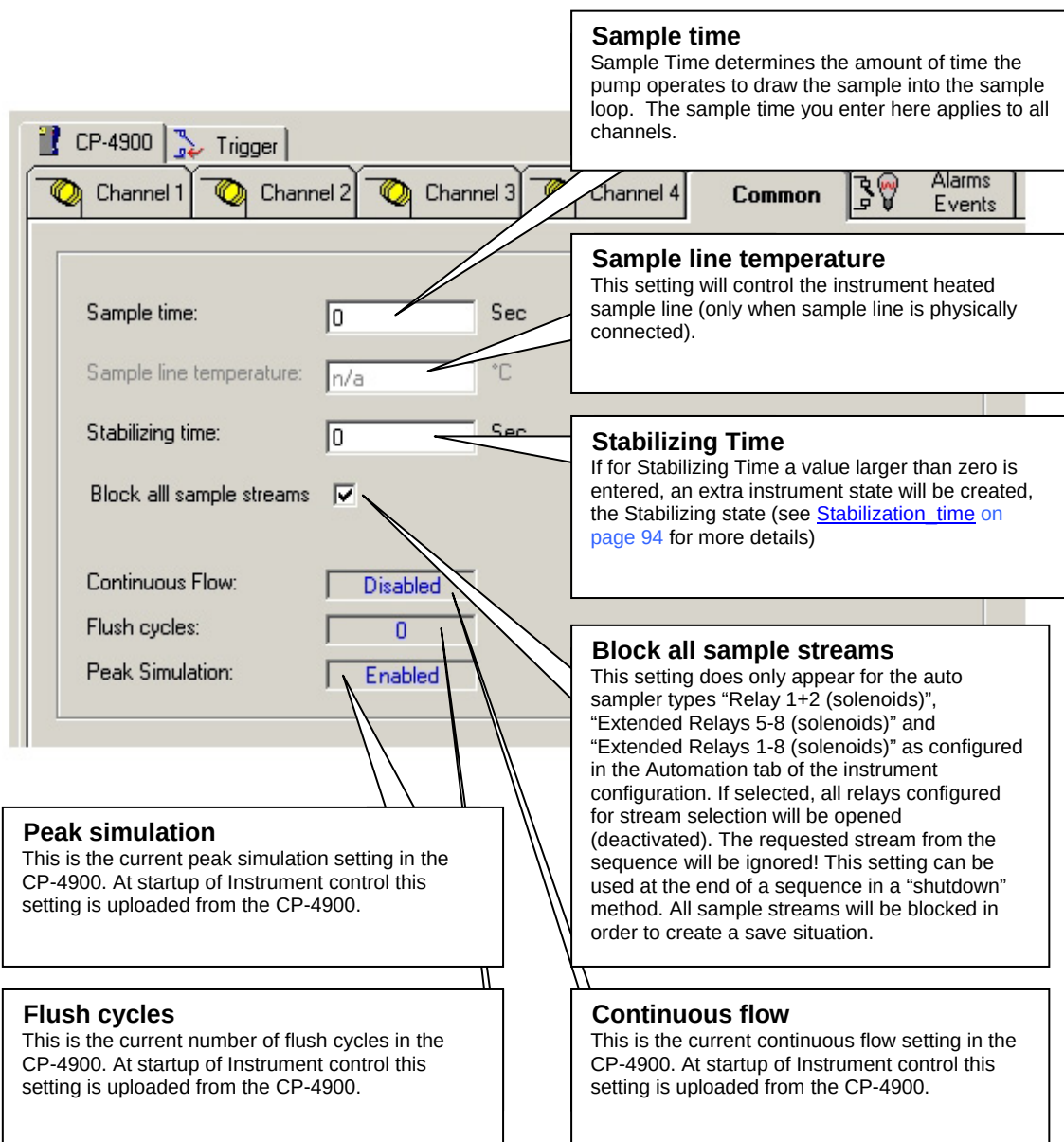
Select External in case an auto sampler is selected in the [Automation Tab on page 76](#) of the CP-4900 configuration or if the CP-4900 is [external started on page 106](#) by another device.

Manual

Select Manual if no auto sampler is selected in the [Automation Tab on page 76](#) of the CP-4900 configuration and the CP-4900 is started by CP-Maitre Elite when the 'OK' button is pressed in the appeared dialog. This dialog will appear if a [single run on page 87](#) or [sequence is started on page 89](#). CP-Maitre Elite waits till the operator presses 'OK'.

COMMON TAB

This tab contains parameters you set which are common for all installed channels.



The screenshot shows the 'Common' tab of the CP-4900 instrument control software. The interface includes tabs for Channel 1, Channel 2, Channel 3, Channel 4, Common, Alarms, and Events. The 'Common' tab is active, displaying several parameters:

- Sample time:** 0 Sec
- Sample line temperature:** n/a °C
- Stabilizing time:** 0 Sec
- Block all sample streams:** ☒
- Continuous Flow:** Disabled
- Flush cycles:** 0
- Peak Simulation:** Enabled

Callout boxes provide detailed explanations for these settings:

- Sample time**
Sample Time determines the amount of time the pump operates to draw the sample into the sample loop. The sample time you enter here applies to all channels.
- Sample line temperature**
This setting will control the instrument heated sample line (only when sample line is physically connected).
- Stabilizing Time**
If for Stabilizing Time a value larger than zero is entered, an extra instrument state will be created, the Stabilizing state (see [Stabilization time on page 94](#) for more details)
- Block all sample streams**
This setting does only appear for the auto sampler types "Relay 1+2 (solenoids)", "Extended Relays 5-8 (solenoids)" and "Extended Relays 1-8 (solenoids)" as configured in the Automation tab of the instrument configuration. If selected, all relays configured for stream selection will be opened (deactivated). The requested stream from the sequence will be ignored! This setting can be used at the end of a sequence in a "shutdown" method. All sample streams will be blocked in order to create a save situation.
- Peak simulation**
This is the current peak simulation setting in the CP-4900. At startup of Instrument control this setting is uploaded from the CP-4900.
- Flush cycles**
This is the current number of flush cycles in the CP-4900. At startup of Instrument control this setting is uploaded from the CP-4900.
- Continuous flow**
This is the current continuous flow setting in the CP-4900. At startup of Instrument control this setting is uploaded from the CP-4900.

Stabilization Time

This state becomes active as soon as all individual temperature and pressure states of all channels are in the Ready state. In the Stabilizing state, all individual temperature and pressure states are checked.

If they all remain ready during the stabilizing period the overall instrument state will become Ready.

If during the stabilizing period one of the channel temperatures or pressures become Not Ready the overall instrument state will jump to Not Ready and the whole process will start again. Enter zero for Stabilizing time if the stabilizing period is not required.

ALARM EVENTS TAB

The Alarm Events tab contains the setup for the two integrated relays and for extended “Extension Box” relays (optional). The two integrated relays (relay 1 and 2) can be used for alarming and relay programming purposes.

The extended eight relays of the Extension box can only be used for alarming purposes. Extended relays configured for stream selection in the Automation tab of the instrument configuration cannot be used for alarming setup. These relays will not be displayed in the Alarms Events tab.

The Alarms Events tab will only appear if the “Extension Box connected” option is selected in the Automation tab of the instrument configuration.

Remote Control External Relays
Relays can be setup for alarming purposes (see [Remote control external relays on page 96](#)).

UserDataStore Address
The UserDataStore database contains the CP-4900 instrument status as well as all kind of calculation values and results (see [UserDataStore address on page 96](#)).

Upper Limit
The upper limit value for the parameter as stored in the selected UserDataStore address.

Lower Limit
The lower limit value for the parameter as stored in the selected UserDataStore address.

Activate Relay if
Here can be chosen between “Within limits”, “Outside limits” and “Equals lower limit” (see [Activate relay if on page 96](#)).

Relay Time Event Table
[Click here for more details on page 97.](#)

Activated	UserDataStore address	Lower limit	Upper limit	Activate relay if
☐ Relay 1	520	10	20	Outside limits
☐ Relay 2	521	10	20	Outside limits
☐ Ext. Relay 1	522	10	20	Outside limits
☐ Ext. Relay 2	523	10	20	Outside limits
☐ Ext. Relay 3	524	10	20	Outside limits
☐ Ext. Relay 4	525	10	20	Outside limits
☐ Ext. Relay 5	526	10	20	Outside limits
☐ Ext. Relay 6	527	10	20	Outside limits
☐ Ext. Relay 7	528	10	20	Outside limits
☐ Ext. Relay 8	529	10	20	Outside limits

Event	Time [sec]	Action
1 None	0	None
2 None	0	None
3 None	0	None
4 None	0	None

Remote control external relays

Relays can be programmed for alarming purposes.

The relay setup condition determines whether a relay will be activated or deactivated. The relay setup condition consists of a UserDataStore address holding a parameter value, the lower limit value, the upper limit value and a relay activating condition.

The UserDataStore database contains the CP-4900 instrument status as well as all kind of calculation results. The relay setup conditions will become operational after the method has been downloaded to the CP-4900 Micro-GC. Every two seconds the CP-4900 driver checks the relay switch condition. If the condition changes the relay will be immediately switched.

UserDataStore Address

The UserDataStore database contains the CP-4900 instrument status as well as all kind of calculation values and results. In case CP-4900 Micro-GC status parameters are required for a relay switch condition, read chapter [Remote Access Instrument Status on page 110](#). In case peak areas, concentrations, etc. from CP-Maitre Elite are required to setup a relay condition, read chapter [EliteExport.dll User file on page 104](#). In case data generated by the Varian User link applications (Mlink32, ISOCAL32, BTU32, InstrumentNorm32) is required for a relay setup condition, read chapter [Varian Userlink applications on page 114](#).

Activate Relay if

Here can be chosen between “Within limits”, “Outside limits” and “Equals lower limit”. Select “Within limits” if the relay needs to be activated if the value stored on the selected userDataSet address is within the defined ‘lower-upper’ range.

Select “Outside limits” if the relay needs to be activated if the value stored on the selected userDataSet address is outside the defined ‘lower-upper’ range.

Select “Equals lower limit” if the relay needs to be activated if the value stored on the selected userDataSet address equals the specified lower limit value.



Relays configured for Auto-Sampler purposes cannot be used for alarming purposes.

Relay Time Event Table

The two integrated relays of the CP-4900 can be used in a time program. This program consists of maximal four lines (actions). Every line consists of one action, which must be performed at a specified time. The specified time can be setup by selecting an event (period) and an (offset)time.

There are three events: "Start of Pre-run", "Start of Injection" and "Post Run".

Pre-Run only exists if an auto sampler has been selected in the [Automation tab on page 76](#) of the instrument configuration. The "Volume" column in the sequence file determines its duration.

Post-run never exists, except when a PostRun event is programmed in the "Relay Time Event table". If a Post-run is programmed, the run will be extended with the time as selected in the "Time" box.

Example 1: Activate relay 1, 10 seconds after start of the Pre-run phase and deactivate relay 1, 5 seconds after injection. This program requires two program lines

Event 1=Start of Pre-run, Time=10, Action=Activate relay 1

Event 2=Start of Injection, Time=5, Action=Deactivate relay 1

Event 3=None

Event 4=None

Example 2: Activate relay 1, 20 seconds after injection and deactivate relay 30 seconds after run

This program requires two program lines. Attention the end of the run will now be postponed with 30 seconds!

Event 1=Start of Injection, Time=20, Action=Activate relay 1

Event 2=Post Run, Time=30, Action=Deactivate relay 1

Event 3=None

Event 4=None

CHANNEL TABS

For each channel installed in the [Hardware tab on page 72](#) of the CP-4900 configuration and not disabled in the [User Settings tab on page 74](#) of the CP-4900 configuration a Channel tab does appear ([Click here if a DMD channel is installed on page 101](#)).

Column temperature
Enter the desired column temperature, in degrees C. The CP-4900 driver checks on the maximum allowed temperature, which can be found in the [Hardware tab on page 72](#) of the instrument configuration.

Injector temperature
Enter the desired injector temperature, in degrees C. This is only possible if the GC channel is equipped with heated injector hardware, see [Hardware tab on page 72](#) of the instrument configuration.

Inject time
Enter the Inject Time. The Inject Time determines the amount of time the injection valve will be open. A practical minimum value is 20ms.

Backflush time
Enter the backflush time in seconds. This is only possible if the GC channel is equipped with backflush to vent hardware, see [Hardware tab on page 72](#) of the instrument configuration. A backflush time of zero means no backflush.

Detector state
Select this box to turn the detector filaments on.

TCD temp. limit check
Select this box to turn the TCD temperature limit check on. If activated the TCD will be protected against high amount of Air to protect the filaments.

Sensitivity
Select the desired detector sensitivity – Auto (auto ranging), Low Medium, High or Extra high. Auto is highly advised as it gives the widest linear dynamic range, with the lowest noise level.

Invert Signal
Select this box to invert (change polarity) of the acquired detector data.

Will be continued on the next page

Instrument Setup

Pressure Mode
Select the pressure-programming mode to be used.
Choose **Static** for non-ramped mode.
Choose **Programmed** if you want to enter a programming ramp rate. If you select **Programmed**, the following parameters will become available.

Initial pressure
Enter the initial pressure setting, in kPa or PSI (depending on configuration).

Initial time
Enter the time to hold the initial pressure, in seconds.

Pressure rise
Enter the rate of pressure change for the ramp, in kPa/min or PSI/min (depending on configuration). **Note: Positive rise only.**

Final pressure
Enter the final pressure setting, in kPa or PSI (depending on configuration).

Final time
The final time will be calculated and displayed, based on the **Run time** you have set in the Acquisition Parameters (see [Final time on page 99](#)).

Detector status: ☒ On
TCD temp. limit check: ☒ On
Sensitivity: Auto ☐ Input signal

Pressure mode: ☐ Static ☒ Programmed

Initial pressure: 150 kPa
Initial time: 10 Sec
Pressure rise: 200 kPa/min
Final pressure: 250 kPa
Final time: 20 sec

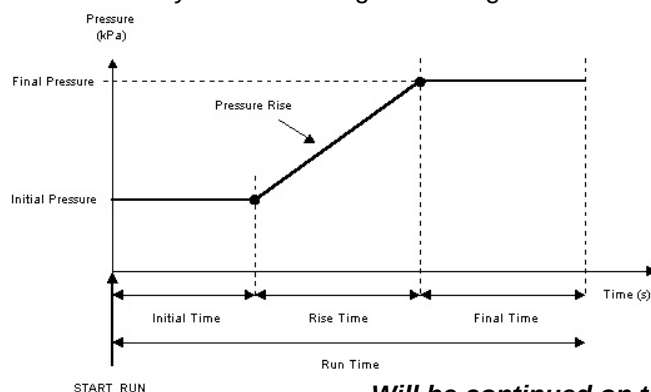
Run time: 60 Sec

Acquisition channel on: ☒

Final time

If the final time displayed is 0, meaning your Run time is equal to or less than the sum of your initial time and the time to ramp the pressure to the final pressure setting. You should change your run time accordingly.

If you have entered an incorrect parameter for any of the above items, an error message will be displayed in this field to aid you in correcting the setting.



Will be continued on the next page

Acquisition parameters
Acquisition Channel On
Select this box to turn the acquisition for this channel ON. If this box is not selected, no data will be acquired for this channel.

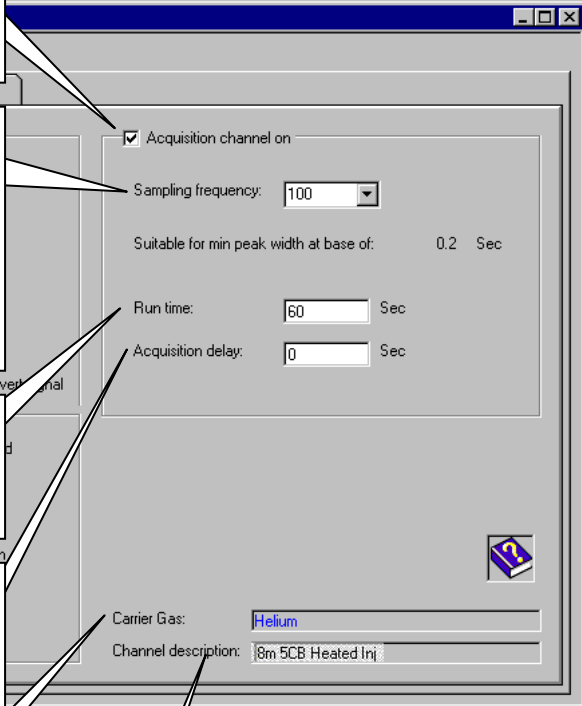
Sampling frequency
This selection is in Hz (samples per second). This is the selection for most chromatography applications. Click on the down-arrow to get a list of the frequencies available for the configuration of your system. **It is recommended that you use the Graphical Events Programming to determine the optimum sampling rate for your chromatography.**

Run Time
Run Time determines the length of time data will be sampled.

Acquisition Delay
Acquisition Delay is the interval between the start of run (Trigger) and the time when sampling starts for this channel.

Carrier gas (actual instrument setting)
Here the actual carrier gas selection in the CP-4900 Micro-GC is displayed. At startup of Instrument control this setting is uploaded from the CP-4900 Micro-GC.

Channel description
Here the channel description as defined in the [User Settings](#) Tab on [page 74](#) of the instrument configuration is displayed.



CHANNEL TAB DMD

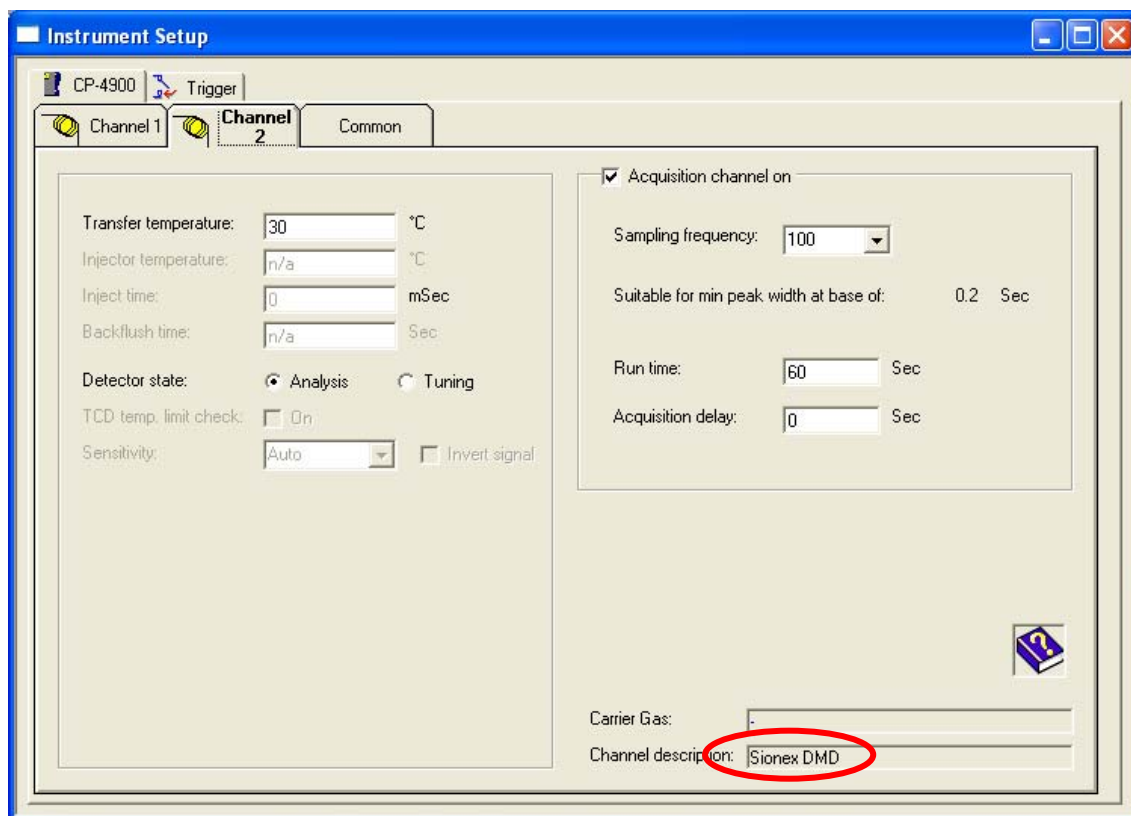
When setting up the instrument for a CP-4900 with DMD detector, in Channel 2 respectively Channel 4 for a Quad CP-4900 system the following is changed:

The Transferline Temperature can be set for the transferline from μ -TCD to DMD. These temperatures are preset with final testing the DMD but may be changed as for sample requirements. Be ware that sample line and transferline are in fact different parts of the instruments and take care not to mix these parameters....

Detector state should be set to analyse always.

NOTE: Tuning of the DMD channel is reserved for trained service engineers.

The Channel Description in the lower right hand corner indicates the presence of a Sionex DMD Channel (unless the channel description is overwritten in the configuration).



SAMPLER TAB

The Sampler tab will appear in case an Auto Sampler of type "VICI Com2" is selected in the [Automation tab on page 76](#) of the instrument configuration.

Stream position
This represents (linked to) the Vial number as defined in the [single run on page 87](#) or [sequence edit on page 89](#) window.

Stream name
Enter here the stream description for the corresponding Vial number.

Transmit before run
Enter here the command, which has to be send to the VICI sampler. Character cal also be typed as numeric ASCII codes between brackets, for instance <10>. An exception is <CR> representing <13>. It is allowed to enter here the command for two valves, for instance 0GO01<CR>1GO02<CR>. The command will be send to the VICI sampler at the start of the pre-run phase, see [Automation Tab on page 76](#) in the instrument configuration.

Transmit after injection
This column is only visible and its function enabled if the Transmit after injection checkbox is selected. Enter here a command identical described in the item above. The command will be send to the VICI sampler five seconds after injection. Actually the command will be send if five seconds of detector data is collected.

Transmit at startup
Enter here the command to be send to the VICI sampler during the first method download to the instrument after CP-Maitre Elite startup.

Transmit after injection checkbox
Select this box to enable sending "Transmit after injection" commands to the VICI sampler.

Reset table button
Click on this button to reset the entire auto sampler table to default settings.

Instrument Setup Window Details:
The window shows tabs for Channel 1, Channel 2, Channel 3, Channel 4, and Common. The Autosampler section contains a table with 8 rows. The 'Transmit at startup' field contains the text '<CR>GO01<CR>'. The 'Transmit after injection' checkbox is checked.

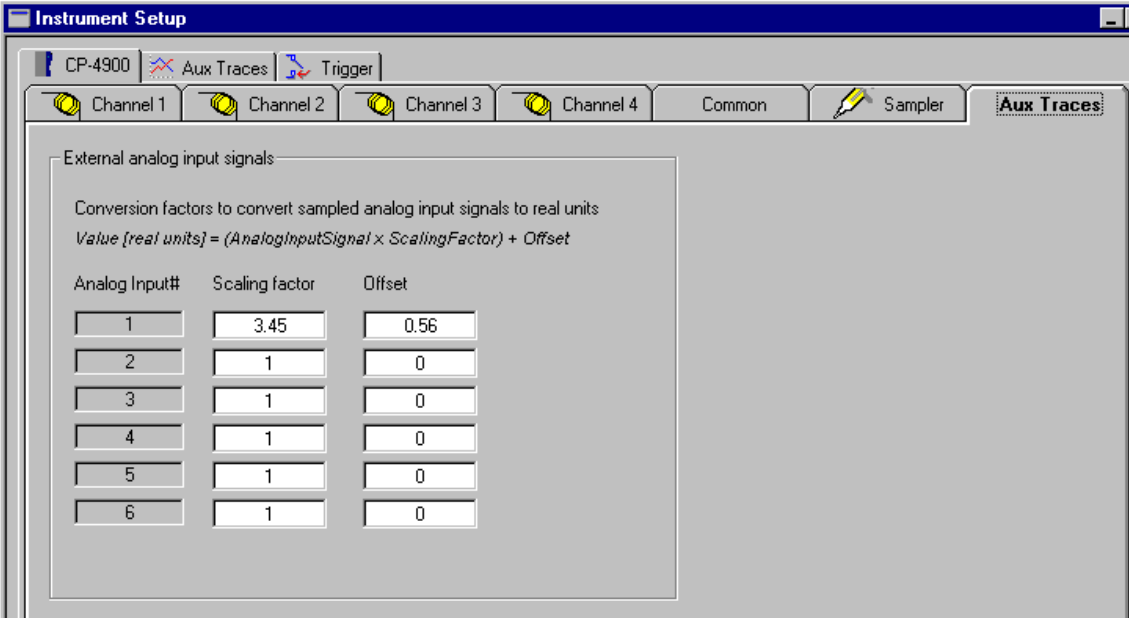
Stream position	Stream name	Transmit before run	Transmit after injection
1	Stream 1	GO01<CR>	GO02<CR>
2	Stream 2	GO02<CR>	GO03<CR>
3	Stream 3	GO03<CR>	
4	Stream 4	GO04<CR>	
5	Stream 5	GO05<CR>	
6	Stream 6	GO06<CR>	
7	Stream 7	GO07<CR>	
8	Stream 8	GO08<CR>	

AUX TRACES TAB

The Auxiliary traces tab contains the conversion factors (scaling factor and offset) for the six external analog input signals.

The conversion factor becomes active after the method is downloaded to the CP-4900.

The corrected analog inputs can be used for drawing plots, see [Aux Traces](#) tab [above](#) and can be stored together with instrument status into the userDataStore library, see topic [Remote Access Instrument](#) on page 110 data and [Automation tab](#) on page 76 of the instrument configuration.



Instrument Setup

CP-4900 | Aux Traces | Trigger

Channel 1 | Channel 2 | Channel 3 | Channel 4 | Common | Sampler | Aux Traces

External analog input signals

Conversion factors to convert sampled analog input signals to real units
 $Value [real\ units] = (AnalogInputSignal \times ScalingFactor) + Offset$

Analog Input#	Scaling factor	Offset
1	3.45	0.56
2	1	0
3	1	0
4	1	0
5	1	0
6	1	0

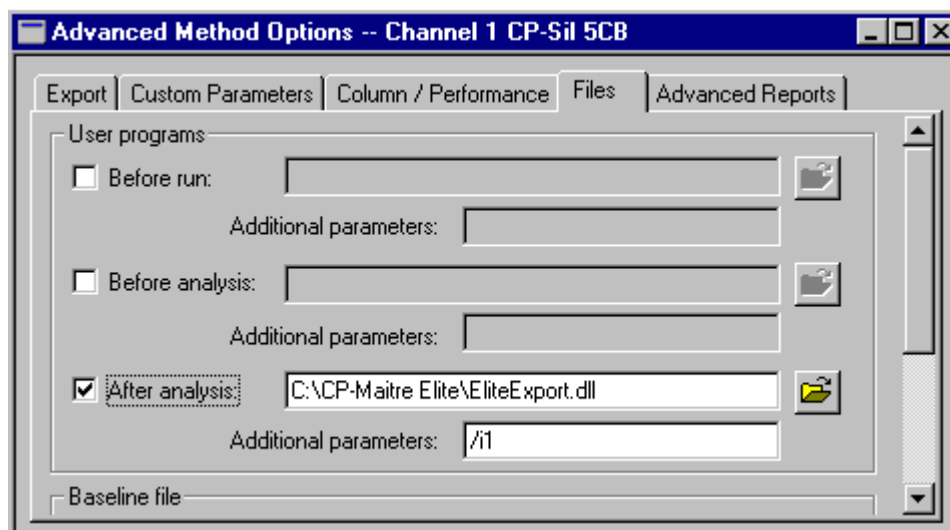
ELITEEXPORT.DLL USER FILE

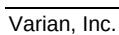
Declare the EliteExport.dll in the Files Tab of the Method –Advanced Method Options if it is required to transfer peak parameters (concentration, area, height, etc) from the instruments integration module to the UserDataStore database.

Data stored in the UserDataStore database can be used by the CP-4900 driver to control the external relays of the CP-4900 Micro-GC. For additional parameters the '/i1' argument has to be entered. This is the UserDataStore instrument number. Make sure to enter the same instrument number as configured in the [Automation tab on page 76](#) of the instrument configuration. Find more information about data exchange between applications in topic [Varian Userlink applications on page 114](#).

The EliteExport.dll user file uses the EliteExport.ini file to determine which peak parameters must be stored in specified UserDataStore address. The EliteExport.ini can be setup by running the EliteExport editor.

Declare the EliteExport.dll in the Files tab of the Method Advanced Options





STANDARD CONTROL

Standard control mode is a CP-4900 Micro-GC controlled and started by CP-Maitre Elite and there is no auto sampler (stream selector) required and additional I/O's are not used.

The following steps are required:

1. Configure the CP-4900. This consist of setup the [communication type on page 67](#), [upload the CP-4900 configuration on page 72](#), configure [user settings on page 74](#) and [CP-Maitre Elite settings on page 75](#).
2. Select Method new or open an existing valid method, which meets the instrument configuration.
3. Show the [Instrument status on page 85](#) window.
4. Startup instrument control and set the [Trigger type on page 92](#) to none.
5. Start a [single run on page 87](#) or [setup and start a sequence on page 89](#).

EXTERNAL STARTED

External start mode is a CP-4900 Micro-GC controlled by CP-Maitre Elite but started by an external device.

The following steps are required:

1. Configure the CP-4900. This consist of setup the [communication type on page 67](#), [upload the CP-4900 configuration on page 72](#), configure [user settings on page 74](#) and [CP-Maitre Elite settings on page 75](#).
2. Select Method new or open an existing valid method, which meets the instrument configuration.
3. Show the [Instrument status on page 85](#) window.
4. Startup instrument control and set the [Trigger type on page 92](#) to none.
5. Start a [single run on page 87](#) or [setup and start a sequence on page 89](#).

AUTO SAMPLER CONTROL

The CP-4900 driver of CP-Maitre Elite is capable to control the VICI Electric Actuated Multi-Positional-Valve.

The following steps must be taken in order to control single or multiple valves:

1. Connect the connector of serial VICI cable to the CP-4900-Com2 port. Multiple valves must all be connected to Com2. Find more information in connection schedule in chapter [External Devices, on page 117](#).
2. Configure an Auto Sampler type in the [Automation Tab on page 76](#) of the Configuration Setup.
3. Select the "External" start in the [Trigger Tab on page 92](#) of the Instrument method
4. The external start selection means here that the CP-4900 is started by the auto sampler control, part of the CP-4900 driver. Actually it is an internal software start by the auto sampler control and does not require any physical wiring.
5. In case the CP-4900 has to be externally started by another device then the internal software start has to be disabled.
6. Select "CP-4900 and Auto-sampler external started" in the [Automation Tab on page 76](#) of the Configuration Setup in order to disable the internal software start.
7. Setup Auto Sampler parameters in the [Sampler Tab on page 102](#) of the Instrument Setup.
8. Setup a [Sequence on page 89](#) or [Single Run on page 87](#) including Vial and Volume values.

ALARM SETUP (CONTACT CLOSURES)

The CP-4900 has two external relays (contact closures), which can be used for alarm functions. In case Relay 1 and/or Relay 2 are already used for Auto Sampler purposes, they cannot be used for alarming purposes.

To setup an alarm function continue with the following steps:

1. Select "Remote Control External Relays" in the [Automation Tab on page 76](#) of Instrument configuration.
2. In [Common Tab on page 93](#) of the Instrument method, fill in the "Remote Control External Relays" parameters and conditions. Find the required UserDataStore addresses in the topics [EliteExport.dll user file on page 104](#) and [Remote Access Instrument status on page 110](#).
3. [Download the Method](#) to the instrument, which activates the alarm function for the defined settings.

The CP-4900 driver will now check every two seconds the relay switch conditions. If a condition changes the relay(s) will be immediately activated or deactivated depending on the condition.

External Pump Control

An external pump can be controlled by connecting it to the external relay 1 of the CP-4900 Micro-GC.

To setup external pump control, the following steps have to be taken:

1. In the [Automation Tab on page 76](#) of the CP-Maitre Elite instrument configuration select the Auto Sampler type "Relay 1 (external pump)" or "VICI Com2 + Relay 1".
2. In the Sequence- or Single Run window enter the "Vial" and "Volume" values. Find details in [Start Single Run on page 87](#) or [Start Sequence on page 89](#) chapter.



If external relay 1 is used for external pump control, this relay won't be available for alarm setup.

ACQUIRE EXTERNAL ANALOG SIGNALS

The CP-4900 has the capability to acquire the six external analog inputs from the CP-4900 Micro-GC.

To enable sampling the analog inputs select "Acquire auxiliary traces" in the [Automation tab on page 76](#) of instrument configuration.

In the [Aux Traces on page 103](#) tab of the Instrument method setup enter the scaling factors and offset values in order to convert the acquired analog voltages to the required units.

The conversion factors will become active after the method is downloaded to the CP-4900 Micro-GC.

If plots of the converted signals are required, select the analog inputs to plot in the [Aux Traces on page 103](#) tab of the Instrument Method setup window.

The topic [Remote Access Instrument Status on page 110](#) describes how to transfer the converted signals to the UserDataStore library. This enables other applications to retrieve the instrument status including the converted signals.

EXTERNAL DEVICE SYNCHRONIZATION

In some cases it is required to synchronize the CP-4900 with another external device. The CP-4900 driver can be configured to wait for external Ready In contact closure before starting the CP-4900 run.

Select “Wait starting CP-4900 till external Ready In” in the [Automation Tab on page 76](#) of the Instrument configuration.

Each time a new run is initiated by for instance a sequence, the method will be downloaded to the instruments and then the CP-4900 driver will wait for an external Ready In contact closure. If this is detected the run will start.

CP-4900 AND SAMPLER EXTERNAL STARTED

If the CP-4900 Micro-GC together with an Auto Sampler are both externally started while CP-Maitre Elite controls (method download, data acquisition, integration, etc.) the instrument, synchronization will be as follows:

1. CP-Maitre Elite is initiating a new run from a sequence.
2. The Method for that particular run is downloaded to the CP-4900 Micro-GC. The instrument will control now to new setpoints.
3. Because the Auto Sampler is configured, the Pre-run phase will be initiated.
4. At the beginning of the Pre-run phase the auto sampler will be switched to the required position determined by the Vial parameter in the sequence. The length of the pre-run phase is determined by the Volume parameter in the sequence.
5. Once the Pre-run phase is completed, the instrument will wait for a start from an external device generated via the “Start In” wire.

How to setup see in chapter [Auto Sampler Control on page 78](#).

REMOTE ACCESS INSTRUMENT STATUS

The Instrument status of the CP-4900 Micro-GC can be accessible for other applications like Varian userlink applications: Mlink32, I/O Control, PCI1000Com or any other self written program capable to collect instrument status from the UserDataStore database. It is required that this application runs on the same computer together as CP-Maitre Elite. Read the user-manual of Mlink32, I/O Control or PCI1000Com in order to import the CP-4900 instrument status into these applications. Find more information in topic [Varian Userlink applications. on page 114.](#)

To enable remote access of instrument status, select a unique "Instrument" number and "Remote Access CP-4900 status" In the [Automation Tab on page 76](#) of the Instrument Configuration.

The following instrument status parameters are available for other applications running:

UserDataStore Address	Parameter description
1200	Serial number Main board
1201	Serial number Channel 1 Controller
1202	Serial number Channel 2 Controller
1203	Serial number Channel 3 Controller
1204	Serial number Channel 4 Controller
1205	Serial number Channel 1 Analytical Module
1206	Serial number Channel 2 Analytical Module
1207	Serial number Channel 3 Analytical Module
1208	Serial number Channel 4 Analytical Module
1209	Part number Channel 1 Analytical Module
1210	Part number Channel 2 Analytical Module
1211	Part number Channel 3 Analytical Module
1212	Part number Channel 4 Analytical Module
1213	Reserved for Tx com2 Don't use this
1214	Reserved for Tx com3 Don't use this
1215	Reserved for Rx com2 Don't use this
1216	Reserved for Rx com2 Don't use this
1218	Instrument State (0=Initializing, 1=Flushing, 2=Running, 3=Stabilizing, 4=Ready, 5=Error, 6=Recovery error, 7=Broken, 8=Not ready)
1219	Instrument general Error State. Find error description in next table
1220	Error State
1221	Sample Line temperature in Celsius
1222	Ambient pressure in kPa
1223	Ambient temperature in Celsius
1224	Power Supply in Voltage
c1226	Auto Sampler position

1227	Auto Sampler position at start of run
402	Current stream position
1230	Instrument external Ready-In state
1231	External Analog Input #1 in units determined by the scaling and offset factors
1232	External Analog Input #2 in units determined by the scaling and offset factors
1233	External Analog Input #3 in units determined by the scaling and offset factors
1234	External Analog Input #4 in units determined by the scaling and offset factors
1235	External Analog Input #5 in units determined by the scaling and offset factors
1236	External Analog Input #6 in units determined by the scaling and offset factors
1237	External Analog Input #1 at start of run (copied from address 1231)
1238	External Analog Input #2 at start of run (copied from address 1232)
1239	External Analog Input #3 at start of run (copied from address 1233)
1240	External Analog Input #4 at start of run (copied from address 1234)
1241	External Analog Input #5 at start of run (copied from address 1235)
1242	External Analog Input #6 at start of run (copied from address 1236)
1243	Column temperature channel 1 in Celsius
1244	Column temperature channel 2 in Celsius
1245	Column temperature channel 3 in Celsius
1246	Column temperature channel 4 in Celsius
1247	Injector temperature channel 1 in Celsius
1248	Injector temperature channel 2 in Celsius
1249	Injector temperature channel 3 in Celsius
1250	Injector temperature channel 4 in Celsius
1251	Column pressure channel 1 in kPa
1252	Column pressure channel 2 in kPa
1253	Column pressure channel 3 in kPa
1254	Column pressure channel 4 in kPa

GENERAL ERROR STATE

The General Error State as stored in UserDataStore address 1219 is composed of the following items:

The error must be handled as 'CLNNN' in which C=error class, L=location and NNN=error number or event number.

The Error class contains of the following values: 0=diagnostic error, 1=advisory error, 2=critical error, 3=fatal error.

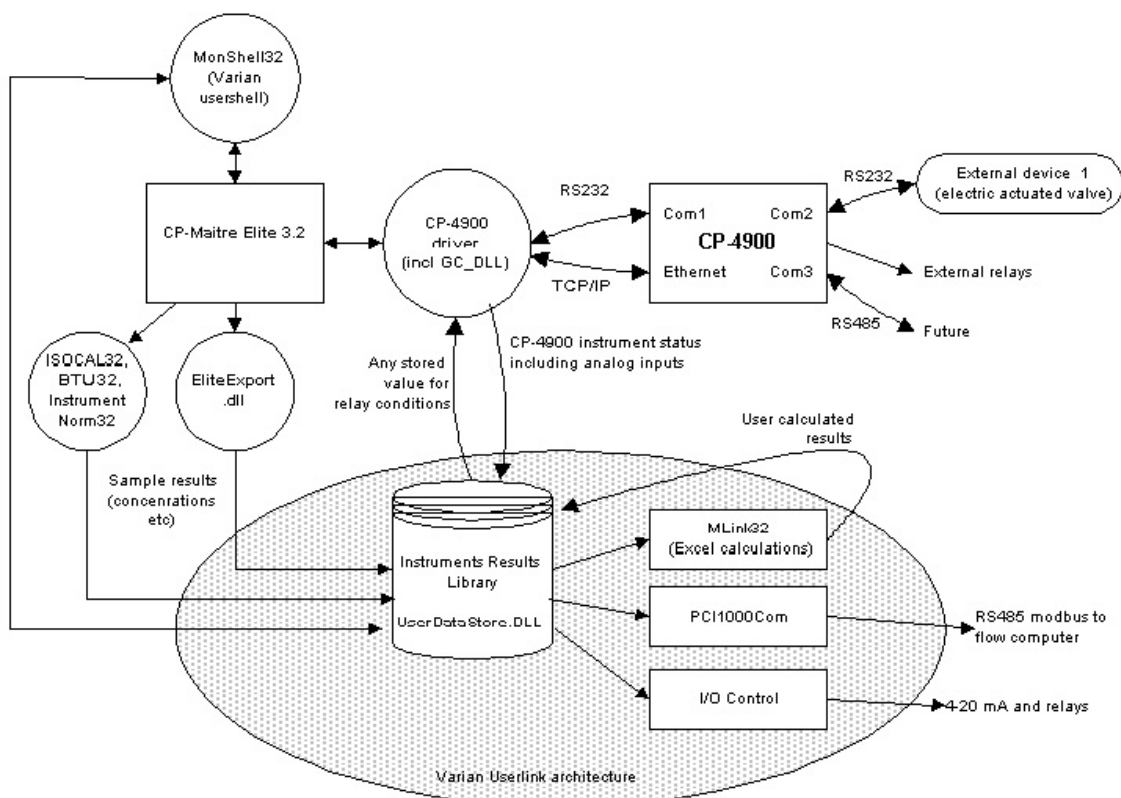
There are five locations: 0=main board, 1=channel 1, 2=channel 2, 3=channel 3 and 4=channel 4.

Error number NNN	Error Description
1	Init passed (event)
2	Pressure restored
3	Start flush cycle
4	Flush cycle passed
5	TCD calibrating
6	Too low pressure
7	Pressure fault
8	Low battery 1
9	Low battery 2
10	Sample line sensor fault
11	Sample line temperature fault
12	Injector temperature fault
13	Column temperature fault
14	TCD Temperature limit activated
15	EDS logging error
16	Low power supply
17	Injector sensor fault
18	Column temperature sensor fault
19	TCD control error
20	TCD calibration failed
21	Hardware reset"
22	Pressure too high
23	Initialization error
24	Internal communication error
25	Instrument EDS incorrect
26	EDS incorrect
27	Internal power failure
28	Flush cycle aborted
29	GC module changed
30	TCD Gain calibrated
31	TCD Offset calibrated
32	Null String
33	ADC reading out of range

34	EDS Analytical Module incorrect
35	EDS Config checksum incorrect
36	EDS Logbook checksum incorrect
37	EDS Protected checksum incorrect
38	EDS C.C. Config checksum incorrect
39	EDS C.C. Logbook checksum incorrect
40	EDS C.C. Protected checksum incorrect
41	EDS A.M. Config checksum incorrect
42	EDS A.M. Logbook checksum incorrect
43	EDS A.M. Protected checksum incorrect
44	EDS Config SVER incorrect
45	EDS Protected SVER incorrect
46	EDS C.C. Config SVER incorrect
47	EDS C.C. Protected SVER incorrect
48	EDS A.M. Config SVER incorrect
49	EDS A.M. Protected SVER incorrect
50	Pressure Offset calibration complete
51	Pressure Offset calibration Failed
52	Unable to store pressure offset
53	Temperature sensor disconnected
60	DMD control to temperature setpoint
61	DMD start run
62	DMD stop run
63	DMD start tuning
64	DMD case temperature error
65	DMD sensor temperature error
66	DMD method file error
67	DMD sensor voltage error
68	DMD RF voltage error
69	DMD Vc voltage error
70	DMD sensor pressure error
71	DMD tuning process error
72	DMD gas flow error
73	DMD system voltage error
74	DMD communication error
75	DMD sensor error

VARIAN USERLINK APPLICATIONS

The schedule describes the data transfer between applications.



CP-4900 External Relays

The switch condition for the external Relays of the CP-4900 can be setup out of almost any parameter available in all application part of this schedule. Everything stored in the shared **UserDataStore** database can be used to setup a switch condition, since every Varian userlink application is capable to store its specific results into this database. To store CP-Maitre Elite 3.2 concentrations into the **UserDataStore** database look at topic [Common Tab on page 93](#) of Instrument Method Setup.

CP-4900 instrument status including analog inputs

The instrument status and analog inputs can be stored into the UserDataBase database. Applications like Mlink32, PCI1000Com and I/O Control can retrieve these from the database.

UserDataStore addresses of Varian userlink applications

Find below a table of relevant UserDataStore addresses, which can be used, for alarming purposes. The addresses are all part of the Varian Userlink applications: ISOCAL32, BTU32, InstrumentNorm32 and Mlink32.

The addresses are specific for each instrument (maximal four instruments)

ISOCAL32		BTU32		ValveControl32	
Address	Parameter	Address	Parameter	Address	Parameter
0	Calib.Level	200	Calib.Level	402	Current Stream Position
1	Total-ESTD	201	Total-ESTD	404	Calib.Level
2	Total-Estimates	202	Total-Estimates		
3	Hs_MJ/m3	203	Hv_actual	InstrumentNorm32	
4	Hi_MJ/m3	204	Hv_dry		
5	Rel.Density	205	Hv_saturated	Address	Parameter
6	Density	206	Hv_act._MJ/m3	0	Calib.Level, SampleID
7	Wobbe_MJ/m3	207	Wobbe	1	Total-ESTD
8	MoleWeight	208	MoleWeight	2	Total-Area
9	MoleWeight ratio	209	MoleWeight ratio	20	ESTD Peak1
10	Hs_KW/m3	210	Rel.Density	109	ESTD Peak90
11	Wobbe_KW/m3			110	ESTD% Peak1
20	ESTD Peak1	220	ESTD Peak1	199	ESTD% Peak90
109	ESTD Peak90	309	ESTD Peak90		
110	ESTD% Peak1	310	ESTD% Peak1		
199	ESTD% Peak90	399	ESTD% Peak90		

EliteExport.dll

Address	Parameter
----------------	------------------

501	Calib.Level and SampleID
511	Stream Position from CP-Maitre Elite
512	Total ESTD summed of all channels

EliteExport.dll or Mlink32

520 and up	User defined parameters as defined in the UserDataStore sheets output section of Mlink32 or as defined in the EliteExport.ini file.
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EXTERNAL DEVICES

The CP-4900 is equipped with several external I/O's in order to control external devices or to synchronize with external devices. External devices can be external pump(s), alarms, Auto Sampler, etc.

The following I/O's are standard available:

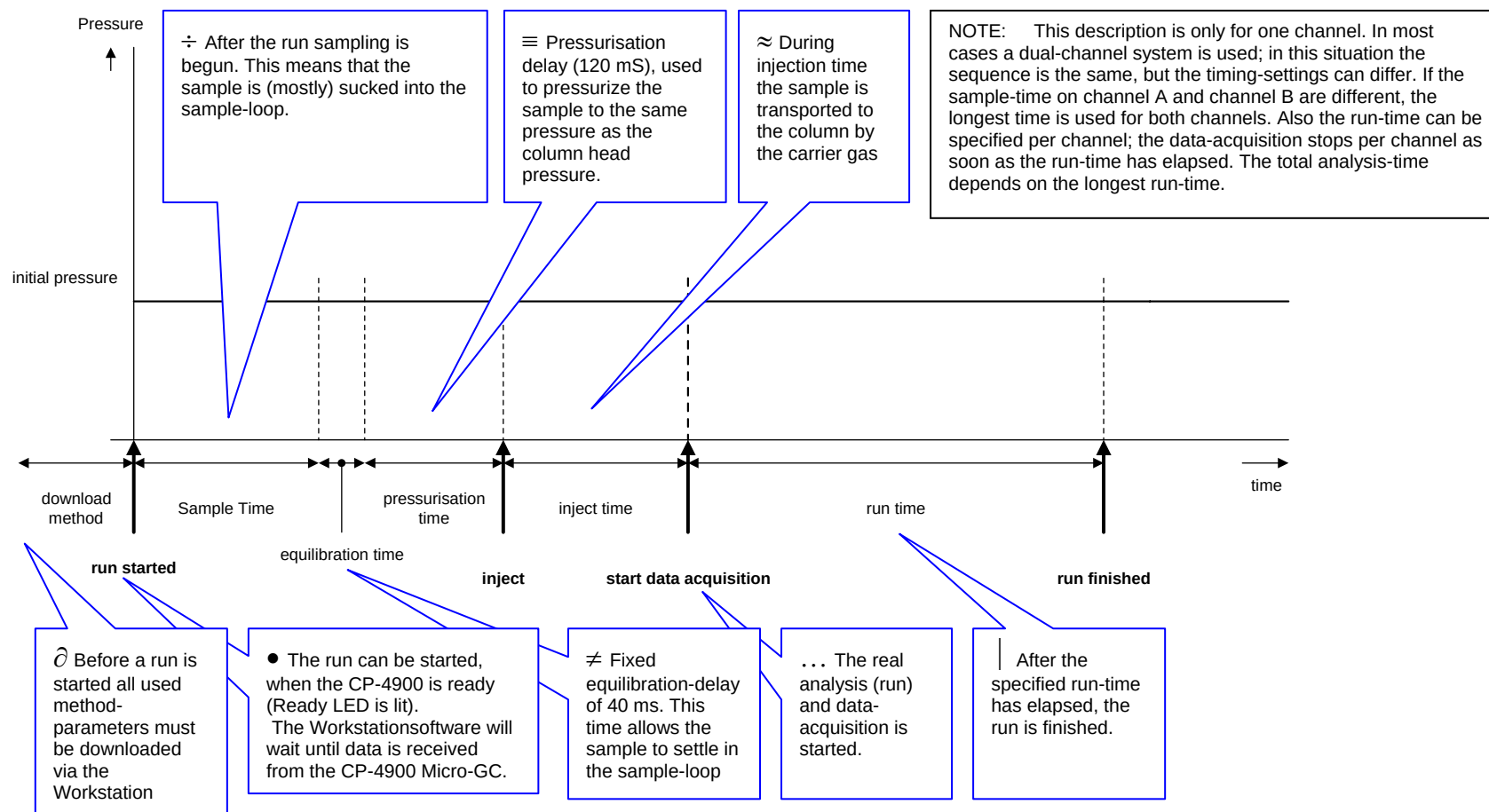
1. Two external serial ports (Com2: RS232, Com3: RS485)
The CP-4900 driver supports control of the VICI electric actuated multi positional valve via Com2 (see also [COM port details on page 39](#)).
2. Two external relays (contact closures)
The CP-4900 driver supports alarming purposes, Auto-Sampler control via solenoids and external pump control (see also [External digital IO on page 38](#)).
3. External Start In
The CP-4900 driver supports the start of the CP-4900 Micro-GC by an external device (Flow computer or PLC). The CP-4900 Micro-GC processes this event (start run) and passes the event to the CP-4900 driver (see also [External digital IO on page 38](#)).
4. External Start Out
The "External Start Out" signal is directly controlled from the CP-4900 Micro-GC (see also [External digital IO on page 38](#)).
5. External Ready In
The "External Ready In" signal is not processed in the CP-4900 Micro GC. The CP-4900 driver acquires this event. It can be used to synchronize with an external device (see also [External digital IO on page 38](#)).
6. External Ready Out
The "External Ready Out" signal is directly controlled from the CP-4900 Micro-GC (see also [External digital IO on page 38](#)).
7. Six External Analog Input signals
The CP-4900 driver supports the acquisition and processing of the External Analog Input signals (see also [External Analog IO on page 38](#)).

The VICI electric actuated multi positional valve



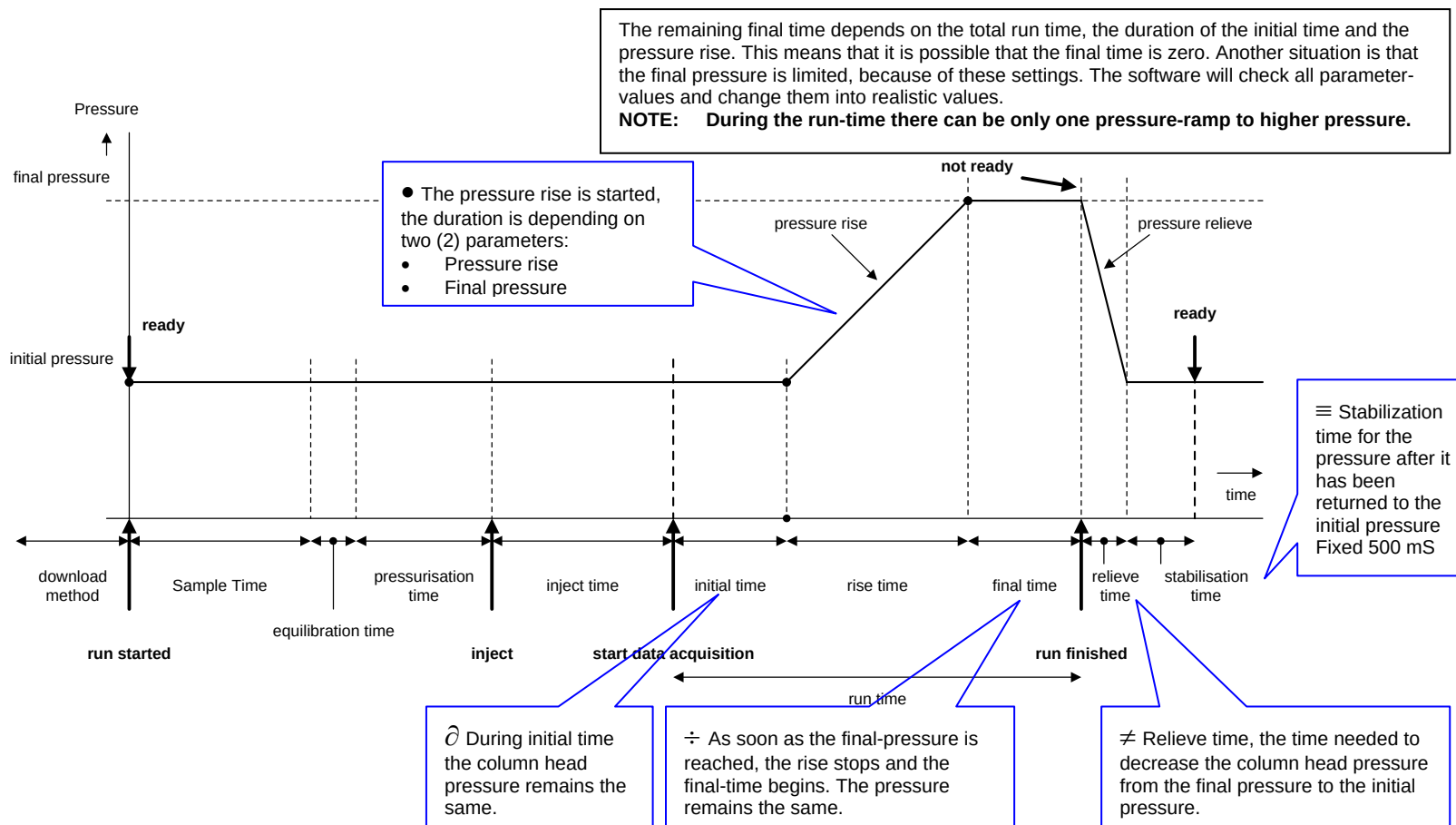
Cycle with static (electronic) pressure

This time diagram will help you to understand the Static (electronic) pressure cycle of the CP-4900.



Cycle with electronic pressure control

This timing diagram will help you to understand the electronic pressure control (EGC) cycle of the CP-4900. The diagram shows the situation in the CP-4900, using electronic (programmed) pressure control. The timing before the injection is identical to the static pressure cycle.



COLUMN MODULE CONDITIONING



NOTE

Follow this procedure to make sure that any “water” that might be present inside the analytical column is removed before the TCD is switched on. Also follow this procedure if the CP-4900 Micro-GC or CP-4900 Micro-GC module has been stored for a long period.



WARNING

The detector filaments may be damaged if this procedure is not followed!

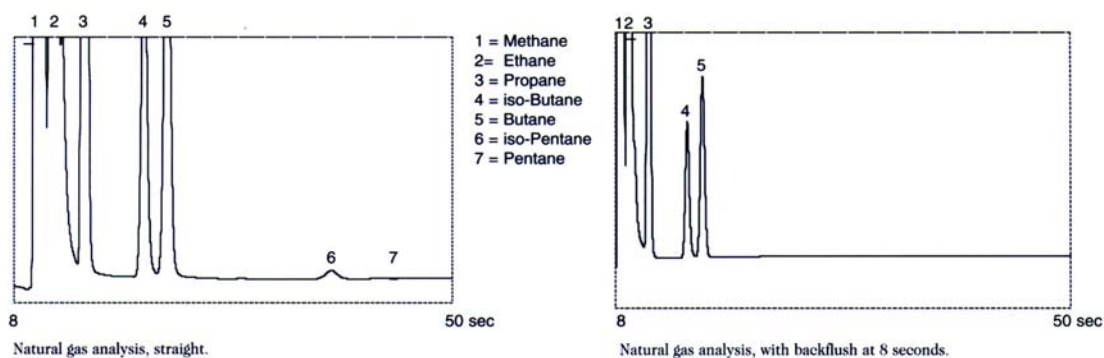
1. Switch off the TCD filaments in the method.
2. Set the column temperature of the module to the maximum temperature.
Leave the filaments off!!
3. Download this method to the CP-4900 Micro-GC.
4. Condition the column module, preferably overnight.

This will insure you that all the “water” has been removed from the column module and no damage will occur to the TCD filaments.

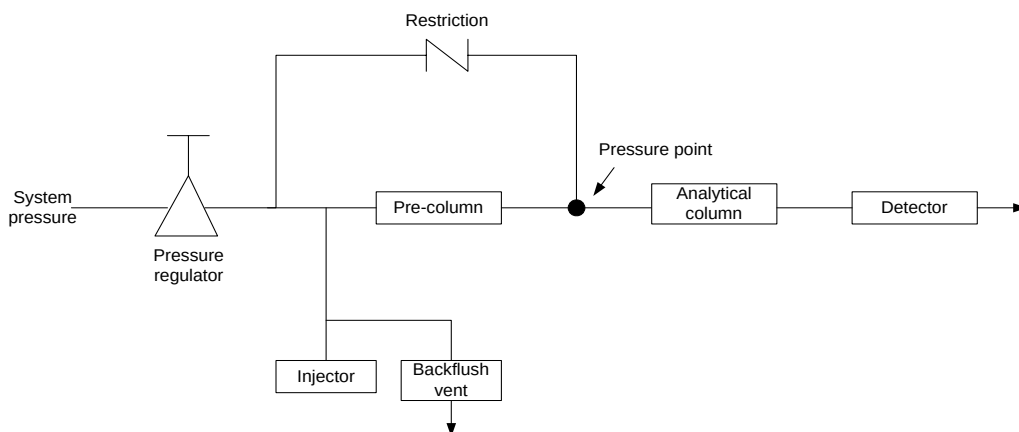
Backflush option

Backflush to vent is an advanced technique, which is used to prevent later eluting compounds to reach the analytical column and detector. The main reason for applying this technique is to keep the analytical column clean and reduce analysis time.

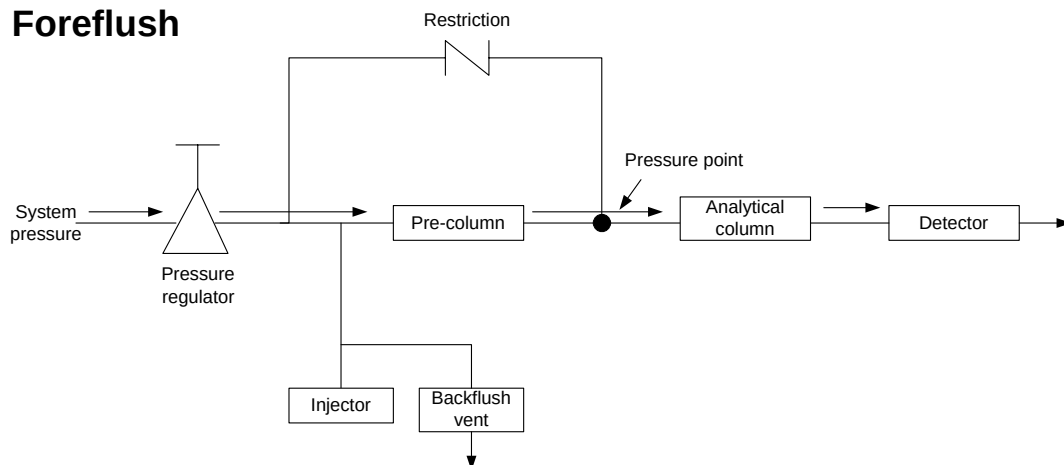
The Varian CP-4900 Micro-GC is optionally available with GC modules that incorporate backflush capabilities.



A backflush system always consists of a pre-column and an analytical column. The two columns are coupled with a so-called pressure point, which makes it possible to invert the carrier gas flow direction through the pre-column at a preset time, the "backflush time".



Foreflush

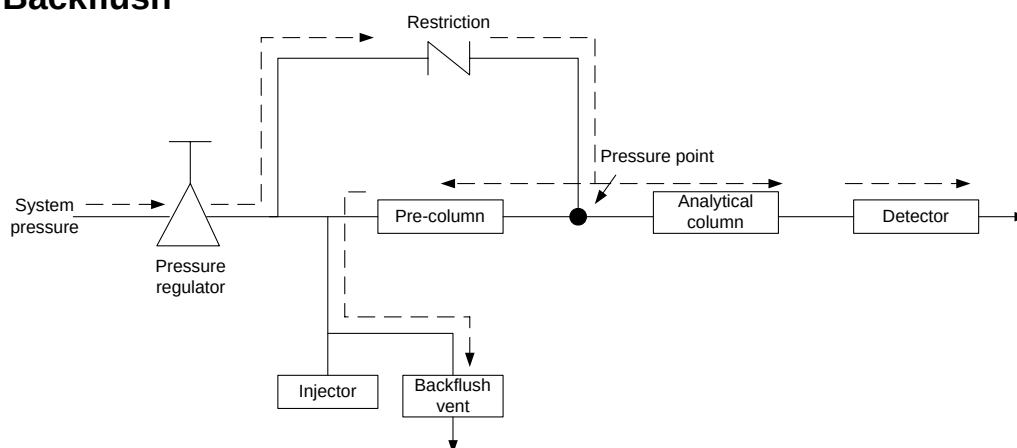


Description

The injector, two columns, and detector are set in line.

The sample is injected onto the pre-column where a pre-separation takes place; injection takes place in "foreflush" mode (see foreflush diagram).

Backflush



When all compounds which are to be quantified are transferred to the analytical column, the backflush valve switch (at the backflush Time) On the pre-column the flow is inverted and all compounds left on the pre-column are now (back) flushed to the vent (see backflush diagram). On the analytical column the separation goes on, because as there the flow is not inverted!

The standby mode for the CP-4900 is to be in the backflush configuration (if the instrument is equipped with the optional backflush valve).
Back flushing will ensure that the pre-column will be in good condition for the next run.

Tuning

Tuning of the backflush time is done by trial and error. Reducing the backflush time will transfer fewer compounds to the analytical column.

How to Tune

Obtain a chromatogram in foreflush. Check out the retention times of the compounds you have to quantify. Start at a backflush time of 10 seconds. Obtain a second chromatogram. Adjust the Backflush time (increments of 0.1 seconds are possible) until all components of interest are transferred to the analytical column and that all unwanted peaks are backflushed.

Be aware that a small pre-column is used. It is not always possible to cut between 2 peaks!

Backflush Time range 0.5 seconds until maximum run time.

Special value

BACKFLUSH TIME = 0 this puts the system in FOREFLUSH mode during run the entire run.

SHIPPING INSTRUCTIONS

If your CP-4900 Micro-GC for any reason must be sent back to the factory, it is very important to follow these additional shipping preparation instructions:

1. Add all the vent caps at the back of the CP-4900 Micro-GC.
2. Always include the power supply.
3. Include, if used, the inlet filter(s).

CLEANING INSTRUCTIONS

To keep the CP-4900 Micro-GC surface clean, refer to the remarks given below:

- Switch the CP-4900 Micro-GC off.
- Remove the power cable.
- Put protection plugs on the sample and carrier gas inlets.
- Put protection plugs on the Column vents.
- Use a soft (no hard or abrasive) brush to carefully brush away all dust and dirt.
- If the outer case is dirty (never clean the inside!) clean it with a soft, clean cloth dampened with mild detergent.
- Never use alcohol or thinners to clean the CP-4900 Micro-GC, these chemicals can damage the case.
- Be careful not to get water on the electronic components.
- Do not use compressed air to clean.

DISPOSAL INSTRUCTIONS

When the lifetime of the CP-4900 Micro-GC or parts of it has reached the end of its useful life, disposal must be carried out in accordance with all (environment) regulations applicable in your country.

ERROR LIST

ERROR HANDLING

During operation a series of events and error messages are generated indicating start or finishing of certain actions and procedures as well as smaller and fatal errors somewhere in the instrument. This section describes how CP-4900 micro-GC reacts to these events or messages.

The following error classes as well as the subsequent actions are available:

Class 0 **Internal event.**

Basically these are only events indicating a certain procedure has started or finished. In no way do they influence the proper functioning of the instrument.

Class 1 **Advisory fault;** the instrument continues.

These are the less-critical errors, advisory errors not requiring immediate action from the user. The ongoing run may be minimally effected by it and thus need not to be stopped. Class 2 error messages indicate certain malfunctions of the instrument. Some errors of this type keep the instrument from becoming ready.

Class 2 **Critical errors** for logging; error LED ON.

These are critical errors for which the user needs immediate warning (window-pop at workstation! as well as Error-LED). The run in progress is to be stopped since its results will definitely be wrong. Corrective action by the user or instrument service may be required.

Class 3 **Fatal errors** for logging; instrument shut-down, error LED and buzzer ON.

These are fatal errors for which the user needs immediate warning! (Error-LED). An instrument shut-down will be generated. Corrective action by the user or service is required.

All errors, independent of class are to be transferred to reader (PROstation or web browser) connected for display (trouble shooting information) under instrument status. All Class 1 and above errors will be logged on flash. Individual numbers identify all errors; these numbers are built using the error class and a number. Events are not numbered.

ERROR LIST:

The General Error State as stored in UserDataStore address 1219 is composed of the following items:

The error must be handled as 'CLNNN' in which C=error class (severity), L=location and NNN=error number or event number.

The Error class contains of the following values: 0=diagnostic error, 1=advisory error, 2=critical error, 3=fatal error.

There are five locations: 0=main board, 1=channel 1, 2=channel 2, 3=channel 3 and 4=channel 4.

ErrorC lass©)	Error number (NNN)	Event/Error code	Description	Action needed
0	1	Init passed (event)	End of initialization phase	NA
0	2	Pressure restored	Pressure restored after Too Low Pressure	NA
0	3	Start flush cycle	Is a part of the initialization cycle	NA
0	4	Flush cycle passed	Is a part of the initialization cycle	NA
0	5	TCD calibrating	Automatic generation after method activation or download.	TCD off and temp. control to default
1	6	Too low pressure	Pressure drops below 35 kPa	Check gas supply
1	7	Pressure fault	Pressure state not ready after 5 minutes	Check gas supply or replace manifold
1	8	Low battery 1	Battery 1 low power (portable Micro-GC only)	Recharge battery
1	9	Low battery 2	Battery 2 low power (portable Micro-GC only)	Recharge battery
2	10	Sample line sensor fault	Sample line temperature sensor error	Heater turned off
2	11	Sample line temperature fault	Temperature not reached within 35 min (heater error)	Replace sample line heater
2	12	Injector temperature fault	Temperature not reached within 35 min (heater error)	Replace module
2	13	Column temperature fault	Temperature not reached within 35 min (heater error)	Replace module
1	14	TCD Temperature limit activated	Hardware protection activated	NA
0	15	EDS logging error	Unable to update EDS log	Call service
1	16	Low power supply	Voltage < 10 Volt	Recharge battery
2	17	Injector sensor fault	Injector temperature sensor error	Replace module
2	18	Column temperature sensor fault	Column temperature sensor error	Replace module
2	19	TCD control error	TCD voltage not or incorrectly set	Call service
2	20	TCD calibration failed	Any error during TCD calibration	Replace module or TCD controller board
2	21	Hardware r"set"	Instrument reset request from WS	NA
2	22	Pressure too high	Pressure > 450 kPa for at least 2 minutes	Replace manifold
3	23	Initialization error	During initialize	Call service
3	24	Internal communication error	During/after initialization, between MPU and IOC/IOE	Call service
3	25	Instrument EDS incorrect	Instrument Electronic Datasheet incorrect	Call service
3	26	EDS incorrect	Electronic Datasheet incorrect	Call service
3	27	Internal power failure	During/after initialization, internal supplies	Call service
0	28	Flush cycle aborted	Flush cycle stopped before completion	NA

Reference

ErrorC lass©)	Error number (NNN)	Event/Error code	Description	Action needed
0	29	GC module changed	Changing a channel (controller or module) and restarting the instrument	NA
0	30	TCD Gain calibrated	End TCD Gain calibration	NA
0	31	TCD Offset calibrated	End of Offset calibration	NA
0	32	Null String	Not used	NA
0	33	ADC reading out of range	Analog Digital Control out of range	NA
0	34	EDS Analytical Module incorrect	Electronic Data Sheet Analytical Module incorrect	NA
0	35	EDS Config checksum incorrect	Electronic Data Sheet Configuration checksum incorrect	NA
0	36	EDS Logbook checksum incorrect	Electronic Data Sheet Logbook checksum incorrect	NA
0	37	EDS Protected checksum incorrect	Electronic Data Sheet Protected checksum incorrect.	NA
0	38	EDS C.C. Config checksum incorrect	Electronic Data Sheet Channel Control checksum incorrect.	NA
0	39	EDS C.C. Logbook checksum incorrect	Electronic Data Sheet Channel Control Logbook checksum incorrect	
0	40	EDS C.C. Protected checksum incorrect	Electronic Data Sheet Channel Control Protected checksum incorrect	
0	41	EDS A.M. Config. checksum incorrect	Electronic Data Sheet Analytical Module Configuration checksum incorrect	
0	42	EDS A.M. Logbook checksum incorrect	Electronic Data Sheet Analytical Module Logbook checksum incorrect	
0	43	EDS A.M. Protected checksum incorrect	Electronic Data Sheet Analytical Module Protected checksum incorrect	
0	44	EDS Config SVER incorrect	Electronic Data Sheet Configuration Structure Version incorrect	
0	45	EDS Protected SVER incorrect	Electronic Data Sheet Protected Structure Version incorrect	
0	46	EDS C.C. Config SVER incorrect	Electronic Data Sheet Channel Control Structure Version incorrect	
0	47	EDS C.C. Protected SVER incorrect	Electronic Data Sheet Channel Control Protected Structure Version incorrect	
0	48	EDS A.M. Config SVER incorrect	Electronic Data Sheet Analytical Module Configuration incorrect	
0	49	EDS A.M. Protected SVER incorrect	Electronic Data Sheet Analytical Module Protected Structure Version incorrect	
0	50	Pressure Offset calibration complete	Notification Pressure Offset calibration is completed	
0	51	Pressure Offset calibration Failed	Calibration offset out of range	
0	52	Unable to store pressure offset	Pressure off set is out of valid range (range??)	
?	53	Temperature sensor disconnected	Temperature sensor not connect to instrument	Connect Temperature sensor
1	54	Not ready to start run	Issued by Safety Control Object in Hardware domain. Bridge Call to GC domain (Reporting Not Ready To Start Run Error)	
1	54	Stream selection failed	Stream selector (VICI) failed switching	
1	55	Ambient pressure or temperature alarm	Issued by Safety Control Object in Hardware domain whenever ambient temperature has passed a certain value.	
1	56	Column cleaning	Instrument in column cleaning state	
1	57	Equilibrating temperature zones	Instrument stabilizing after column cleaning	Wait till Ready
	60	DMD control to temperature setpoint	Notification that DMD is warming up.	Wait for completion

ErrorC lass©)	Error number (NNN)	Event/Error code	Description	Action needed
0	61	DMD start run		
0	62	DMD stop run		
0	63	DMD start tuning		
1	64	DMD case temperature error	Case Temperature reading is outside of acceptable tolerance range	Cool down
2	65	DMD sensor temperature error	Sensor temperature is outside of acceptable tolerance range. If temperature was just reset, please wait for stabilization	Call Service
2	66	DMD method file error	The method file is not loaded or the file data is corrupted	Reboot
2	67	DMD sensor voltage error	Saturated $\pm$ sensor readings	Call service
2	68	DMD RF voltage error	RF voltage is outside of acceptable tolerance range	Call service
2	69	DMD Vc voltage error	Compensation voltage is outside of acceptable tolerance range	Call service
1	70	DMD sensor pressure error	Sensor pressure reading is outside of acceptable range	Call service
0	71	DMD tuning process error	Tuning process fail, previously calibrated values are kept for failed compounds	Confirm presence of compound in calibration gas
1	72	DMD gas flow error	Startup gas flow diagnostic fail	Check for empty gas tank or gas line leakage/blockage
2	73	DMD system voltage error	Main supply voltage is outside of acceptable tolerance range	Call service
2	74	DMD communication error	Internal communication error	Reboot
2	75	DMD sensor error	Startup sensor diagnostic fail	Call service
3	76	IOC Communication error	MPU is not able to communicate with IOC	
3	77	Read main board EDS error	Not able to read Main board EDS	
3	78	Read channel controller EDS error	Unable to read EDS controller	
3	79	Read channel analytical module EDS error	Not able to read analytical module EDS	
3	990	Watchdog Error: Store Application report on flash error	Internal Software Error, can't store application report on flash memory.	Auto reboot
3	991	Watchdog Error: Store ErrorLog report on flash error	Internal Software Error, can't store ErrorLog report on flash memory.	Auto reboot
3	992	Watchdog Error: Instrument frozen (hazardous error)	Internal Software Error, software hanging	Auto reboot
3	993	Watchdog Error: OOA Timer error	Internal Software Error, OOA Timer could not be created.	Auto reboot
3	994	Watchdog Error: ACE reactor stopped	Internal Software Error, ACE reactor stopped.	Auto reboot
3	995	Watchdog Error: Event pump stopped for 20 s	Internal Software Error, Event pump stopped.	Auto reboot
3	996	Watchdog Error: IOC Fatal error 0)	Internal Software Error, IOC fatal error 0	Auto reboot
3	997	Watchdog Error: IOC Fatal error 1)	Internal Software Error, IOC fatal error 1	Auto reboot
3	998	Watchdog Error: IOC Fatal error 2)	Internal Software Error, IOC fatal error 2	Auto reboot
3	999	Watchdog Error: IOC Fatal error 3)	Internal Software Error, IOC fatal error 3	Auto reboot