O P E R A T I N G M A N U A L

3000 Micro GC

Gas Analyzer

PN 074-519-P1C

INFICON

O P E R A T I N G M A N U A L

3000 Micro GC

Gas Analyzer

PN 074-519-P1C

INFICON Bring the Lab to the Sample™

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This is to certify that this equipment manufactured by:

INFICON Instruments (Shanghai) Co., Ltd
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Shanghai, 201612,
China

Design Control Authority

INFICON Inc.
Two Technology Place
East Syracuse, NY 13057
USA

Meets the essential safety requirements of the European Union and is placed on the market accordingly. It has been constructed in accordance with good engineering practice in safety matters in force in the Community and does not endanger the safety of persons, domestic animals or property when properly installed and maintained and used in applications for which it was made.

In addition, this is to certify that this equipment has also been designed and manufactured; having regard to the state of the art, to ensure complies with the Protection Requirements of EMC Directive 2004/108/EC.

A Technical Documentation File is also available for review by competent authorities and will be maintained for a period of ten years after the date on which the equipment was last manufactured. In additional to this file, technical, installation, maintenance and application information concerning this equipment can also be found in the Operating Manual(s) for this product or product family.

Equipment Description: INFICON 3000 Micro Gas Chromatograph, INFICON 3000 Natural Gas Analyzer. Including all standard options and accessories.

Applicable Directives: Low Voltage Directive 2006/95/EC

EMC Directive 2004/108/EC

Applicable Standards:

Safety: IEC 61010-1:2001 / EN 61010-1:2001 2)

EMC:

IEC 61326-1:2005	EN 61236-1:2006
Standard	Limit
CISPR11:2003	EN55011:1998+A1:1999+A2:2002 1)

CE Implementation Date: 17 November 2009

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INFICON Inc.

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Revised 2010/06/17 (Rev A)

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Chapter 1
Introduction

This operating manual describes the use and maintenance of the INFICON 3000 Micro Gas Chromatograph (GC).

3000 Micro GC can be used to analyze alternative fuels such as natural gas, syngas, biogas, and landfill gas. Additional applications include: refinery gases, mine gas, furnace gas, custody transfer, well logging, environmental screening, storage tank analysis, scrubber analyses, and monitoring volatile organic compounds (VOC).

3000 Micro GC in combination with EZ IQ data handling and instrument control software provides a comprehensive, easy-to-use gas analysis system.

1.1 About the Instrument

3000 Micro GC self-contained GC modules consist of an injector using Microelectromechanical Systems (MEMS) technology, analytical and reference columns, electronic pressure control, and a thermal conductivity detector (TCD) also using MEMS technology.

NOTE: When installed in a 3000 Micro GC chassis, a module is referred to as a *channel*. When standalone, it is referred to as a *module*.

Routine replacement of parts such as septa, ferrules, or columns is not required. This eliminates the need for frequent leak testing.

Samples are introduced through a 1/16 in. Swagelok® connection to inlet(s) on the 3000 Micro GC front panel. This design eliminates the need for traditional hypodermic syringe injection through septa. The inlet pressure can be nearly atmospheric because an internal vacuum pump connected to the column exit eliminates column back pressure. See Table 1-1 for a summary of external connections.

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Table 1-1 Summary of connections

Connection	Notes
Input fitting(s)	1/16 in. Swagelok
Input pressure range Recommended range	0 to 172 kPa (0 to 25 PSI) 35 to 69 kPa (5 to 10 PSI)
Sample filtration	External 10 micron particle trap standard (not used with accessories G2816A, G2817A, G2818A, G2819A-X[1], G2845A-X[1], or G2846A-X[1], G2857A-X[1], G2858A-X[1]) [1] Where X is the country specific power cord number: 1: China 2: Europe 3: US 4: Japan 5: UK/HK/SG/MY 6: Australia/NZ 7: Korea
Instrument control	EZ IQ software
Carrier gas inlet fitting	1/8 in. Swagelok
Vent gas fitting	1/8 in. Luer-Lok®

Only clean gases or vapors should be introduced to 3000 Micro GC. Avoid aerosols, condensable vapors, liquids and solid particles. Install an appropriate sample filter or conditioner. An external 10 micron filter (PN G2801-60900) is shipped with every 3000 Micro GC. This filter must be used unless it is replaced by another filter or sample conditioner. Contact INFICON for details on available accessories.

3000 Micro GC can be controlled by a personal computer (computer) through a standard RJ-45 connection, either directly from a computer using a cross-over cable connection or through a Local Area Network (LAN) connection. EZ IQ software controls all experimental settings, data collection, and data analysis.

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1.2 Definition of Notes, Warnings and Cautions

When using this manual, please pay attention to the Notes, Cautions, and Warnings found throughout. For the purposes of this manual they are defined as follows:

NOTE: Pertinent information that is useful in achieving maximum 3000 Micro GC efficiency when followed.

CAUTION

Failure to heed these messages could result in damage to 3000 Micro GC.

WARNING

Failure to heed these messages could result in personal injury.

WARNING - Risk Of Electric Shock

Dangerous voltages are present which could result in personal injury.

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1.3 Safety Overview

3000 MicroGC meets IEC (International Electro-technical Commission) classifications: Safety Class III, Transient Overvoltage Category II, Pollution Degree 2.

WARNING

3000 Micro GC has been designed and tested in accordance with recognized safety standards and is designed for indoor use.

WARNING

If 3000 Micro GC is used in a manner not specified by the manufacturer, the protection provided by 3000 Micro GC may be impaired.

WARNING

Whenever the safety protection of 3000 Micro GC has been compromised, disconnect 3000 Micro GC from all power sources and secure 3000 Micro GC against unintended operation.

WARNING

Refer servicing to qualified service personnel.

WARNING

Substituting parts or performing any unauthorized modification to the instrument may result in a safety hazard.

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WARNING

3000 Micro GC has inlets which can be heated to 140°C. Touching the inlets once they are at operating temperatures can result in injury. Extreme care should be taken to avoid touching the inlets.

WARNING

Do not operate in an explosive environment or in the presence of flammable gases or fumes. Operation of any electrical instrument in such environments constitutes a safety hazard.

WARNING

Use only the INFICON supplied power source. Use of any other power supply could result in catastrophic failure of the electrical system and may cause personal injury.

WARNING - Risk Of Electric Shock

Always disconnect the power supply before replacing or touching any components.

WARNING

Hot surfaces. Many parts of 3000 Micro GC operate at temperatures high enough to cause serious burns. These parts include, but are not limited to: the inlet port, the inlet manifold, the GC module, the column nuts attaching the module to an inlet or a vent. Extreme care should be taken to avoid touching these heated surfaces.

WARNING

Do not operate the instrument with the GC module disassembled. Column temperatures can reach 180°C.

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CAUTION - Static Sensitive Device

Electrostatic discharge (ESD) is a threat to electronics. Electrostatic discharge can damage the circuit boards in the instrument. Do not handle the circuit boards.

WARNING

Hydrogen (H_2) gas is flammable and can present an explosion hazard. Leaks, when confined in an enclosed space, may create an ignition or explosion hazard. In any application using hydrogen, leak test all plumbing connections before operating 3000 Micro GC. Always turn off the hydrogen supply at its source and disconnect the tubing before servicing the instrument. Do not flow hydrogen through a disassembled GC module. Vent exhaust gases safely.

WARNING

Never fill the Portable 3000 Micro GC internal gas cylinder with hydrogen. A hydrogen leak inside the instrument can present an explosion hazard.

NOTE: The pressure in the Portable 3000 Micro GC internal carrier gas tank should not exceed 12,405 kPa (1800 PSI). If this pressure is exceeded, the relief valve on the Cylinder Recharge Kit will open. A loud startling noise will commence and continue until the internal carrier pressure drops to 12,405 kPa (1800 PSI).

NOTE: The Portable 3000 Micro GC refillable carrier gas cylinder is United States Department of Transportation rated at a 12,405 kPa (1800 PSI) maximum with a five year Hydrostatic approval.

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1.3.1 Cleaning 3000 Micro GC

To clean the exterior of 3000 Micro GC, disconnect the power and wipe down with a slightly damp, lint-free cloth.

1.4 Electromagnetic Compatibility

3000 Micro GC complies with the requirements of CISPR 11 and EN 61326. Operation is subject to the following conditions:

- This device may not cause harmful interference
- This device must accept any interference received, including interference that may cause undesired operation

If 3000 Micro GC causes harmful interference to radio or television reception when turned on or off, try one or more of the following measures:

- Relocate the radio or television antenna
- Move the device away from the radio or television
- Plug the device into a different electrical outlet, so that the device and the radio or television are on separate electrical circuits
- Ensure all peripheral devices are also certified
- Ensure appropriate cables are used to connect the device to peripheral equipment

If none of above measures reduce the interference, contact INFICON.

- Changes or modifications not expressly approved by INFICON could void the user's authority to operate the equipment
- This ISM device complies with Canadian ICES-001

1.5 Sound Emission Certification for Federal Republic of Germany

- Sound pressure level Lp <65 dB(A)
- During normal operation
- At the operator position
- According to ISO 7779 (Type Test)

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Chapter 2
Specifications

2.1 3000 Micro GC Specifications

Table 2-1 Specifications

	1 or 2-channel 3000 Micro GC	3 or 4-channel 3000 Micro GC	Portable 3000 Micro GC	Heated Vaporizer (PN G2819A-X[1] / G2846A-X[1]/ G2857A-X[1])	Heated Regulator (PN G2818A-X[1]/ G2845A-X[1]/ G2858A-X[1])
Main voltage	100-240 V (ac)	100-240 V (ac)	100-240 V (ac)	115/230 V (ac)	115/230 V (ac)
Power	100 VA	130 VA	130 VA	1.2/0.6 A	1.2/0.6 A
Frequency	50-60 Hz	50-60 Hz	50-60 Hz	50-60 Hz	50-60 Hz
Height	15 cm (6 in.)	15.5 cm (6.1 in.)	15.5 cm (6.1 in.)	15 cm (6 in.)	15 cm (6 in.)
Width	25 cm (10 in.)	48 cm (18.5 in.)	36.4 cm (14.3 in.)	12.5 cm (5 in.)	12.5 cm (5 in.)
Depth	41 cm (16.5 in.)	42 cm (16.5 in.)	41.3 cm (16.3 in.)	9 cm (3.5 in.)	9 cm (3.5 in.)
Weight	8.2 kg (18.0 lb.)	11.2 kg (24.8 lb.)	16.6 kg (36.5 lb.)	1.4 kg (3.1 lb.)*	1.65 kg (3.64 lb.)*

* Does not include mounting bracket

[1] Where X is the country specific power cord number:
1: China
2: Europe
3: US
4: Japan
5: UK/HK/SG/MY
6: Australia/NZ
7: Korea

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2.2 Environmental Conditions

The following specifications are applicable to the 3000 Micro GC Heated Regulator and Heated Vaporizer sample conditioners.

Operating temperature range . . . . . 0 to 50°C

Relative humidity . . . . . 5 to 95% (non-condensing)

Altitude . . . . . 4572 m (15000 ft.)

Usage location . . . . . Temperature controlled environment

2.3 Instrument Specifications

2.3.1 Sample Inlet Specifications

Sample type . . . . . Gas

Maximum sample pressure . . . . . <172 kPa (25 PSI)

Recommended sample pressure . . . Ambient to 69 kPa (ambient to 10 PSI)

2.3.2 Sample Injector Specifications

Injector types

- Variable volume/timed, heated
- Variable volume/large loop, heated
- Fixed volume, heated
- Backflush to vent, heated

Injection volume

- 1 to 10 µL for variable volume/timed
- 1 to 30 µL for variable volume/large loop
- 1 µL for fixed volume injector and backflush injector with fixed mode

2.3.3 Column Heater Specification

Isothermal Operation . . . . . Ambient plus 15 to 180°C

2.3.4 TCD Specifications

Internal Volume . . . . . 240 nL

Detection Limit . . . . . Low ppm to 100%

Linear Dynamic Range. . . . . 10^6 ±10%

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2.3.5 Repeatability

Typical results for Relative Standard Deviation (RSD) at constant temperature and pressure (for C_1 to C_6 components at % level) are shown below for peak areas.

Injector Type	Peak Area Repeatability
Variable volume	<1% RSD
Fixed volume	<0.2% RSD
Backflush (timed mode)	<1% RSD
Backflush (fixed mode)	<0.5% RSD

2.3.6 Carrier Gas Specifications

Connection to 3000 Micro GC	1/8 in. Swagelok fittings
External source	Helium Hydrogen Nitrogen Argon
Carrier gas purity	99.995 to 99.9995%
Input pressure	552 to 566 kPa (80 to 82 PSI)

2.3.7 Portable 3000 Micro GC Carrier Gas Specifications

Onboard cylinder source	Helium Nitrogen Argon
Onboard cylinder capacity	12,410 kPa (1800 PSI)
Onboard cylinder usage	35-40 hours, application dependent

2.3.8 External Input/Output

- RJ-45 based LAN
- Power supply input connector
- Remote start

2.3.9 Portable 3000 Micro GC Onboard Battery

The 3000 Micro GC onboard battery will operate the instrument up to two hours, depending on the application.

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2.3.10 Safety and Regulatory Standards

Conforms to the following safety standards:

- CSA/National Recognized Test Laboratory (NRTL) UL61010-1
- International Electrotechnical Commission (IEC) 61010-1
- Canadian Standards Association (CSA) C22.2 No. 61010-1
- EuroNorm (EN) 61010-1

Conforms to the following regulations on Electromagnetic Compatibility (EMC) and Radio Frequency Interface (RFI):

- CISPR I1/EN 55011 Group 1 Class A IEC/EN 61326
- Declaration of Conformity available

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Chapter 3
Overview

3.1 Overview of 3000 Micro GC Instrument and Accessories

3000 Micro GC is a gas analyzer with applications ranging from fixed gases (H_2, O_2, N_2, CO, CO_2, etc.) to light hydrocarbons (methane, ethane, ethylene, propane, butanes, and pentanes) and volatile organic compounds (methanol, ethanol, benzene, etc.). 3000 Micro GC contains from 1 to 4 channels that perform analysis in seconds. For many applications, hydrocarbons between the C_6 - C_{10} boiling range can be detected at mid-to-high ppm concentrations.

NOTE: When installed in a 3000 Micro GC chassis, a module is referred to as a *channel*. When standalone, it is referred to as a *module*.

Samples can be introduced manually by a gas tight syringe, Tedlar® bag, or a sample cylinder such as a summa canister. Samples can also be interfaced to 3000 Micro GC with appropriate INFICON supplied sample conditioners to facilitate on-line analysis from bench scale or pilot plant reactors, or directly from a process line. See Chapter 5, Accessory Installation for information on sample conditioners.

3000 Micro GC is a ready to use solution combining speed of analysis, simplicity, and small size. Since 3000 Micro GC is a gas chromatographic instrument, all principles of GC operation and calibration apply.

3000 Micro GC is used in combination with INFICON EZ IQ chromatography software for instrument control and chromatography analysis.

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3.2 3000 Micro GC Chassis

There are three types of 3000 Micro GC chassis that house GC modules:

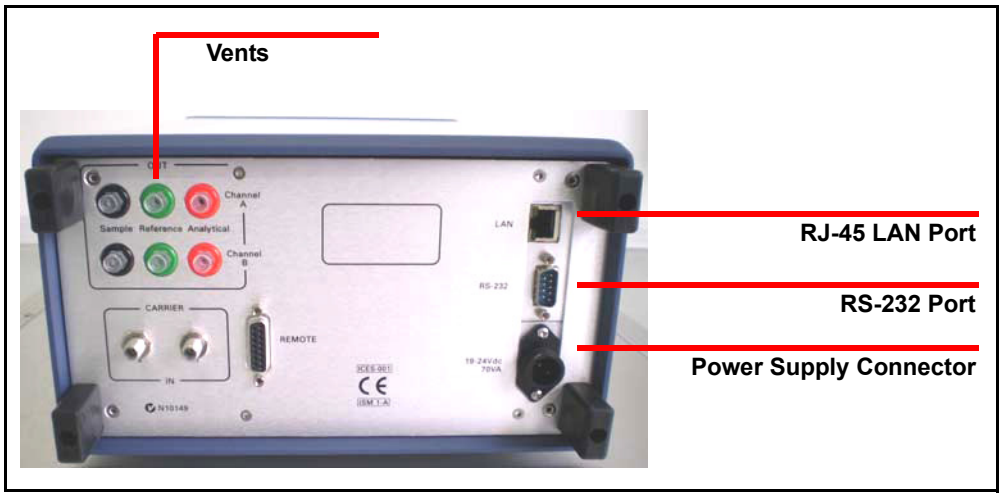
- 1,2-Channel Chassis, see section 3.2.1 on page 3-2
- 3,4-Channel Chassis, see section 3.2.2 on page 3-3
- Portable Chassis, see section 3.2.3 on page 3-4

3.2.1 1,2-Channel Chassis

The 1,2-channel chassis can accept one or two channels. The carrier gas and power for a 1,2-channel system must be supplied externally. See Figure 3-1 and Figure 3-2.

Figure 3-1 Front panel of the 1,2-channel 3000 Micro GC

Figure 3-2 Rear panel of the 1,2-channel 3000 Micro GC



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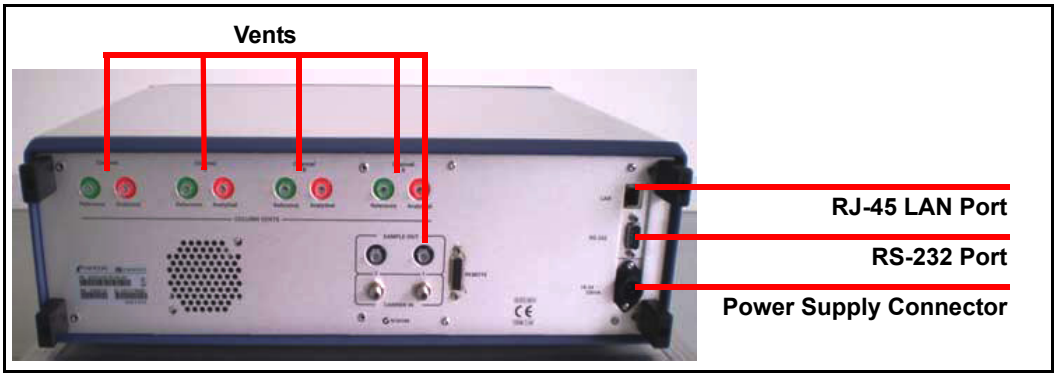
3.2.2 3,4-Channel Chassis

The 3,4-channel chassis can accept three or four channels. The carrier gas and power for a 3,4-channel system must be supplied externally. See Figure 3-3 and Figure 3-4.

Figure 3-3 Front panel of the 3,4-channel 3000 Micro GC

Figure 3-4 Rear panel of the 3,4-channel 3000 Micro GC



3.2.3 Portable Chassis

Portable 3000 Micro GC is a completely self-contained, miniaturized gas chromatograph specifically designed for fast, accurate analysis in the field. Each instrument contains one or two GC channels and an internal carrier gas cylinder. Rechargeable battery packs and automobile power cable options are available for alternative power sourcing. See Figure 3-5, Figure 3-6, and Figure 3-7.

Figure 3-5 Front panel of the Portable 3000 Micro GC

Figure 3-6 Rear panel of the Portable 3000 Micro GC

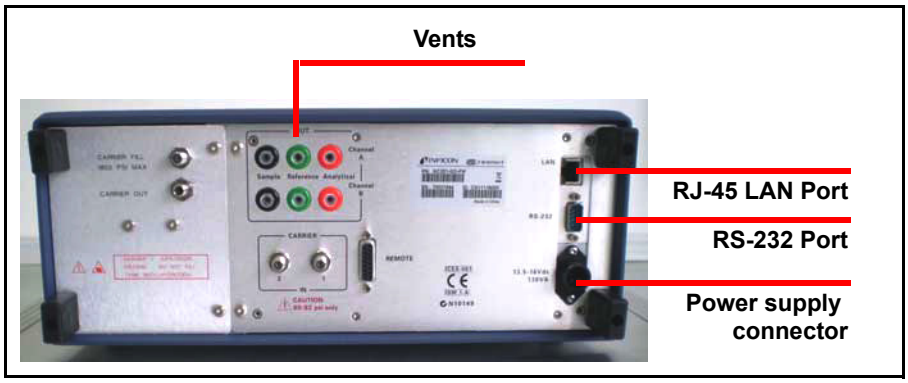


Figure 3-7 Onboard carrier gas cylinder (battery installed underneath)

Portable 3000 Micro GC has an internal, refillable carrier gas tank. When full, it can support 35 to 40 hours of operation, application dependent.

Portable 3000 Micro GC also contains an optional internal, rechargeable lead-acid battery pack that supports instrument operation without external power.

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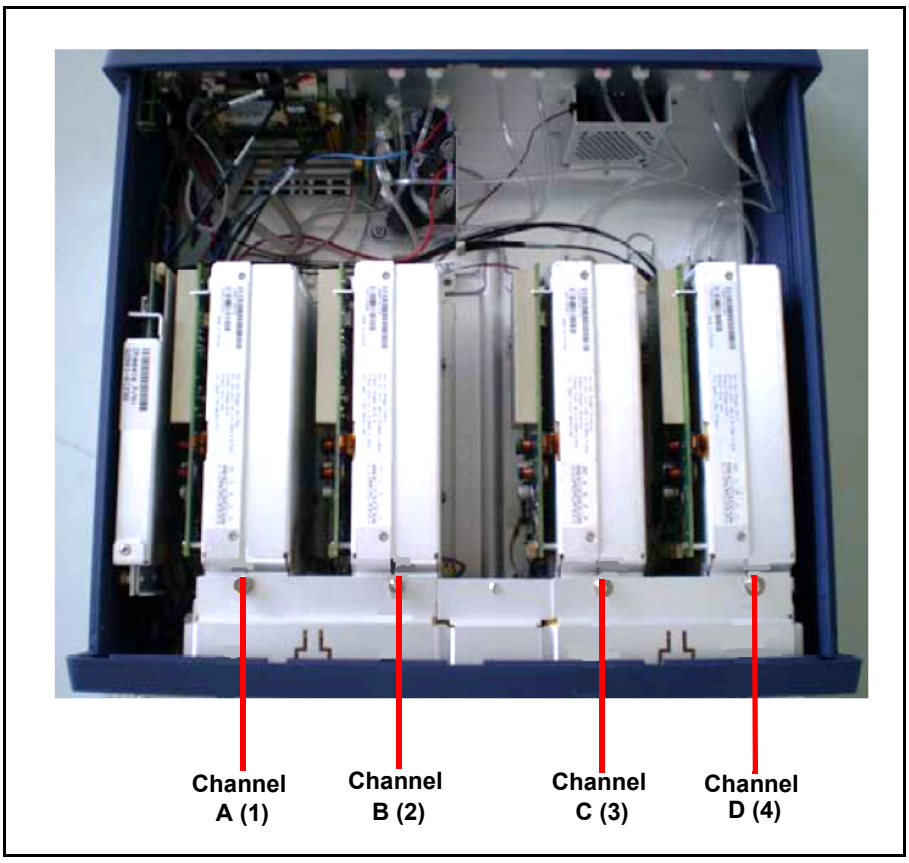
3.3 The 3000 Micro GC Module

3000 Micro GC utilizes a modular GC platform, which can simultaneously analyze samples from one to four independent 3000 Micro GC channels. Each channel (or module) is a self-contained GC that performs sample injection, separation, and detection on a set of target components.

When installed in a 3000 Micro GC chassis, a module is referred to as a *channel*. When standalone, it is referred to as a *module*.

Modules may be referred to as Channel A, B, C, D or 1, 2, 3, 4 from left to right. See Figure 3-8.

Figure 3-8 Modules installed in a 4-channel 3000 Micro GC



3.3.1 Principle of 3000 Micro GC Module Operation

The major functions of the 3000 Micro GC module operation are: injection, separation, and detection.

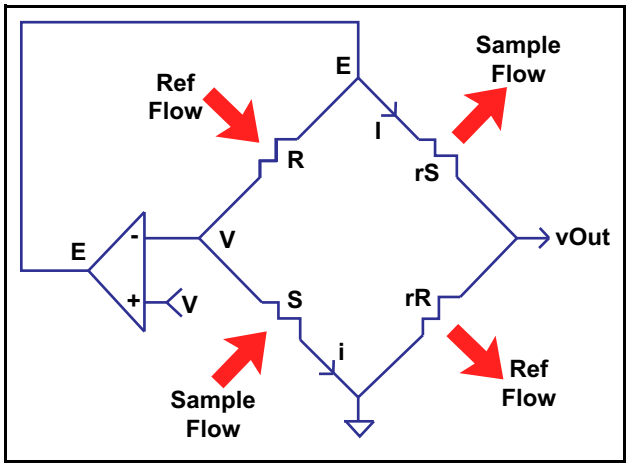
1. **Injection:** Gaseous sample is injected into 3000 Micro GC through the heated inlet manifold. The manifold regulates the sample temperature and directs it into the 3000 Micro GC injector flow assembly on a module. The sample is drawn by vacuum pump through the injector sample loop and is released onto the column.

2 **Separation:** As the sample gas enters the column, its component gases are separated based on their retention or adsorption property with the column stationary phase material. The longer the component gas is retained by the column, the later it will elute from of the column for detection. Components may be separated based on size, polarity, or boiling point, depending on the column.

3 **Detection:** After column separation, the sample gas enters the Thermal Conductivity Detector (TCD). 3000 Micro GC employs a Microelectromechanical systems (MEMS) TCD which operates on a Wheatstone bridge circuit. The carrier gas enters the TCD via two pathways, the reference path and the analytical path. The reference path contains only carrier gas. The analytical path contains carrier gas and sample gas. The TCD measures the difference in thermal conductivity between the carrier gas reference and the sample gas components.

For example, the thermal conductivity of helium carrier gas at 300 K is 157 mW/m K. The thermal conductivity of methane sample gas at 300 K is 34 mW/m K.This difference is picked up by the Wheatstone bridge circuit, generating signal response to the sample component eluted. See Figure 3-9.

Figure 3-9 Wheatstone bridge circuit



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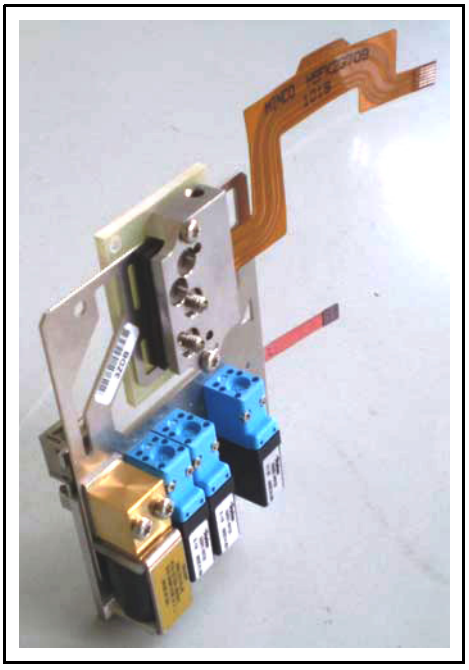
3.3.2 Injector Flow Assembly

The injector flow assembly (see Figure 3-10) consists of:

- **MEMS injector chip**—micro-machined miniature chip that injects sample into the GC column
- **Injector Pilot Solenoid Valve**—on/off valve that directs carrier gas to drive diaphragm valves within the MEMS injector chip
- **Electronic Pressure Control (EPC) Valve**—regulates the column head pressure
- **Sample Manifold Plate**—provides interface between the EPC valve and the Injector Pilot Solenoid valve to the MEMS injector

Figure 3-10 Injector flow assembly



3.3.3 Injectors

Depending on application requirements, 3000 Micro GC supports four different types of injectors. These MEMS based injector “wafers” contain sample loops etched into the wafer and micro-diaphragm valves used to direct sample and carrier gas flow. The sample volume is controlled in EZ IQ by the **Inject Time** in milliseconds (ms). The **Injector Temperature** can be set from 40-100°C or be turned off.

3.3.3.1 Variable Injector (Timed)

The variable injector allows the injection volume to be changed by the user. An inject time of 0 ms results in no injection.

Valid settings are between 10-100 ms. No significant difference in inject volume is achieved after 100 ms.

The typical setpoint is 25 ms. Values less than 10 ms may result in repeatability issues.

The higher the setting, the more sample is injected which results in higher sensitivity. Actual injection volumes are on the order of a few microliters (µL) of gas.

Variable injectors will show the matrix effect as the sample density varies with compositional changes.

3.3.3.2 Variable Large Volume Injector (Timed)

Similar to the Variable Injector, the Large Volume Injector can be programmed to inject a large volume. Variable Large Volume Injectors should only be used when low sensitivity (1-10 ppm) is required. An **Inject Time** of 0 ms results in no injection.

Valid settings are between 10-400 ms. No significant difference in inject volume is achieved after 400 ms.

Values less than 10 ms may result in repeatability issues.

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3.3.3.3 Fixed Injector

Fixed Injectors are unique to 3000 Micro GC. Fixed Injectors provide the best accuracy and precision for 0.2% levels and higher.

Valid settings are between 0-50 ms. An inject time of 0 ms results in no injection.

A typical setpoint is 30 ms. No significant difference in inject volume is achieved from inject times between 15-50 ms. Values less than 15 ms may result in repeatability issues.

Actual injection volumes are typically 1-2 µL of gas.

Fixed volume injectors should not be used for trace levels (<200 ppm).

Fixed injectors minimize any matrix effects as sample density varies with compositional changes.

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3.3.3.4 Backflush Injector

The backflush assembly consists of:

- a backflush injector
- a precolumn
- an analytical capillary column

The precolumn is a short section of column, whereas the analytical column is usually longer. The precolumn and analytical column are connected in series. The precolumn functions to prevent contaminants from entering the analytical column. The sample first travels through the precolumn and then through the analytical column. After components of interest enter the analytical column, the flow is reversed through the precolumn, flushing the unwanted components to vent. This *backflushing* of the precolumn prevents these contaminants from entering the analytical column and causing deactivation or ghost peaks.

The backflush injector has two method parameters in EZ IQ software: **Backflush Time** (in seconds) and **Inject Time** (in milliseconds). The **Backflush Time** parameter on the **Instrument Setup** window can be changed to suit analysis needs. Valid settings for the **Backflush Time** are between 0-240 s. Recommended settings for the **Backflush Time** are between 6-12 s. Valid settings for the **Inject Time** are between 0-250 ms.

The backflush injector can also function in a semi-fixed mode. An **Inject Time** of 0 ms results in a fixed volume injected and is best used for component levels from 0.1% and higher. This will result in higher precision.

The backflush injector can function in a variable volume mode. An **Inject Time** greater than 10 ms will result in a higher injection volume. This used for component levels below 0.1%.

Actual inject volumes are typically a few microliters of gas. For better sensitivity, set a higher **Inject Time**, however, accuracy and precision will be negatively impacted.

Backflush times vary with column and setpoints and must be optimized for every 3000 Micro GC module.

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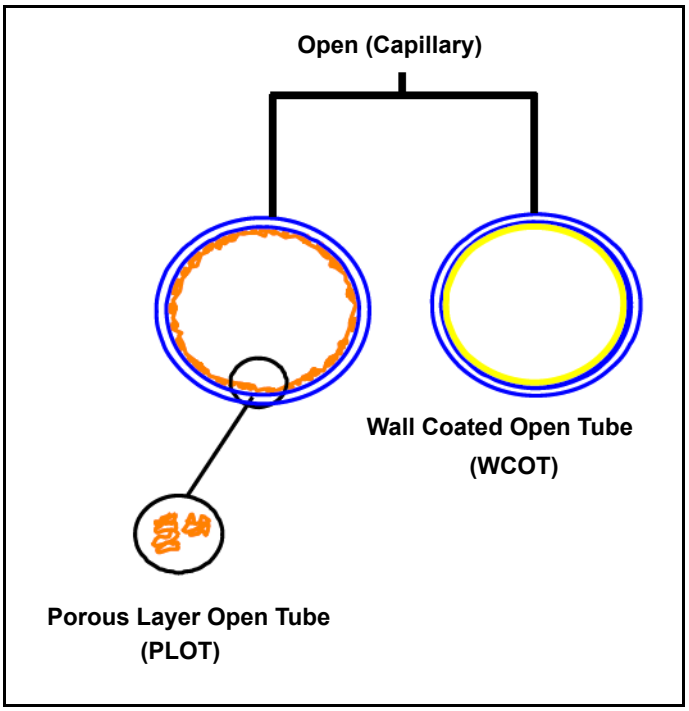
3.3.4 Columns

3000 Micro GC utilizes capillary columns for separation. Two types of capillary columns are used: Porous Layer Open Tubular (PLOT) and Wall Coated Open Tubular (WCOT). The capillary columns are wound into a column can, which is installed into a module and can be heated up to 180°C. Columns are connected to the injector on one end and the TCD on the other end using small dead-volume fittings. Typical column flow rates range from 0.4 to 4 mL/min (cc/min) depending on column dimensions.

PLOT columns have small particles embedded on the surface of the column. See Figure 3-11. PLOT column separation is based on gas-solid partitioning. The most popular PLOT columns are Molecular Sieve 5A (MolSieve), PLOT Q, PLOT U and Alumina. PLOT columns separate according to compound polarity. Typical lengths are 4 to 30 m with an internal diameter of 0.32 mm.

WCOT columns have a chemical stationary phase bonded to the internal surface of the column. (See Figure 3-11.) WCOT separation based on gas-liquid partitioning. OV-1 is a commonly used WCOT column, which separates compounds according to boiling point. Typical lengths are 4 to 14 m, with an internal diameter of 0.15 mm. Stationary phase thicknesses of 1.2 or 2 µm are used for the OV-1. Other columns are also used in 3000 Micro GC, such as Stabilwax®, OV-1701, etc.

Figure 3-11 PLOT and WCOT columns



Separation may be optimized by varying the column coating type and thickness, column length and diameter, and carrier gas type. EZ IQ can further optimize separation by adjusting column head pressure and column temperature.

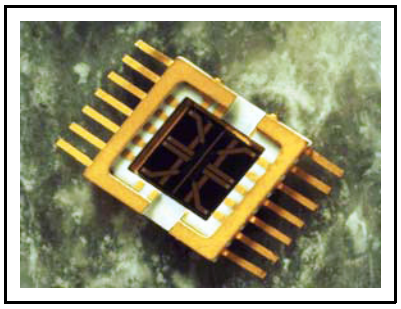
3.3.5 Detector

3000 Micro GC uses a MEMS based TCD, which has a 240 nL internal cell volume. (See Figure 3-12.) The small volume provides for excellent sensitivity. For some components, a detection limit of 1 ppm can be achieved.

NOTE: TCD sensitivity is matrix, carrier gas, and component dependent.

The TCD uses a Wheatstone bridge design and has a sample and reference channel. The TCD detects the difference in thermal conductivity of the gas traveling through the reference side (pure carrier gas) versus the gas traveling through the sample side (carrier gas plus the sample gas). When ON, the TCD filament is hot. 3000 Micro GC monitors the column pressure. If carrier gas flow is turned off, the TCD will automatically turn off.

Figure 3-12 MEMS TCD detector



3.3.6 D-Board

A Detector board, also known as a D-board, is attached to the side of each module. The D-Board controls the module conditions and communicates module information and setpoints to the Communications Board (C-Board, see section 3.4.2 on page 3-15). 3000 Micro GC supports two types of D-board: Enhanced and Standard.

3.3.6.1 Enhanced D-Board

Enhanced D-Board circuitry significantly reduces solvent peak tailing, resulting in better chromatography and improved sensitivity of peaks eluting after the solvent peak (e.g., air). This feature is most useful for applications that involve low ppm trace analysis in a solvent gas.

3.3.6.2 Standard D-Board

The Standard D-Board circuitry is for general purpose applications with a mid-to-high ppm analysis requirement.

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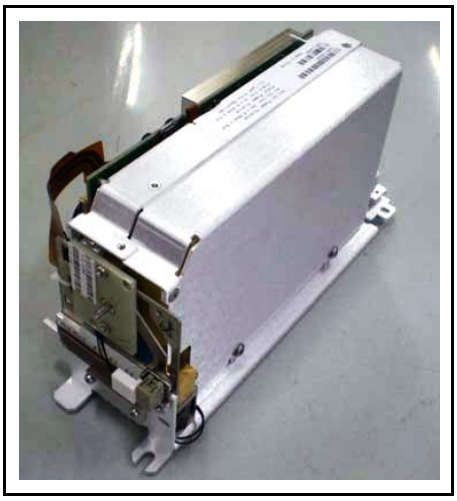
3.3.7 Module Cases

3000 Micro GC supports two types of module cases, a standard module case and a Modbox module case.

3.3.7.1 Standard Module Case

The standard module case is used for most column types. MolSieve modules are an exception. See Figure 3-13.

Figure 3-13 Standard module



3.3.7.2 Modbox Module Case

The Modbox module allows the column to be wound in a larger diameter. The MolSieve column benefits from this design because the column is vulnerable to breakage when winding into a small diameter. See Figure 3-14.

Figure 3-14 Modbox module

3.4 3000 Micro GC Chassis Components

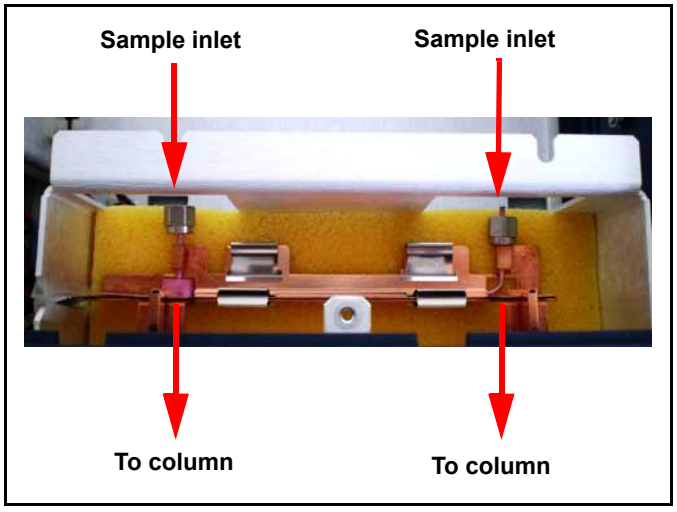
3000 Micro GC modules are installed into the 3000 Micro GC chassis. The components that are integrated into the chassis are:

- Inlet Tubing, see section 3.4.1 on page 3-14
- C-Board, see section 3.4.2 on page 3-15
- OBC Board, see section 3.4.3 on page 3-15
- Sample Pump, see section 3.4.4 on page 3-16
- Carrier Gas Weldment, see section 3.4.5 on page 3-17
- Carrier Gas Inlet, see section 3.4.6 on page 3-18
- Vents, see section 3.4.7 on page 3-19
- Remote Control Module, see section 3.4.8 on page 3-20

3.4.1 Inlet Tubing

The inlet tubing is enclosed in a heated compartment which contains a short piece of 1/16 in. OD tubing. One side of the tubing is connected to the sample fitting on the front panel. The other side of the tubing connects to one or more modules. Depending on instrument configuration, the tubing is split to each module. Temperatures can be set from 45-140°C. Typical setpoints are between 80-100°C. The inlet temperature can also be turned off. The internal surface of the tubing is deactivated to ensure the surfaces of the tubing are inert.

Figure 3-15 Inlet tubing of a 2-Channel 3000 Micro GC with two inlets



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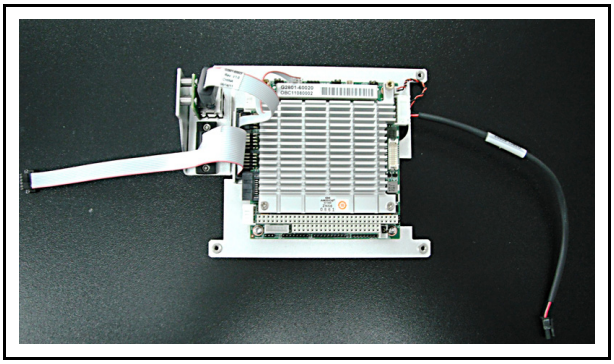
3.4.2 C-Board

The Communications Board, also known as the C-board is internally mounted on the side of 3000 Micro GC. It controls the inlet zone heater and communicates with the D-boards and onboard computer.

3.4.3 OBC Board

The onboard computer (OBC) is internally mounted on the back of 3000 Micro GC. It is the main processor which communicates with the C-board and the external control system. OBC has an internal flash memory which stores 3000 Micro GC configuration information. See Figure 3-16.

Figure 3-16 Onboard computer (OBC)



The OBC provides a RJ-45 based LAN interface. 3000 Micro GC can be connected to a LAN network or directly to an external control system (i.e., EZ IQ software) via a RJ-45 LAN connection.

Figure 3-17 LAN connection on rear side of 3000 Micro GC

3.4.4 Sample Pump

One or two sample pumps are installed internally in 3000 Micro GC. There is no flow through the sample path until the pump turns on. When the sample pump turns on, the sample is drawn through the sample inlet tubing and the sample injectors open for the time specified in the acquisition method. Set pump time at a minimum of 20 seconds. If sufficient sample gas is available, increase the pump time to 60 seconds. The sample pump draws at a rate of 10 mL/min.

NOTE: For specific applications, there is a mode of operation called *continuous* where the pumps can be turned off and sample gas flows continuously through the internal tubing. Continuous operation can only be used with variable and fixed volume injectors.

Backflush injectors cannot be used in continuous mode. In continuous mode, the sample valve always remains on (open) and sample gas can flush the sample inlet lines and injector.

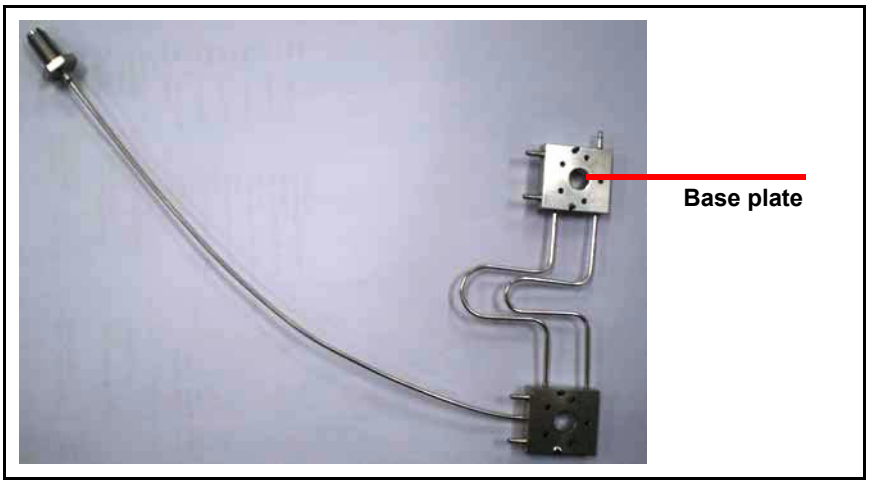
Figure 3-18 Sample pump

3.4.5 Carrier Gas Weldment

The carrier gas weldment connects the carrier gas to each module. It consists of a base plate and stainless steel tubing. Base plates align to each module.

NOTE: See section 8.2, Remove and Replace a 3000 Micro GC Module, on page 8-5 for more information about how to align a module.

Figure 3-19 Carrier gas weldment



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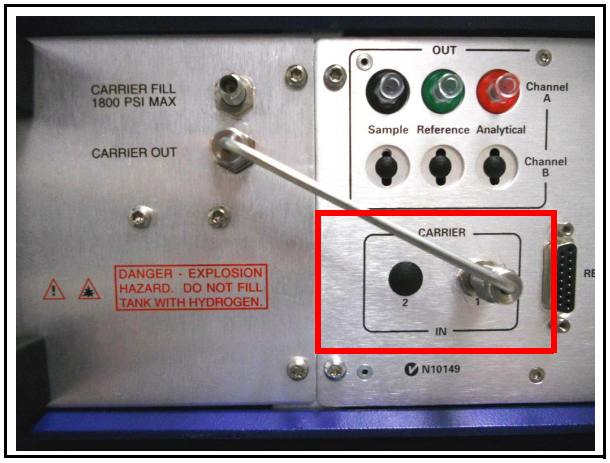
3.4.6 Carrier Gas Inlet

One or two carrier gases can be configured with the carrier gas inlets located on the rear of 3000 Micro GC. See Figure 3-20, Figure 3-21, and Figure 3-22.

Figure 3-20 Carrier Gas inlet of a 1,2-Channel 3000 Micro GC

Figure 3-21 Carrier Gas inlet of a 3,4-Channel 3000 Micro GC

Figure 3-22 Carrier gas inlet of a Portable 3000 Micro GC



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3.4.7 Vents

Analytical vents expel sample gas and carrier gas mixture from the sample side of the TCD. **Reference** vents expel carrier gas from the reference side of the TCD. **Sample** vents expel sample gas when the sample pump is drawing sample gas into sample loop or the sample is backflushed from pre-column out of 3000 Micro GC. See Figure 3-23, Figure 3-24 and Figure 3-25.

Figure 3-23 Vent outlets for a 1,2-Channel 3000 Micro GC

Figure 3-24 Vent outlets for a 3,4-Channel 3000 Micro GC

Figure 3-25 Vent outlets for a Portable 3000 Micro GC

3.4.8 Remote Control Module

The Remote Control Module allows an external control system to start 3000 Micro GC. The Remote Control Module port is located on the rear of 3000 Micro GC. See Figure 3-26.

Figure 3-26 Remote connector on the rear panel.

3.5 Sample Conditioners

CAUTION

3000 Micro GC is a gas-only analyzer!

Extreme caution must be taken to ensure that liquid and solid particles are not introduced into 3000 Micro GC.

A 10 micron sample inlet filter (PN G2801-60900) is provided in the 3000 Micro GC ship kit and must be connected to instrument sample inlet at installation. In addition, a variety of sample conditioners are available to ensure sample entering the instrument is in gas phase and that the sample gas pressure is below 25 PSI.

Available sample conditioners:

- Genie Filter Assembly
- Pressure Reducer
- Pressure Reducer and Genie Filter Assembly
- Heated Regulator
- Heated Vaporizer for Liquefied Petroleum Gas (LPG)

For more detailed description of each sample conditioner, see section 5.1, Sample Conditioners, on page 5-1.

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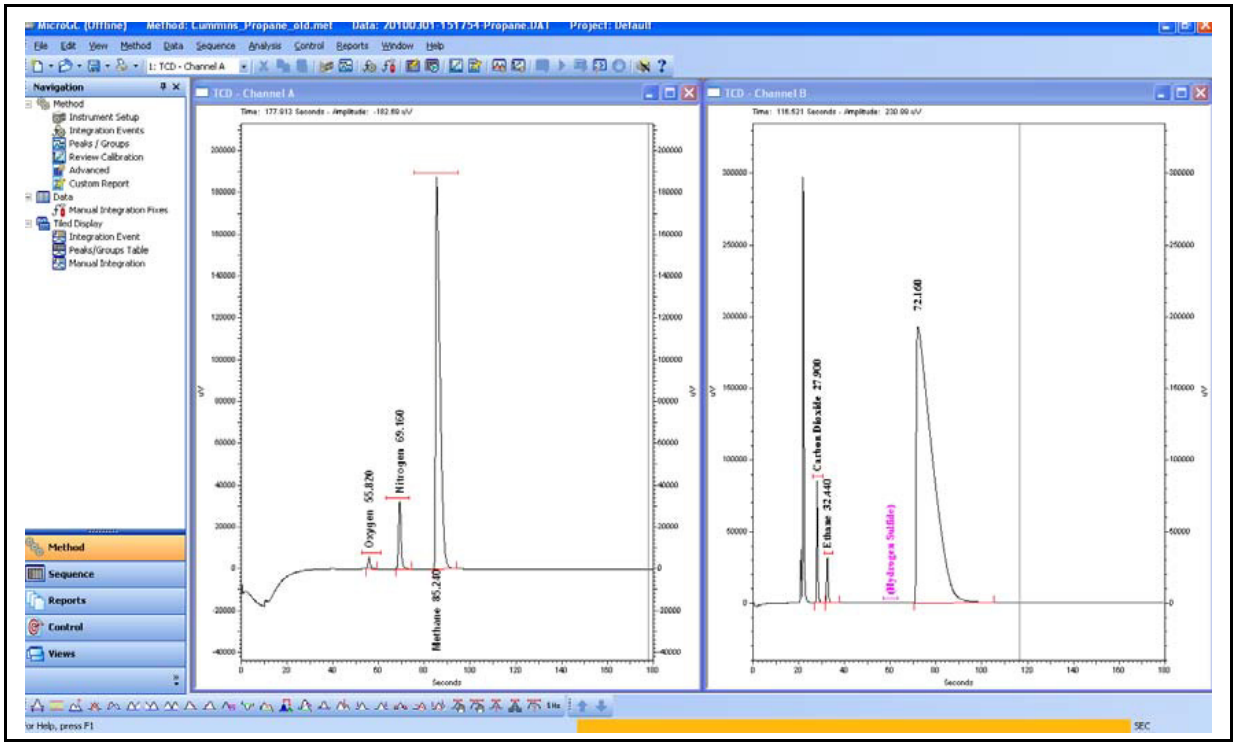
3.6 EZ IQ Chromatography Software

EZ IQ is a powerful chromatography software running under the Microsoft Windows® operating system with an easy-to-use graphical user interface. EZ IQ supports three languages: English, Chinese, and Japanese. See Figure 3-27.

Figure 3-27 EZ IQ software interface



3.7 Product Identification

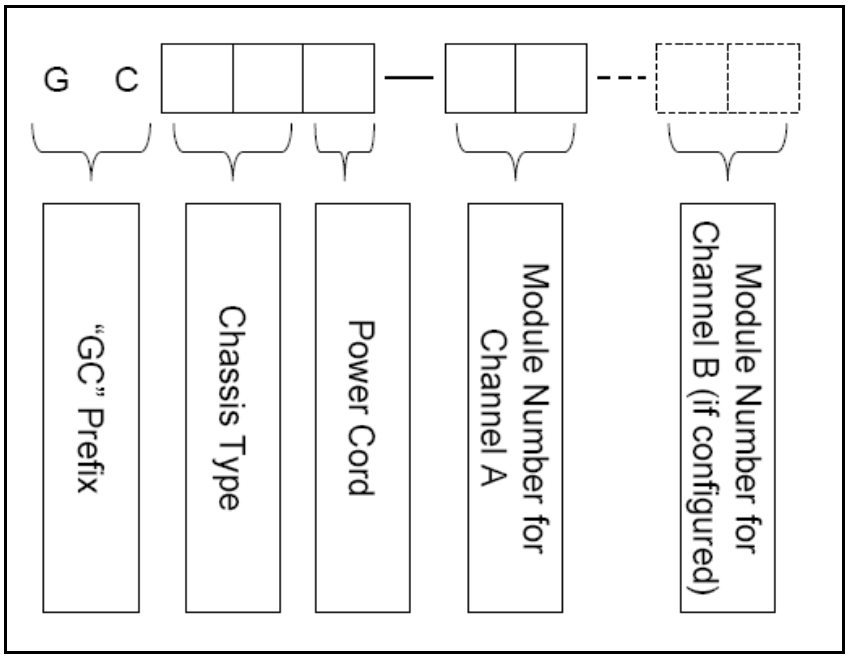
Each 3000 Micro GC carries a configuration specific part number (**PN:**), serial number (**SN:**) and identification number (**ID:**). When contacting INFICON regarding a 3000 Micro GC, please have all three product identification numbers available. See Figure 3-28.

Figure 3-28 3000 Micro GC product label.

3.7.1 1,2-Channel and Portable 3000 Micro GC Part Numbering

The 1,2-channel 3000 Micro GC chassis and the Portable 3000 Micro GC chassis can be equipped with one or two channels (modules). Figure 3-29 shows how an instrument part number is constructed for both types of chassis.

Figure 3-29 1,2-Channel and Portable 3000 Micro GC part number format



- **GC Prefix**: a fixed two digit prefix and is same for every instrument
- **Chassis Type**: a two digit number representing the chassis type, including sample inlet, carrier gas and number of channels
- **Power Cord**: a one digit number representing the country specific power cord
- **Number for Channel A**: a two digit number that specifies a particular channel equipped with an application specific injector type, column type, and length
- **Number for Channel B**: a two digit number that specifies a particular channel equipped with an application specific injector type, column type, and length

NOTE: At least one channel must be specified for each 1,2-channel or Portable 3000 Micro GC. The number for Channel B is only specified when Channel B is present.

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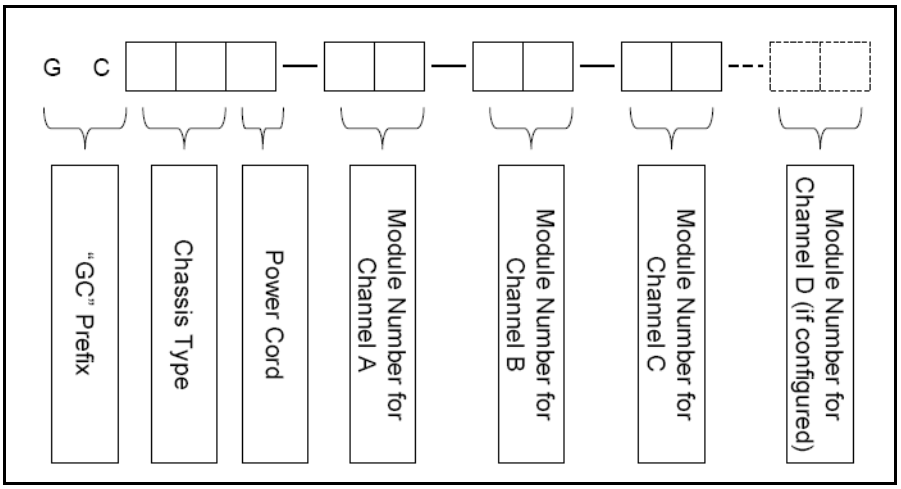
3.7.2 3,4-Channel 3000 Micro GC Part Numbering

The 3,4-channel 3000 Micro GC chassis can be equipped with three or four channels (modules). Figure 3-30 shows how an instrument part number is constructed for a 3,4-channel chassis.

Figure 3-30 3,4-Channel 3000 Micro GC part number format



- **GC Prefix**: a fixed two digit prefix and is same for every instrument
- **Chassis Type**: a two digit number representing the chassis type, including sample inlet, carrier gas, and number of channels
- **Power Cord**: a one digit number representing the country specific power cord
- **Number for Channel A**: a two digit number that specifies a particular channel equipped with an application specific injector type, column type, and length
- **Number for Channel B**: a two digit number that specifies a particular channel equipped with an application specific injector type, column type, and length
- **Number for Channel C**: a two digit number that specifies a particular channel equipped with an application specific injector type, column type, and length
- **Number for Channel D**: a two digit number that specifies a particular channel equipped with an application specific injector type, column type, and length

NOTE: At least three channels must specified for a 3,4-channel 3000 Micro GC. The number for Channel D is only specified when Channel D is present.

See Figure 3-31 on page 3-26 for an example of a 3000 Micro GC product label.

3.7.3 Serial Number

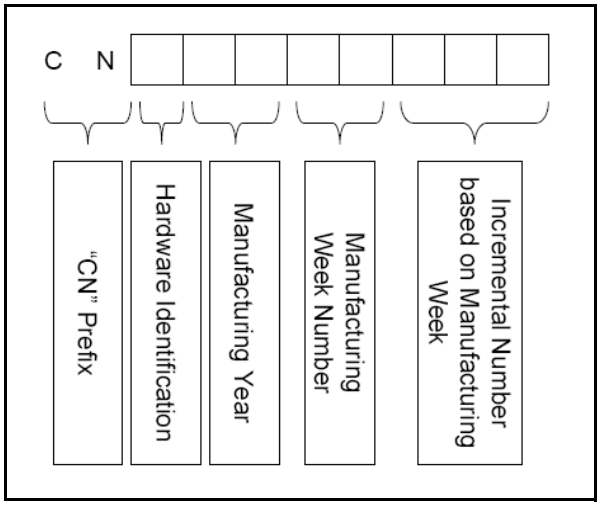
Each serial number (SN:) uniquely identifies an instrument. This number is stored in the manufacturing database for traceability.

PN 074-519-P1C

3.7.4 Identification Number

Each instrument is uniquely identified by an identification number (ID:). See Figure 3-31.

Figure 3-31 3000 Micro GC identification number format



- **CN Prefix**: a fixed two digit prefix and is the same for every instrument
- Hardware Identification
  - 0 indicates the module is equipped with Standard D-board
  - 1 indicates the hardware is an instrument
  - 2 indicates the module is equipped with Enhanced D-board
- **Manufacturing Year**: a two digit year
  - For instance, 2014 is represented as 14
- **Manufacturing Week Number**: is a two digit week number
  - For instance, the first week in January is represented as 01
- **Incremental Number**: is based on Manufacturing Week and is a three digit number
  - For instance, the first instrument manufactured in a week is represented as 001.

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Chapter 4
Installation

4.1 Site Preparation

Before installation, make sure that the installation site is fully prepared. Contact INFICON with any question regarding site preparation.

4.1.1 List of Required Tools

- Adjustable wrench (small)
- Adjustable wrench (large)
- Two 7/16 in. open-ended wrenches
- 9/16 in. open-ended wrench
- 5/16 in. open-ended wrench
- 1/4 in. open-ended wrench
- Tubing cutter
- Teflon® tape

4.1.2 Tubing and Fitting Requirements

- Use pre-cleaned copper or stainless steel tubing, 1/8 in. OD, for carrier gas connections between the tank regulator and 3000 Micro GC.
  - 3000 Micro GC has a 1/8 in. Swagelok male carrier gas connection.
  - Pre-cleaned, GC grade copper tubing in 50 ft. lengths can be purchased from various chromatography vendors. It is also included in the optional Install Kit for Micro GC (PN G2860A).
  - Do not clean the tubing with a solvent prior to use.
  - Do not use Teflon or Tygon® tubing for the carrier gas.
- Swagelok 1/8 in. nuts, front ferrules, and back ferrules.

PN 074-519-P1C

4.1.3 Site Requirements

4.1.3.1 Electrical Requirements

A standard 100 to 240 V(ac) electrical outlet is required. A Universal/Uninterruptable Power Supply (UPS) or surge protector is recommended.

4.1.3.2 Space and Venting Requirements

For optimum 3000 Micro GC performance and lifetime, allow unrestricted airflow around 3000 Micro GC to dissipate heat.

Safely vent sample streams—potentially toxic, noxious, or flammable gases—outside the instrument and away from the operating area. Vent toxic gases to a hood, chemical trap, or reaction medium.

Avoid venting the instrument into drafty areas, such as in front of a heating/cooling vent.

4.1.4 computer Requirements

- Microsoft Operating Systems
- Windows XP Pro with Service Pack 3 or Windows 7
- .Net 3.0 or 3.5 Service Pack 1
- Dual Core 2 Ghz CPU, 2 GB RAM, >10 GB free space
- DVD Drive
- Network card for Ethernet connection to 3000 Micro GC (TCP/IP)

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4.1.5 Gas and Regulator Requirements

4.1.5.1 Carrier Gas and Regulator Requirements

A continuous, controlled flow of carrier gas is required.

Use high purity grade gas specifically intended for chromatographic use. All carrier gas types should be 99.995% to 99.9995% pure.

The carrier gas tank requires a dual stage regulator capable of delivering 80 to 82 PSI of gas pressure. The regulator outlet fitting must be adapted to Swagelok in order to connect the tubing. Use 1/8 in. fittings or 1/8 in. adapters.

CAUTION

Exceeding 82 PSI for the carrier gas pressure may result in instrument damage.

CAUTION

To protect 3000 Micro GC and to enhance performance, carrier gas traps must be used to purify the carrier gas before the carrier gas is introduced into 3000 Micro GC. A hydrocarbon/moisture trap (PN G2870A-01) is usually sufficient.

4.1.5.2 Calibration Gas and Regulator Requirements

Obtain an ample supply of a calibration gas, specific to the analysis needs, from a commercial vendor.

For the most accurate measurements, use a calibration gas that closely resembles the actual sample gas composition.

A regulator specific to the calibration gas cylinder should be used. The regulator should be capable of supplying output pressure from ambient to 25 PSI. The regulator must be clean, grease free and non-venting.

CAUTION

Checkout gas mixtures supplied by INFICON are not calibration gases. Checkout gas mixtures are only used for instrument installation and start up.

PN 074-519-P1C

4.2 Instrument Hardware Setup

4.2.1 Unpacking the Instrument

Verify the contents of the order, including software, sample conditioners, and checkout gases, against the packing list. The contents of the shipping kit should also be verified.

4.2.2 Shipping Kit Contents

A PN 074-542-P1 3000 Micro GC Shipping Kit Packing List is included with each instrument package. This packing list will indicate which items are included for a particular instrument configuration.

4.2.2.1 Shipped with Every Instrument

PN	Description	Quantity
5183-0394	1/16 and 1/8 in. Nut and Ferrule Set, 2 pack	1 pc
5183-4649	Crossover Ethertwist Cable, 10 ft.	1 pc
5183-4652	3000 Micro GC Replacement Filters, 5 Pack	1 pc
G2890-90701	Carrier Gas Label Ar/N_2	2 pc
G2890-90702	Carrier Gas Label He/N_2	2 pc
0100-2375	Male Luer x 1/16 in. ID Tube Bar	5 pc
0890-2183	Tubing, 0.066 in. ID Polyurethane	100 cm
0100-2378	Female Luer x 1/6 in. ID Tube Barb Panel	5 pc
G2801-90200	3000 Micro GC Factory Info CD	1 pc
G2801-90118	3000 Micro GC User Information CD	1 pc
G2801-90108	3000 Micro GC Installation Poster	1 pc

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4.2.2.2 Configuration Dependent Parts

4.2.2.2.1 1,2-Channel and 3,4-Channel 3000 Micro GC Specific Parts

PN	Description	Quantity
G2801-60747	24 V (dc) AC/DC Power Supply	1 pc

4.2.2.2.2 Portable 3000 Micro GC Specific Parts

PN	Description	Quantity
PNU-2058	Onboard Carrier Gas Refiller Apparatus	1 pc
G2801-60748	15 V (dc) AC/DC Power Supply	1 pc

4.2.2.2.3 Sample Inlet Parts

PN	Description	# of Inlets	Quantity
G2801-60900	Sample Inlet Filter, stainless steel	1 or 2	1 or 2 pc
5185-5817	Gas Sampling Tubing 1/16 in. SS with Fittings	1 or 2	1 or 2 pc
FRL-1269	Ferrule Dual End	1 or 2	1 or 2 pc

4.2.2.2.4 Gas Inlet Parts

PN	Description	# of Carriers	Quantity
3150-0602	Carrier gas filter, CO_2 Cryo	1 or 2	1 or 2 pc

4.2.2.2.5 GC Module Parts

PN	Description	# of GC Modules	Quantity
G2801-00952	Gang Block Keepers	1 to 4	1 to 4 pc

4.2.2.2.6 Power Cords - Country Dependent

PN	Description	Quantity
8121-0723	Power Cord, China	0 or 1 pc
8120-1689	Power Cord, Europe	0 or 1 pc
8120-1378	Power Cord, US	0 or 1 pc
8120-4753	Power Cord, Japan	0 or 1 pc
8120-8705	Power Cord, GB/HK/SG/MY	0 or 1 pc
8120-1369	Power Cord, Australia/NZ	0 or 1 pc
8121-1226	Power Cord, Korea	0 or 1 pc

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4.2.3 Making Carrier Gas and Sample Inlet Connectors

3000 Micro GC is equipped with a 1/8 in. carrier gas Swagelok connector on the back of the instrument. This section demonstrates how to assemble 1/8 in. carrier gas tubing with the instrument.

The following procedure reviews how to make Swagelok connections. This procedure explains how to connect tubing to a fitting, such as the sample inlet(s), carrier gas inlet(s), or the gas supply tank.

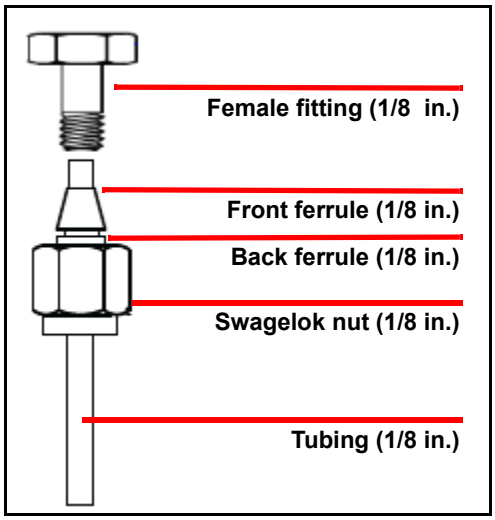
Materials Needed

- 1/8 in. OD pre-cleaned copper or stainless steel tubing
- 1/8 in. Swagelok nuts, and front and back ferrules
- Two 7/16 in. wrenches for 1/8 in. tubing
- Two 5/16 in. wrenches for 1/16 in. tubing

Procedure

1 Attach a 1/8 in. Swagelok nut, back ferrule and front ferrule to the tubing as shown in Figure 4-1.

Figure 4-1 Swagelok nut and ferrules setup on tubing



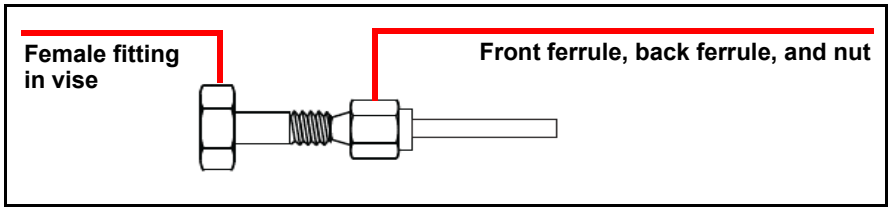
2 Clamp a female fitting in a bench vise.

3 Push the tubing into the female fitting.

PN 074-519-P1C

4 Ensure that the front ferrule makes contact with the female fitting, slide the Swagelok nut over the ferrule, then finger tighten. See Figure 4-2.

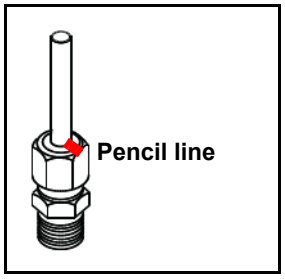
Figure 4-2 Vise fitting assembly



5 Push the tube fully into the female fitting.

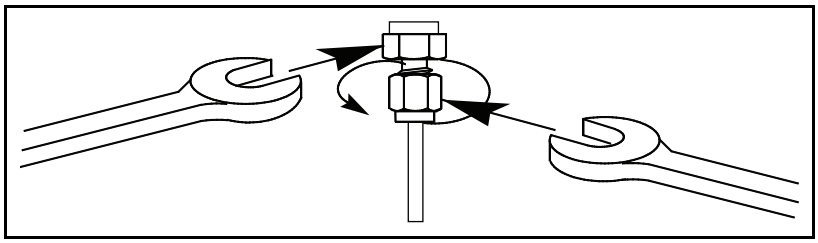
6 Mark the Swagelok fitting with a pencil line as shown in Figure 4-3.

Figure 4-3 Pencil line



7 Tighten the 1/8 in. fitting 3/4 of a turn, referenced to the pencil line, using one 7/16 in. wrench to hold the fitting steady, and the other 7/16 in. wrench to turn the fitting. See Figure 4-4.

Figure 4-4 Using wrenches to tighten Swagelok fittings



8 Unscrew the nut. Connect the tubing with the swaged ferrules to the pencil marked location. Tighten the nut 1/4 turn past finger tight.

3000 Micro GC is equipped with a 1/16 in. sample inlet Swagelok connector on the faceplate. Connecting sample inlet tubing is the same procedure as described for carrier gas inlet tubing.

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4.2.4 Connecting the Carrier Gas

4.2.4.1 Gas Safety

WARNING

Gas cylinders present a hazard when not secured properly. Securely fasten all compressed gas cylinders to an immovable structure or permanent wall. Store and handle compressed gases in accordance with safety procedures.

WARNING

Gas cylinders may present a hazard under extreme temperature conditions. Do not store gas cylinders in the path of heated oven exhausts or other sources of heat. Do not expose cylinders to extreme cold or heat. It is recommended to store or place cylinders in a temperature controlled environment.

WARNING

Wear eye protection when using compressed gas.

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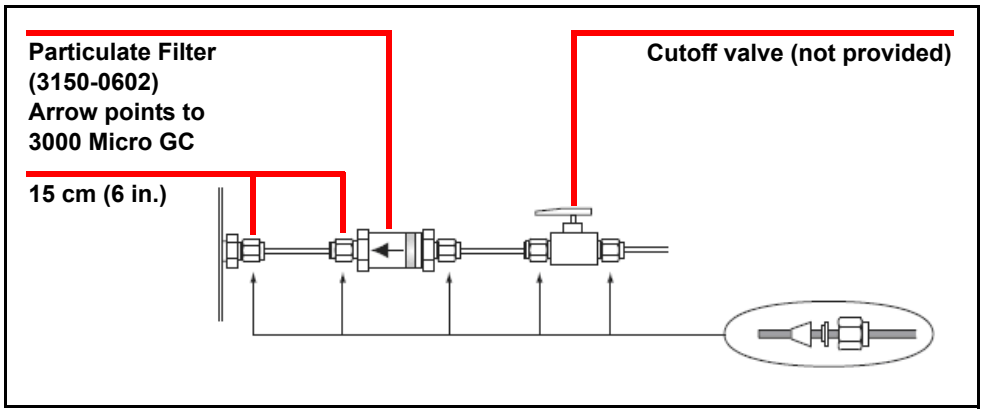
4.2.4.2 Connecting the Carrier Gas Particulate Filter

1. Remove any shipping caps on 3000 Micro GC.
2. Install one carrier gas particulate filter (PN 3150-0602) on the carrier gas supply tubing for each carrier gas used (see Figure 4-5). Do not connect the tubing to 3000 Micro GC at this time.

Figure 4-5 Carrier gas particulate filter setup



- Install the carrier gas filter within 15 cm (6 in.) of the 3000 Micro GC fitting to maximize its effectiveness.
- Use a cutoff valve (not provided) as shown in Figure 4-5 for ease of maintenance. The valve should be "packless" (sealed to atmosphere) and grease free. Common industrial or home-supply ball valves should not be used.
- Chemical traps on the carrier gas line may be used to protect the column.

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4.2.4.3 Setting the Gas Pressure

Set the carrier gas regulator as shown in Table 4-1.

Table 4-1 Carrier gas input pressure

Carrier Gas	Required Delivery Pressure
helium*	552 +/- 14 kPa (80 +/- 2 PSI)
hydrogen*	552 +/- 14 kPa (80 +/- 2 PSI)
argon	552 +/- 14 kPa (80 +/- 2 PSI)
nitrogen	552 +/- 14 kPa (80 +/- 2 PSI)

* Required for checkout

WARNING

Never fill the Portable 3000 Micro GC internal gas cylinder with hydrogen. A hydrogen leak inside the instrument can present an explosion hazard.

CAUTION

Exceeding 82 PSI for the carrier gas pressure may result in damage to 3000 Micro GC.

CAUTION

Carrier gas pressure below 78 PSI will negatively affect 3000 Micro GC operation.

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4.2.4.4 Purge the Carrier Gas Line

Ensure the gas line is not connected to the instrument. Purge carrier gas supply lines to remove air by opening the tank and letting the carrier gas flow for five to ten seconds.

4.2.4.5 Connecting the Carrier Gas to the 3000 Micro GC

1 Connect the carrier gases to the instrument via the 1/8 in. Swagelok fitting(s) located on the back of the instrument. See section 4.2.3 on page 4-6.

WARNING

If a hazardous sample is used, the sample exhaust must be vented to a fume hood or other designated area for hazardous waste disposal.

CAUTION

Do not use leak detection fluids.

4.2.4.6 Using the Onboard Carrier Gas Cylinder (Portable 3000 Micro GC only)

For information on refilling the internal carrier gas cylinder, see section 8.5.3.1, Refill Onboard Carrier Gas Cylinder, on page 8-43.

1 Remove the shipping caps.

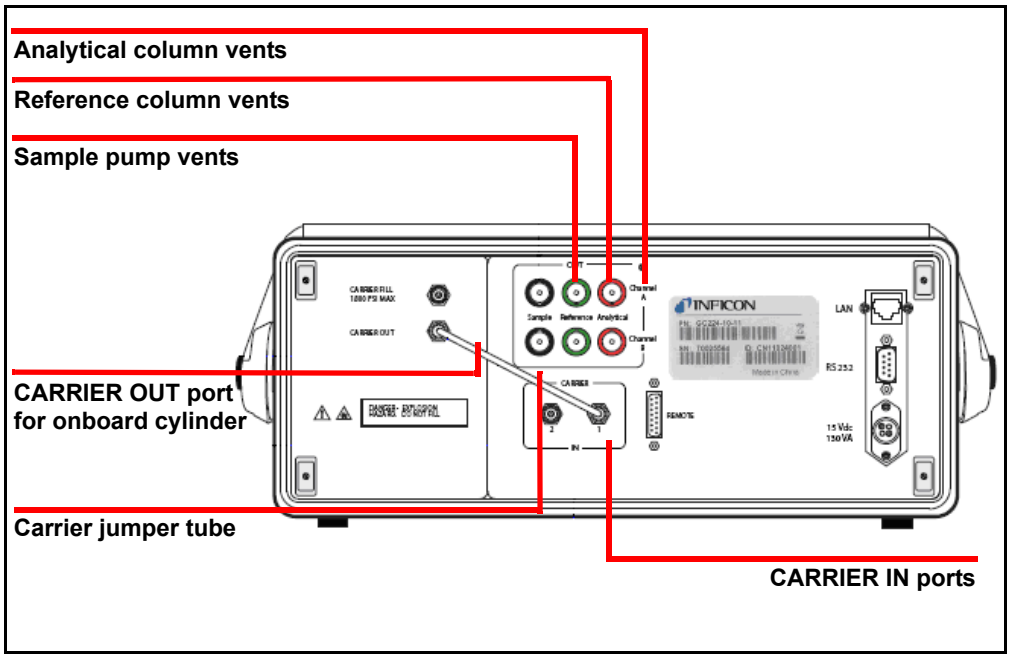
2 Ensure the carrier gas knob on the front of the instrument is set to **OFF**. See Figure 4-6.

Figure 4-6 Carrier gas knob

3 Connect the **CARRIER OUT** port to the **CARRIER IN** port with the carrier jumper tube as show in Figure 4-7. Use **CARRIER IN** port 1 if 3000 Micro GC has two ports available.

PN 074-519-P1C

Figure 4-7 Portable 3000 Micro GC, back view



4 Set the carrier switch on the front of Portable 3000 Micro GC to **ON**.

5 Connect sample gases.

WARNING

If a hazardous sample is used, the sample exhaust must be vented to a fume hood or other designated area for hazardous waste disposal.

4.2.5 Installing the Sample Inlet Filter

3000 Micro GC is shipped with an external 10 micron sample inlet filter assembly, one dual-ended ferrule per sample inlet, and extra replacement filter disks.

4.2.5.1 Sample Inlet Filter Parts List

Table 4-2 Sample inlet filter parts list

Description	PN
Sample Inlet Filter Assembly	G2801-60900
Dual-Ended Ferrule	FRL-1269
Replacement Filter Disks (5/pk)	5183-4652

PN 074-519-P1C

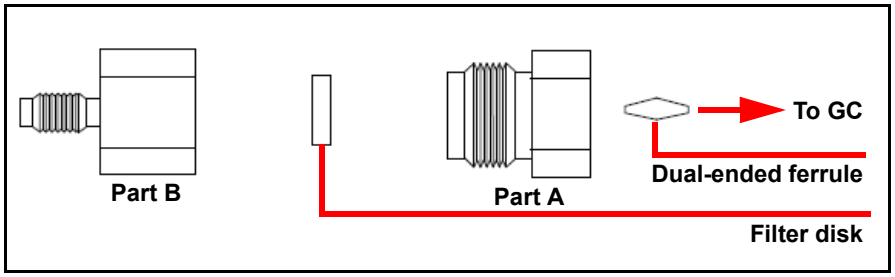
4.2.5.2 Tools Required

- Two 7/16 in. wrenches, for the sample inlet filter assembly
- One 5/16 in. wrench, for user sample line to sample inlet filter

4.2.5.3 Sample Inlet Filter Assembly Installation

1. Shut off any sample flow to 3000 Micro GC.
2. Allow the sample inlet to cool.
3. Disconnect the sample line to the 3000 Micro GC input fitting using the 5/16 in. wrench, while holding the sample inlet filter with a 7/16 in. wrench.
4. Inspect the sample inlet filter assembly and verify that the filter disk is in place. If not, place a filter disk between parts A and B of the filter body and thread the parts together until finger-tight. See Figure 4-8.

Figure 4-8 Exploded view of sample inlet filter assembly G2801-60900



5. Install the sample inlet filter assembly on the 3000 Micro GC inlet using the dual-ended ferrule. Use the two 7/16 in. wrenches to tighten the filter halves until snug.

5a. Tighten sample inlet filter assembly to 3000 Micro GC inlet an additional 1/4 turn using 7/16 in. wrench on filter Part A.

6. Connect the sample line to the male portion of filter Part B, shown in Figure 4-8, while stabilizing the sample inlet filter assembly Part B using a 7/16 in. wrench.

CAUTION

Do not overtighten the sample inlet filter assembly to 3000 Micro GC. This will damage the dual-ended ferrule.

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4.2.6 Power and Communication Cable Setup

1. Connect the crossover cable (PN 5183-4649) between the computer and 3000 Micro GC.

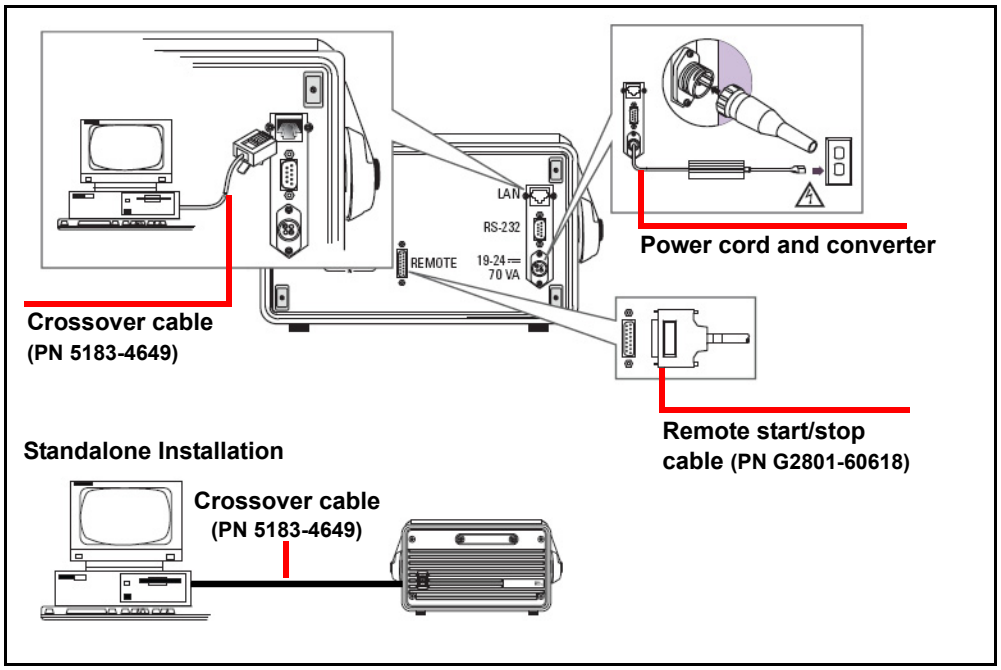
   NOTE: If a LAN connection through a hub is required, consult an IT specialist to configure the setup.

2. Connect the power cable to the AC/DC converter supplied in the Shipping Kit.

3. If desired, connect the remote start cable (PN G2801-60618) to 3000 Micro GC. See section 5.2, The Remote Connector, on page 5-30 for remote start cable pinout details.

4. If a customized checkout is necessary or no checkout is required, reconfigure carrier gas type as needed by following the instructions in section 6.4, Change Carrier Gas Configuration, on page 6-9.

Figure 4-9 Power and communication connections



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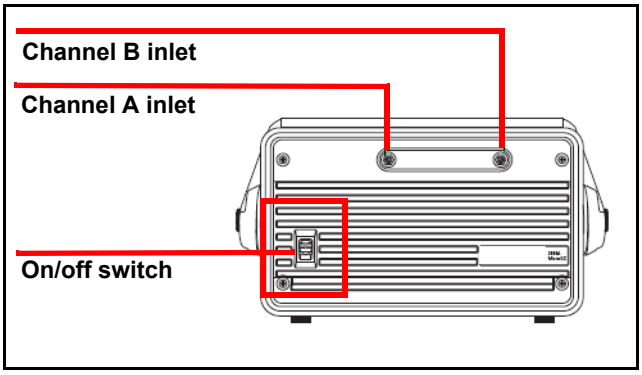
4.3 Instrument Configuration Setup

3000 Micro GC can be connected directly to the computer on a LAN using a crossover cable (PN 5183-4649, supplied in the Shipping Kit). Use a crossover cable to establish the initial connection.

4.3.1 Turn on 3000 Micro GC

To turn on 3000 Micro GC, set the switch on the front of the instrument to the on position. The switch will illuminate green to indicate that 3000 Micro GC is on.

Figure 4-10 INFICON 3000 Micro GC (2-channel, two inlet instrument shown)



4.3.2 IP Address Configuration

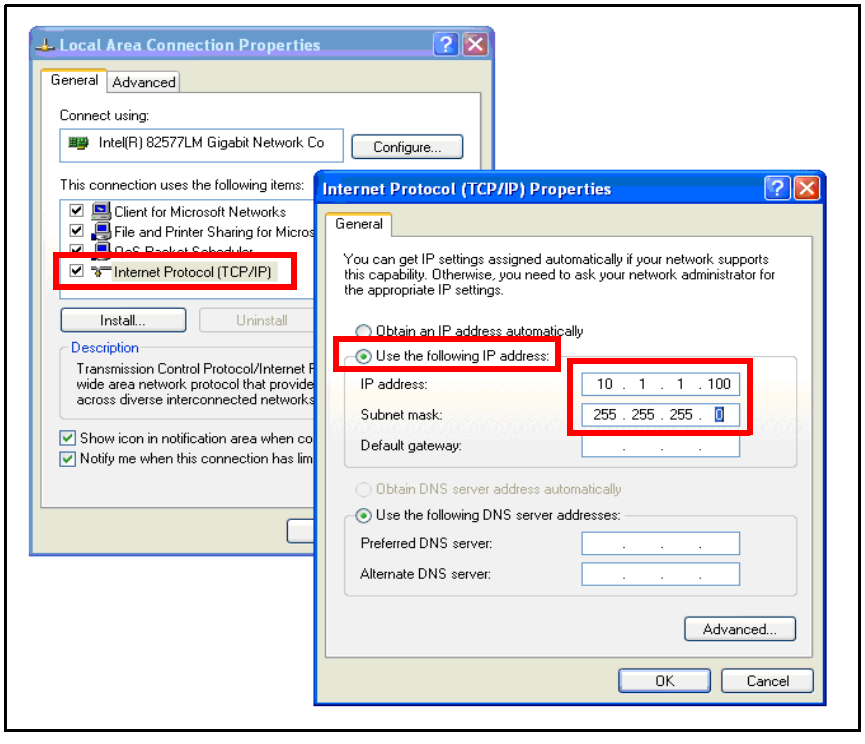
The IP address on the computer must be changed in order to communicate with 3000 Micro GC. Set the IP address as follows, assuming the computer is running Windows XP operation system:

1. Click **Start >> Connect To >> Show All Connections.**
2. Click **Local Area Connection** on the **Network Connections** window.
3. Click the **General** tab and click **Properties.**
4. Highlight **Internet Protocol (TCP/IP)** and click **Properties.**

   NOTE: If 3000 Micro GC will be set up on a LAN, record all of the computer's current IP address settings. It is recommended that an IT specialist be consulted when any IP addresses are configured on a LAN.

5. Click **Use the following IP address**.
6. For a direct connection via the crossover cable, the IP address must be set to **10.1.1.100**. The subnet mask must be set to **255.255.255.0**. The **Default gateway** and **DNS server** can remain blank for a direct connection. See Figure 4-11.

Figure 4-11 IP address TCP/IP



7. Click **OK** in the **Internet Protocol (TCP/IP) Properties** window and subsequent window to make the entered IP address effective.

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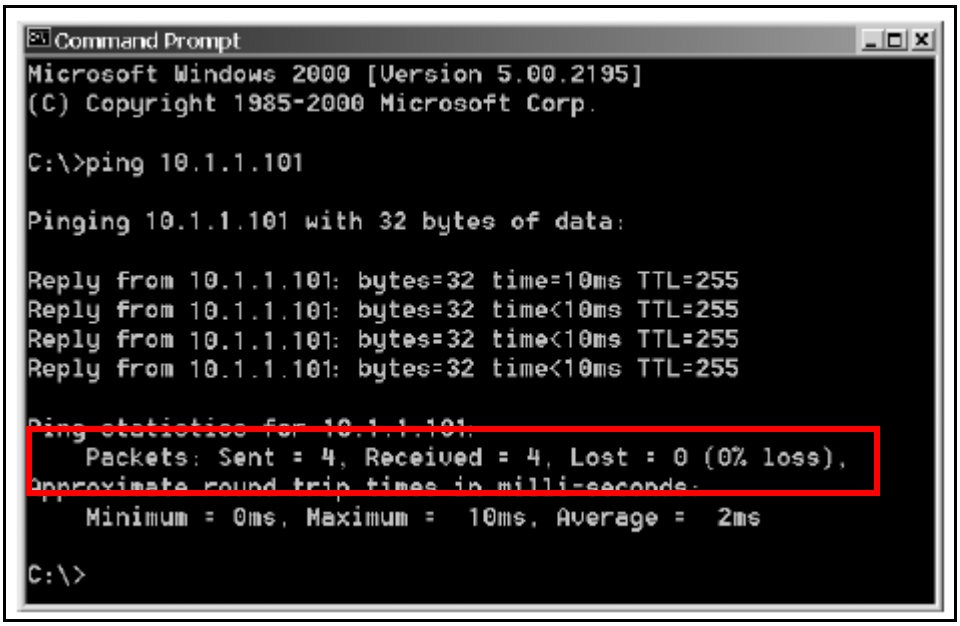
4.3.3 Ping the Instrument

Ensure that the instrument is turned on and is fully booted up. On the computer, click **Start >> Run** and type **ping 10.1.1.101**. Ensure data packets are being received, as shown in Figure 4-12. If data packets are not being received, check the IP settings or consult the troubleshooting table in section 9.1.3, Common Connection Problems, on page 9-8.

NOTE: At the factory, the instrument IP address was set to **10.1.1.101**.

Figure 4-12 Command prompt showing successful ping



4.3.4 Carrier Gas Configuration

At the factory, 3000 Micro GC is configured to use helium carrier gas to verify instrument quality. If the checkout gas was ordered from INFICON and it will be used for the instrument checkout, do not change the carrier gas software setup at this point.

If a customized checkout gas is necessary or no checkout is required, reconfigure the carrier gas type as needed by following the instructions in section 6.4, Change Carrier Gas Configuration, on page 6-9.

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4.4 Chromatography Software Installation

For an in-depth guide on installing and configuring EZ IQ, refer to the *074-537 EZ IQ Installation Guide*.

PN 074-519-P1C

Chapter 5
Accessory Installation

5.1 Sample Conditioners

3000 Micro GC can be damaged by contaminants, especially particulates and condensing aerosols. Use an appropriate filter or sample conditioner at all times. Table 5-1 lists the typical usage and filtration capabilities of the standard filter and available accessories.

5.1.1 List of Sample Conditioners and IPNs

Table 5-1 List of sample conditioners, inlet pressures, and IPNs

Type	Input Pressure to Accessory	Sample Container/delivery	Sample Matrix	Particle filtration (microns)	PN
Standard external sample inlet filter, or direct connection	0 to 172 kPa (0 to 25 PSI)	All	Relatively clean and dry	10	G2801-60900
Genie Filter Assembly	70 to 345 kPa (10 to 50 PSI)	All	Entrained liquids and particles	-	G2817A
Pressure Reducer	345 to 6895 kPa (Ambient to 1000 PSI)	All	C6+ components <0.5 mole%	-	G2815A
Pressure Reducer and Genie Filter Assembly	<3477 kPa (<500 PSI)	All	Entrained liquids and particles, C6+ components <0.5 mole%		G2816A

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Table 5-1 List of sample conditioners, inlet pressures, and IPNs

Type	Input Pressure to Accessory	Sample Container/delivery	Sample Matrix	Particle filtration (microns)	PN
Heated Regulator for Sampling	14 to 5516 kPa (2 to 800 PSI)	Transfer line or high-pressure vessel	C6+ components >0.5 mole%	7	G2818A-X, G2845A-X, or G2857A-X
Heated Vaporizer for LPG Sampling	1379 to 5516 kPa (00 to 800 PSI)	High-pressure vessel	Liquefied Petroleum Gas (LPG)	2	G2819A-X, G2846A-X, or G2858A-X

NOTE: For online sampling, install the 10 micron sample inlet filter on the sampling line.

NOTE: The Heated Regulator and Heated Vaporizer come equipped with a separate power cord. The part number shows the power cord option with an X, where X is a country specific power cord number:
1: China
2: Europe
3: US
4: Japan
5: UK/HK/SG/MY
6: Australia/NZ
7: Korea

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5.1.2 Installing the 10 Micron Sample Inlet Filter

For instruction on installing the 10 micron sample inlet filter (PN G2801-60900), refer to section 4.2.5.3, Sample Inlet Filter Assembly Installation, on page 4-13.

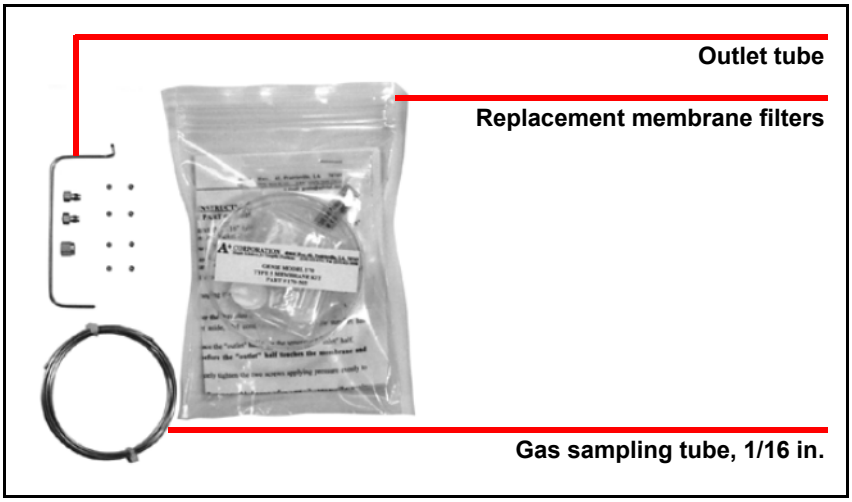
5.1.3 Installing the Genie Filter Assembly

The Genie Filter Assembly Kit (PN G2817A) provides gas-liquid separation function through a Genie Membrane Separator. It is not compatible with other sample conditioners mounted on the 3000 Micro GC front panel. See Table 5-2 and Figure 5-1 for G2817A kit contents.

Table 5-2 Genie filter assembly kit contents

Description	Quantity
Outlet tube	1 ea
Genie filter assembly	1 ea
1/4 in. male nut and ferrule set	1 ea
Replacement membrane filters (5/pk)	1 ea
5/16 in. female nut and ferrule set	1 ea
Gas sampling tubing, 1/16 in.	1 ea

Figure 5-1 G2817A kit contents



5.1.3.1 Tools Required

- 5/16 in. open-ended wrench
- 7/16 in. open-ended wrench
- 1/4 in. open-ended wrench

PN 074-519-P1C

5.1.3.2 User Supplied Parts

- Fittings for vent tubing, if used
- Sample input tubing and fittings

5.1.3.3 Installation Instructions for the Genie Filter Assembly

1 Turn off 3000 Micro GC and allow the sample inlet fitting to cool.

WARNING

3000 Micro GC has inlets which can be heated to 140°C. Touching the inlets at operating temperatures can result in injury. Extreme care should be taken to avoid touching the heated inlets.

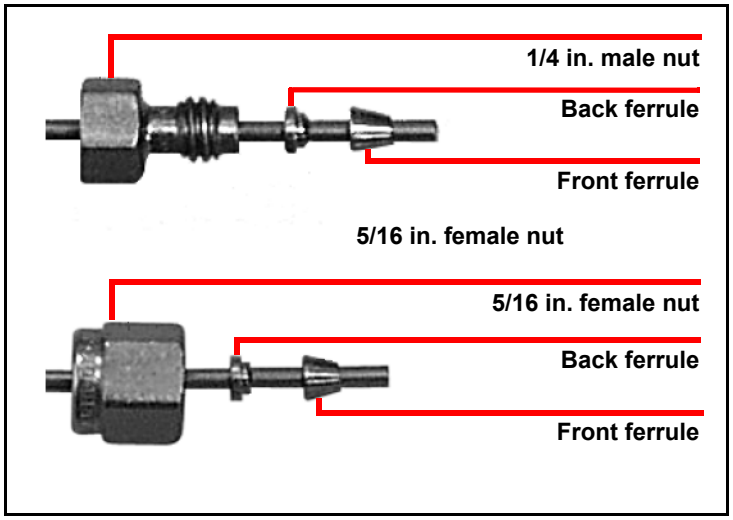
2 Move the 3000 Micro GC handle fully away from the front cover.

3 Remove any fittings or hardware currently installed on the 3000 Micro GC sample fitting.

4 Place a 1/4 in. male nut, a back ferrule, and front ferrule on the outlet tube. Use the longer outlet tube on the portable models. See Figure 5-2 for ferrule orientation.

5 Loosely install a 5/16 in. nut, back ferrule, and front ferrule onto the 3000 Micro GC sample inlet fitting. Do not tighten. Tubing will be installed into this fitting later.

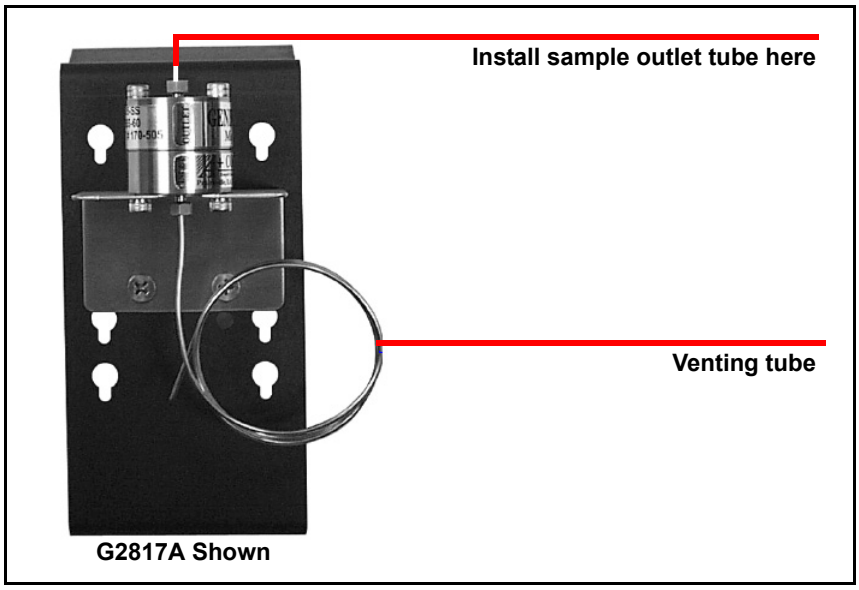
Figure 5-2 Installing ferrules



PN 074-519-P1C

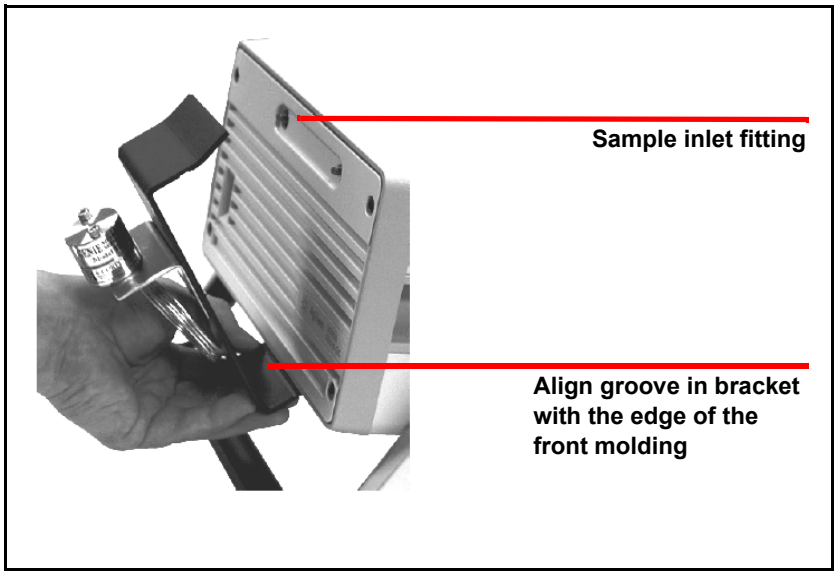
6 Install the sample outlet tube into the output fitting on the Genie Filter Assembly. See Figure 5-3. Tighten 1/2 turn past finger tight using a 1/4 in. open-ended wrench, then loosen 1/4 turn, so that the tube is loose but will not disengage.

Figure 5-3 Installing the sample outlet tube



7 Align the Genie Filter Assembly bracket horizontally the 3000 Micro GC face so that the end of the outlet tubing is near the inlet fitting. Then, place the lower lip of the mounting bracket under the bottom front panel as shown in Figure 5-4. The edge of the 3000 Micro GC front molding fits into the groove in the bracket.

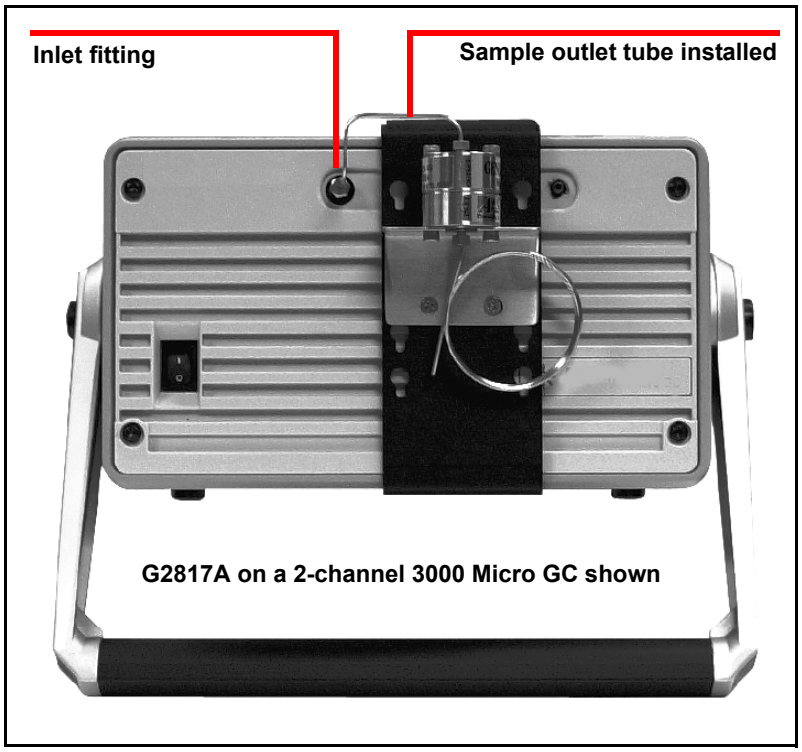
Figure 5-4 Installing the Genie filter assembly



PN 074-519-P1C

8 While maintaining the alignment of the outlet tubing to the inlet fitting, tilt the bracket up and snap it onto the front of the instrument. When properly mounted, the bracket should be flat against the 3000 Micro GC frame. Insert the outlet tubing into the 3000 Micro GC inlet fitting. See Figure 5-5.

Figure 5-5 Genie filter assembly, installed



NOTE: The outlet tubing should insert easily into the 3000 Micro GC sample inlet fitting. If not, slide the accessory along the 3000 Micro GC frame until the outlet tubing is unstressed.

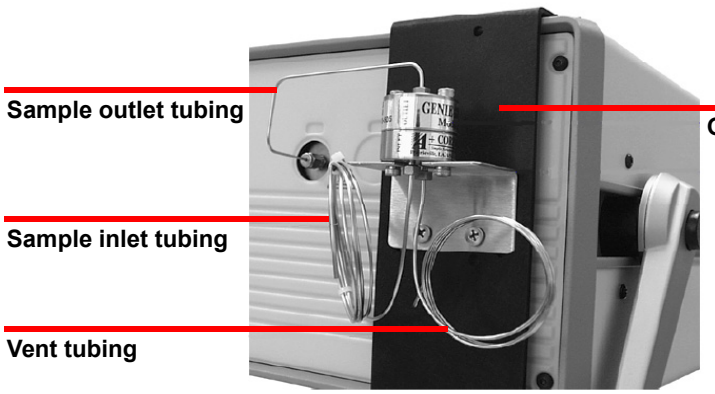
9 Tighten the 1/4 in. nut on the top of the Genie Filter Assembly.

10 Tighten the 5/16 in. nut on the 3000 Micro GC sample inlet fitting using the appropriate size wrenches.

PN 074-519-P1C

11 Install one end of the sample inlet tubing, 1/4 in. nut, and front and back ferrules provided in the kit onto the sample input fitting on the bottom of the filter as shown in Figure 5-6. Connect the open end of the sample inlet tube to the sample.

Figure 5-6 Installing the sample tube



WARNING

If a hazardous sample is used, the sample exhaust must be vented to a fume hood or other designated area for hazardous waste disposal.

12 Uncoil the vent tubing. Run the exhaust to a fume hood or other designated area for hazardous waste disposal.

Figure 5-7 shows the Genie Filter Assembly mounted on 3000 Micro GC.

Figure 5-7 Genie filter assembly mounted on 3000 Micro GC

G2817A on a 2-channel 3000 Micro GC shown

PN 074-519-P1C

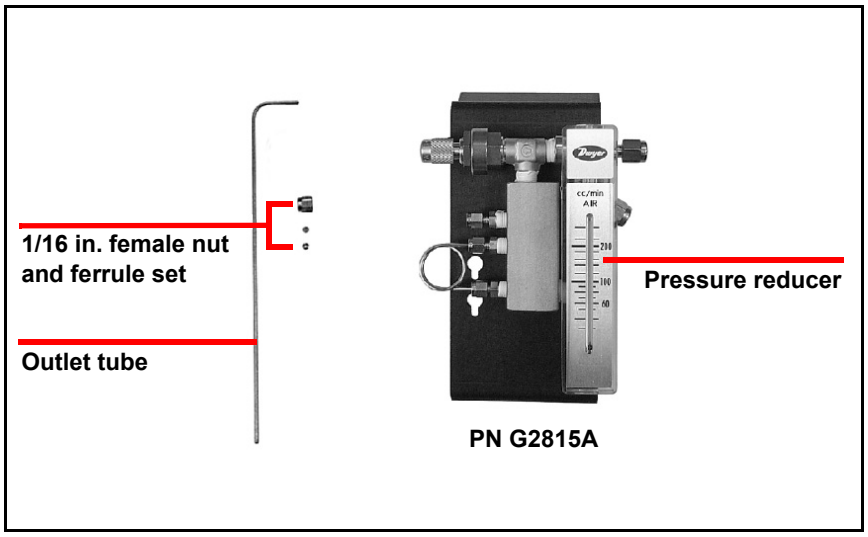
5.1.4 Installing the Pressure Reducer

The Pressure Reducer (PN G2815A) provides a pressure reducing function. It is not compatible with other sample conditioners mounted on the 3000 Micro GC front panel.

Table 5-3 Pressure reducer kit contents.

Description	Quantity
Outlet tube	1 ea
Flow controller	1 ea
1/16 in. nut and ferrule set	1 ea

Figure 5-8 Pressure reducer kit



5.1.4.1 Tools Required

- 5/16 in. open-ended wrench
- 7/16 in. open-ended wrench
- 1/4 in. open-ended wrench

5.1.4.2 User Supplied Parts

- Vent tubing, if used
- Fittings for vent tubing, if used
- Sample input tubing and fittings

PN 074-519-P1C

5.1.4.3 Installation Instructions for the Pressure Reducer

1 Turn off 3000 Micro GC and allow the sample inlet fitting to cool.

WARNING

3000 Micro GC has inlets which can be heated to 140°C. Touching the inlets at operating temperatures can result in injury. Extreme care should be taken to avoid touching the heated inlets.

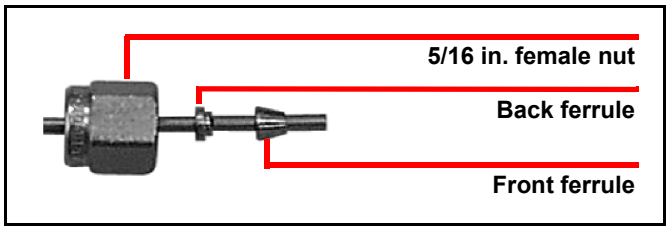
2 Move the 3000 Micro GC handle fully away from the front cover.

3 Remove any fittings or hardware currently installed on the 3000 Micro GC sample fitting.

NOTE: The external 10 micron sample inlet filter may be left in place. Refer to section 5.1.2 on page 5-3.

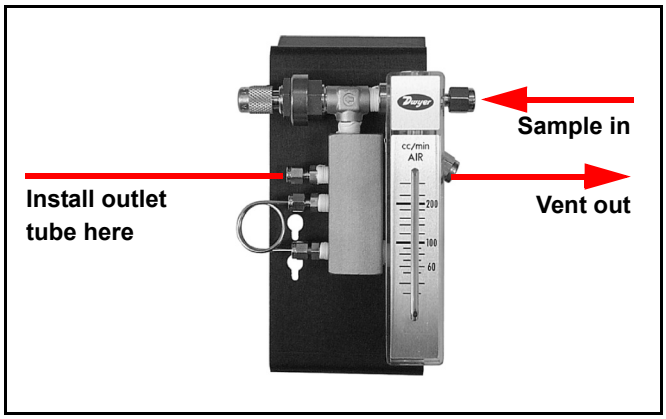
4 Loosely install a 5/16 in. female nut, back ferrule, and front ferrule onto the sample inlet fitting or the 10 micron sample inlet filter. See Figure 5-9. Do not tighten. The outlet tube will be installed into this fitting later.

Figure 5-9 Installing ferrules



5 Insert the outlet tube into the top 1/16 in. fitting on the flow controller (see Figure 5-10). Tighten 1/2 turn past finger tight using the 1/4 in. open-ended wrench, then loosen 1/4 turn, so that the tube is loose but will not disengage.

Figure 5-10 Installing the sample outlet tube

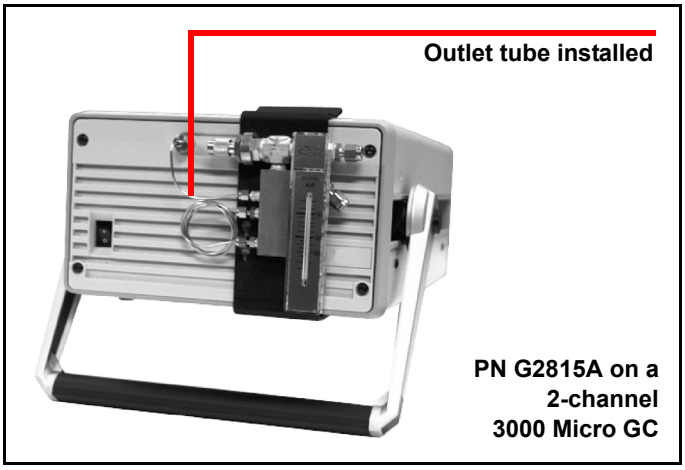


6 Align the Pressure Reducer bracket horizontally on the face of the 3000 Micro GC so that the end of the outlet tubing is near the inlet fitting. Place the lower lip of the mounting bracket under the bottom front panel as shown in Figure 5-11. The edge of the 3000 Micro GC front molding will fit into the groove in the bracket.

Figure 5-11 Installing the bracket onto the 3000 Micro GC

7 While maintaining the alignment of the outlet tubing and the inlet fitting (or 10 micro sample inlet filter), tilt the bracket up and snap it onto the front of the 3000 Micro GC. When properly mounted, the bracket should be flat against the 3000 Micro GC frame. Insert the outlet tubing into the sample inlet fitting (or 10 micron sample inlet filter). See Figure 5-12.

Figure 5-12 Pressure reducer, installed



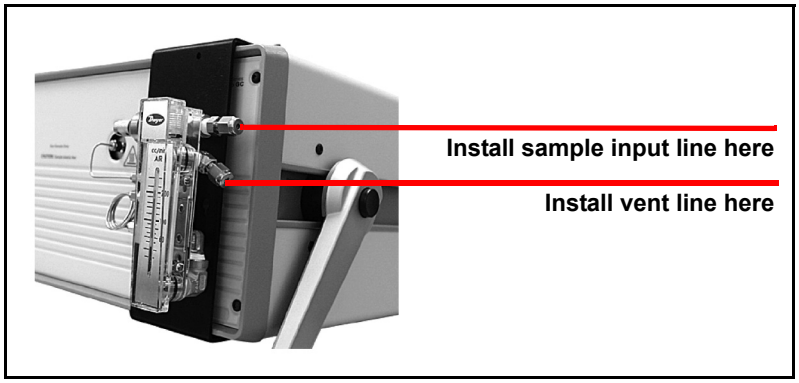
8 The sample outlet tubing should insert easily into the 3000 Micro GC inlet fitting. If not, slide the accessory along the 3000 Micro GC frame until the sample outlet tubing is unstressed.

9 Tighten the 5/16 in. nut to the sample inlet fitting using the 5/16 in. open-ended wrench.

PN 074-519-P1C

10 Install 1/8 in. sample input line to the top right Swagelok fitting on the accessory. See Figure 5-13.

Figure 5-13 Installing sample input and vent lines



WARNING

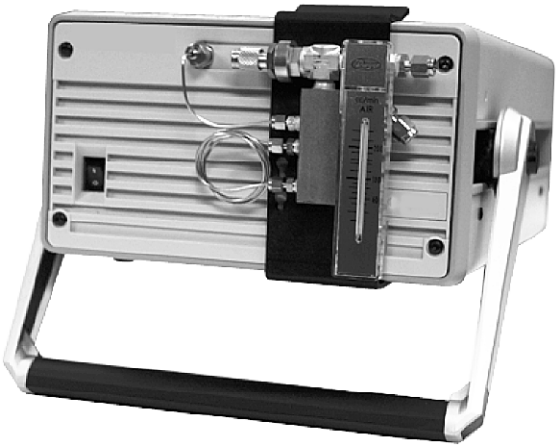
If a hazardous sample is used, the sample exhaust must be vented to a fume hood or other designated area for hazardous waste disposal.

11 Connect a vent line to the vent fitting using standard 1/8 in. fittings. Run the exhaust to a fume hood or other designated area for hazardous waste disposal.

Installation is now complete.

Figure 5-14 shows the Pressure Reducer mounted on 3000 Micro GC.

Figure 5-14 Pressure reducer mounted on a 3000 Micro GC



PN G2815A on a 2-channel 3000 Micro GC

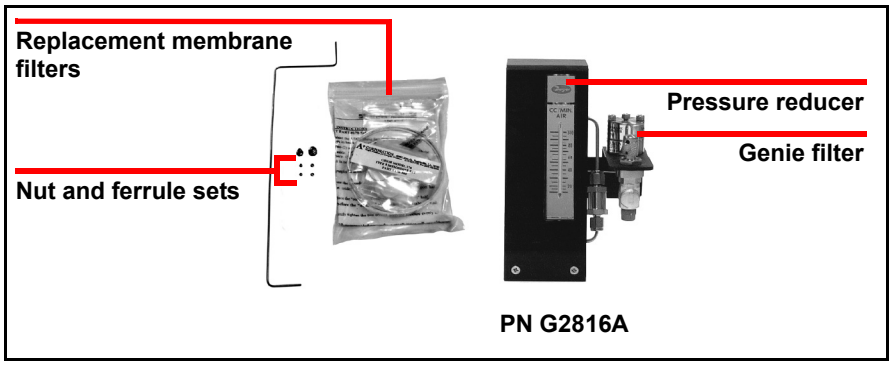
5.1.5 Installing the Pressure Reducer and Genie Filter Assembly

The Pressure Reducer and Genie Filter Assembly (G2816A) provides a pressure reducing function and a gas-liquid separation through a Genie filter. It is not compatible with other sample conditioners mounted on the 3000 Micro GC front panel. See Table 5-4 and Figure 5-15 for G2816A kit content.

Table 5-4 Pressure reducer and Genie filter assembly kit contents.

Description	Quantity
Outlet tube	1 ea
Genie filter assembly	1 ea
1/4 in. male nut and ferrule set	1 ea
5/16 in. female nut and ferrule set	1 ea
Replacement membrane filters (5/pk)	1 ea

Figure 5-15 Pressure reducer and Genie filter assembly kit



5.1.5.1 Tools Required

- 5/16 in. open-ended wrench
- 7/16 in. open-ended wrench
- 1/4 in. open-ended wrench

5.1.5.2 User Supplied Parts

- Vent tubing, if used
- Fittings for vent tubing, if used
- 1/8 in. female national pipe thread (NPT) fitting
- Sample input tubing and fittings

PN 074-519-P1C

5.1.5.3 Installation Instructions for the Pressure Reducer and Genie Filter Assembly

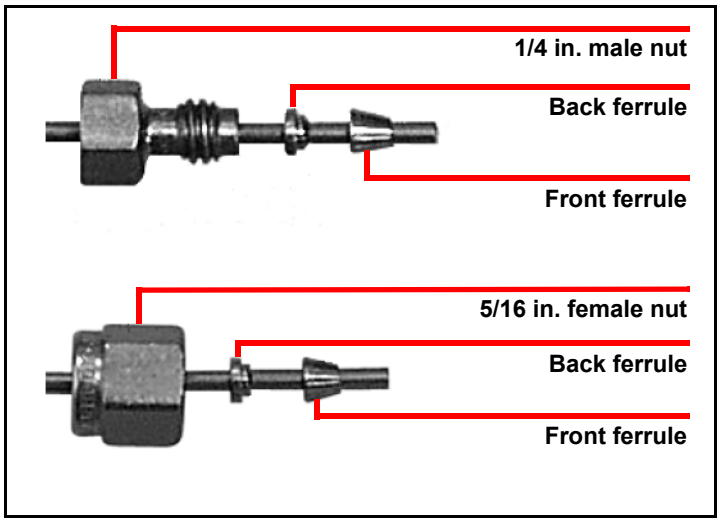
1. Turn off 3000 Micro GC and wait for the sample inlet fitting to cool.

WARNING

3000 Micro GC has inlets which can be heated to 140°C. Touching the inlets at operating temperatures can result in injury. Extreme care should be taken to avoid touching the heated inlets.

2. Move the 3000 Micro GC handle fully away from the front cover.
3. Remove any fittings or hardware currently installed on the 3000 Micro GC sample fitting.
4. Place a 1/4 in. male nut, back ferrule, and front ferrule onto one end of the outlet tube provided. See Figure 5-16 for ferrule orientation. See Figure 5-17 for outlet tube orientation.
5. Loosely install a 5/16 in. nut, back ferrule, and front ferrule onto the sample inlet fitting. Do not tighten. The outlet tube will be installed into this fitting later.

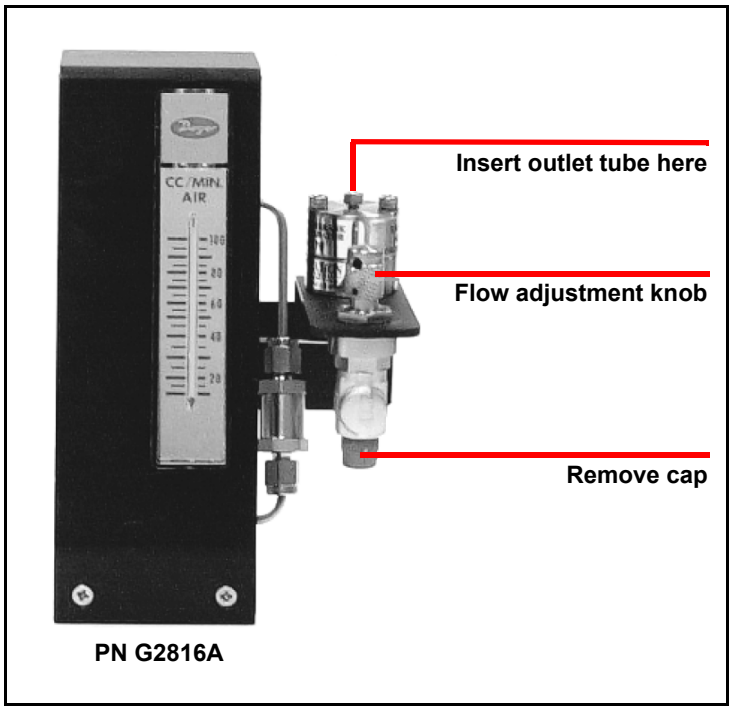
Figure 5-16 Installing ferrules



PN 074-519-P1C

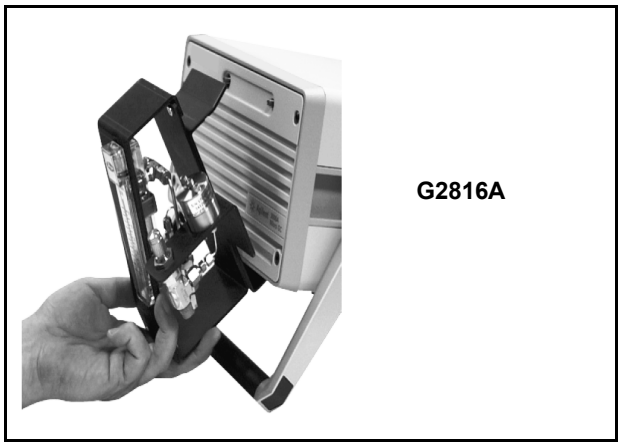
6 Insert the outlet tube into the outlet fitting on the Genie Filter Assembly. See Figure 5-17. Tighten 1/2 turn past finger tight using the 1/4 in. open-ended wrench, then loosen 1/4 turn so that the tube is loose but will not disengage.

Figure 5-17 Installing the sample outlet tube (PN G2816A shown)



7 Align the Pressure Reducer and Genie Filter Assembly bracket horizontally on the 3000 Micro GC face so that the end of the outlet tubing is near the inlet fitting. Then, place the lower lip of the mounting bracket under the bottom front panel as shown in Figure 5-18. The edge of the 3000 Micro GC front molding will fit into the groove in the bracket.

Figure 5-18 Installing the pressure reducer and Genie filter assembly



PN 074-519-P1C

8 When maintaining the alignment of the outlet tubing and the inlet fitting, tilt the bracket up and snap it onto the front of the 3000 Micro GC. When properly mounted, the bracket should be flat against the 3000 Micro GC frame. Insert the outlet tubing into the sample inlet fitting. See Figure 5-19.

Figure 5-19 Installed pressure reducer and Genie filter assembly

G2816A on a 2-channel 3000 Micro GC

9 The sample outlet tubing should insert easily into the sample inlet fitting. If not, slide the accessory along the 3000 Micro GC frame until the tubing is unstressed.

10 Tighten the 1/4 in. nut on top of the Genie Filter Assembly.

11 Tighten the 5/16 in. nut on the 3000 Micro GC sample inlet fitting with the appropriately sized open-ended wrenches.

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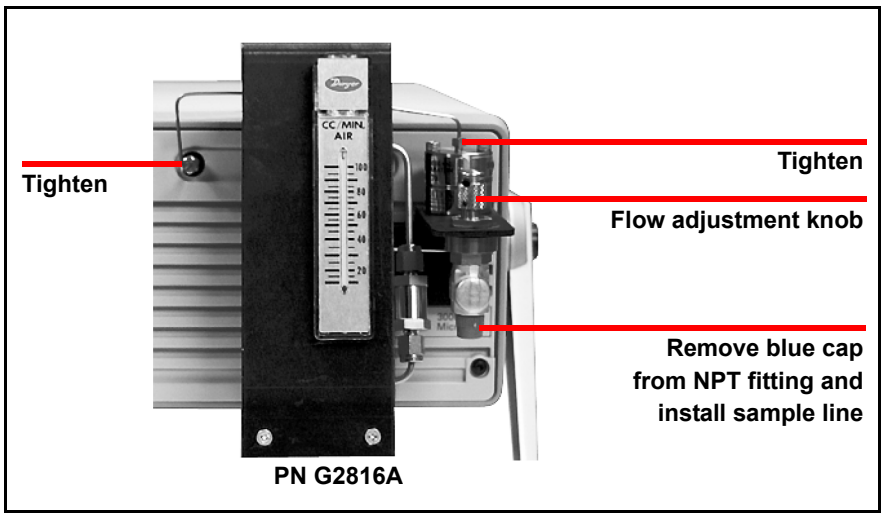
12 Remove the blue cap from the 1/8 in. NPT male input fitting and install a user-provided 1/8 in. female NPT fitting and sample line. See Figure 5-20.

Figure 5-20 Installing the sample line

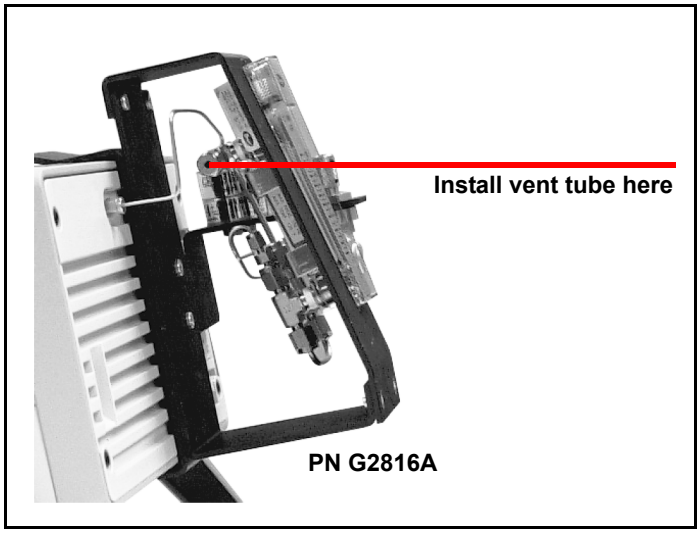


WARNING

If a hazardous sample is used, the sample exhaust must be vented to a fume hood or other designated area for hazardous waste disposal.

13 Connect a vent line to the vent fitting using standard 1/8 in. fittings. Run the exhaust to a fume hood or other designated area for hazardous waste disposal.

Figure 5-21 Installing the vent tubing



PN 074-519-P1C

Figure 5-22 shows the Pressure Reducer and Genie Filter Assembly mounted on 3000 Micro GC.

Figure 5-22 Pressure reducer and Genie filter assembly mounted on 3000 Micro GC

G2816A on a 2-channel 3000 Micro GC

5.1.6 Installing Heated Sample Introduction Accessories

Heated sample introduction accessories are separately powered sample conditioners for the 3000 Micro GC. See Table 5-5.

Table 5-5 Heated sample introduction accessory types

Model PN	Description	Source Pressure
G2818A-X/G2845A-X/G2857A-X	Heated Regulator for natural gas at variable pressure	14 to 5516 kPa (2 to 800 PSI)
G2819A-X/G2846A-X/G2858A-X	Heated Vaporizer for liquefied petroleum gas under high pressure	1379 to 5516 kPa (200 to 800 PSI)

NOTE: G2818A-X and G2819A-X are heated sample introduction accessories designed for a 1,2-channel 3000 Micro GC.

NOTE: G2845A-X and G2857A-X are heated sample introduction accessories designed for a 3,4-channel 3000 Micro GC.

NOTE: G2857A-X and G2858A-X are heated sample introduction accessories designed for a Portable 3000 Micro GC.

NOTE: The Heated Regulator and Heated Vaporizer come equipped with a separate power cord. The PN reflects the power cord option with an X, where X is a number representing one of the following countries:
1: China
2: Europe
3: US
4: Japan
5: UK/HK/SG/MY
6: Australia/NZ
7: Korea

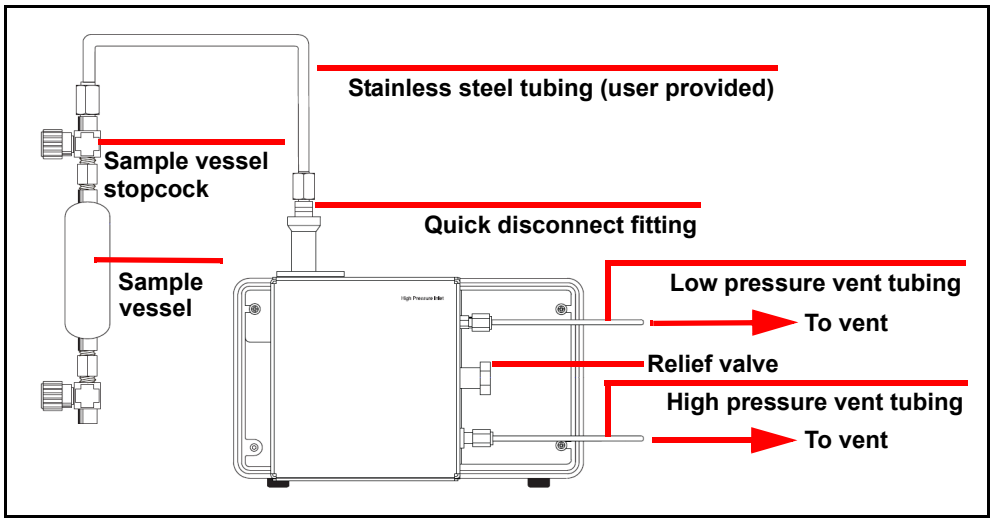
5.1.6.1 Heated Regulator

The Heated Regulator for natural gas (PN G2818A-X/G2845A-X/G2857A-X) is a separately powered accessory that reduces the pressure of a gas sample for introduction into 3000 Micro GC while maintaining the sample in a non-condensed gas phase. This device is designed for use with natural gas samples introduced through sample vessels or through sample lines connected to wellheads or transfer points. The sample gas pressure must be 14 to 5516 kPa (2 to 800 PSI) with thermal properties of up to 112 kJ/m^3 (3,000 BTU) as an ideal gas.[1] [2]

The sample enters the system through a quick disconnect fitting where it passes through the particle filter and into a Heated Regulator. The sample pressure is reduced to a range of 69 to 103 kPa (10 to 15 PSI) before it enters the 3000 Micro GC inlet.

A 7 micron sintered stainless steel particle filter reduces the risk of damage to 3000 Micro GC by particulate matter. The entire sample pathway, from the quick connect fitting through the 3000 Micro GC sample transfer line, is heated to a minimum temperature of 60°C.

Figure 5-23 Sample vessel connected to PN G2818A-X/G2845A-X/G2857A-X heated regulator and 3000 Micro GC via quick disconnect fitting (2-channel 3000 Micro GC shown)



PN 074-519-P1C

1.Gas Processors Association (GPA) Standard 2145–00, Revision 1, "*Table of Physical Constants for Hydrocarbons and Other Compounds of Interest to the Natural Gas Industry.*"

2.Gas Processors Association (GPA) Standard 2172–96, *"Calculation of Gross Heating Value, Relative Density and Compressibility Factor for Natural Gas Mixtures from Compositional Analysis."* Joint standard with the American Petroleum Institute, API MPMS 14.5.

5.1.6.1.1 Target Analytes

Natural gas typically consists of methane and a wide distribution of other hydrocarbons and fixed gases. The Heated Regulator is designed for the broadest range of sample compositions that are in the gas phase at ambient temperature and pressure.

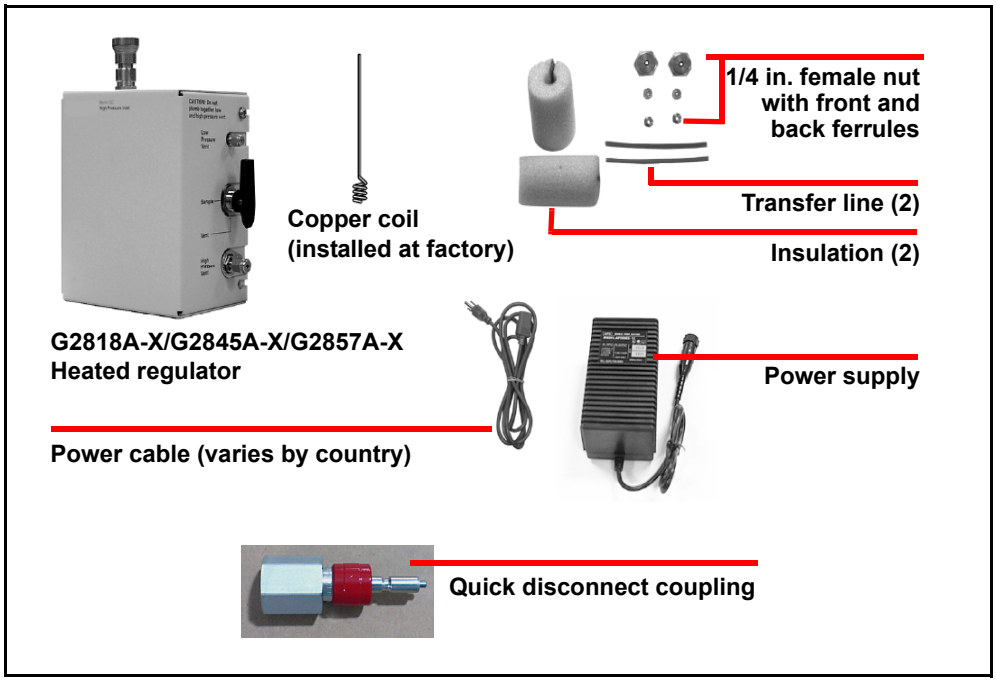
NOTE: The Heated Regulator is not intended for use with natural gas liquid (NGL) samples.

5.1.6.1.2 Heated Regulator Accessory Contents

Table 5-6 Heated regulator accessory kit contents (PN G2818A-X/G2845A-X/G2857A-X)

Description	Quantity
Heated Regulator assembly, with copper coil extension installed	1 ea
Power supply and cable	1 ea
Transfer line kit (two each transfer lines, insulation, 1/16 in. ID front and back ferrules, and 1/4 in. female nuts)	1 ea
Quick disconnect coupling	1 ea

Figure 5-24 Heated regulator accessory kit



5.1.6.2 Heated Vaporizer

The Heated Vaporizer (PN G2819A-X/G2846A-X/G2858A-X) is used for high pressure liquefied petroleum gas (LPG). This sample enters a pressure regulator in the vaporizer where it expands, reducing the pressure to 52 ±17 kPa (7.5 ±2.5 PSI). The sample is introduced into the injector through the transfer line at a flow rate of approximately 40 mL/min. To prevent sample condensation, the vaporizer temperature is regulated at 100 ±5°C.

This accessory is optimized for analyzing relatively clean and dry C_3 and C_4 sample streams. The sample must be completely vaporous at 100°C and 52 ±17 kPa (7.5 ±2.5 PSI). Although a two micron particle filter is provided to remove particulates that could lodge in the injector and damage the instrument, using very dirty samples should be avoided.

NOTE: Samples with excessive water content will exhibit large water peaks.

Several analytes detectable with the Heated Vaporizer and 3000 Micro GC are shown in Table 5-7.

Table 5-7 Selected target analytes and comments

Target Analyte	Comments
C_1 (methane)	N/A
C_2 (ethane)	N/A
C_3 (propane, propene)	Optimized for detecting C_3 and C_4 streams
C_4, IC_4 (butane, isobutane, butene)	Optimized for detecting C_3 and C_4 streams
C_5, IC_5 (pentane, isopentane)	Detectable in trace amounts in propane, provided that the concentration is low enough that the C_5/IC_5 is completely vaporous in the sample. In larger concentrations, C_5/IC_5 condenses in the instrument and in the low pressure vent line.
C_6, IC_6 (hexane, isohexane)	Detectable in trace amounts in propane, provided that the concentration is low enough that the C_6/IC_6 is completely vaporous in the sample. In larger concentrations, C_6/IC_6 condenses in the instrument and in the low pressure vent line.

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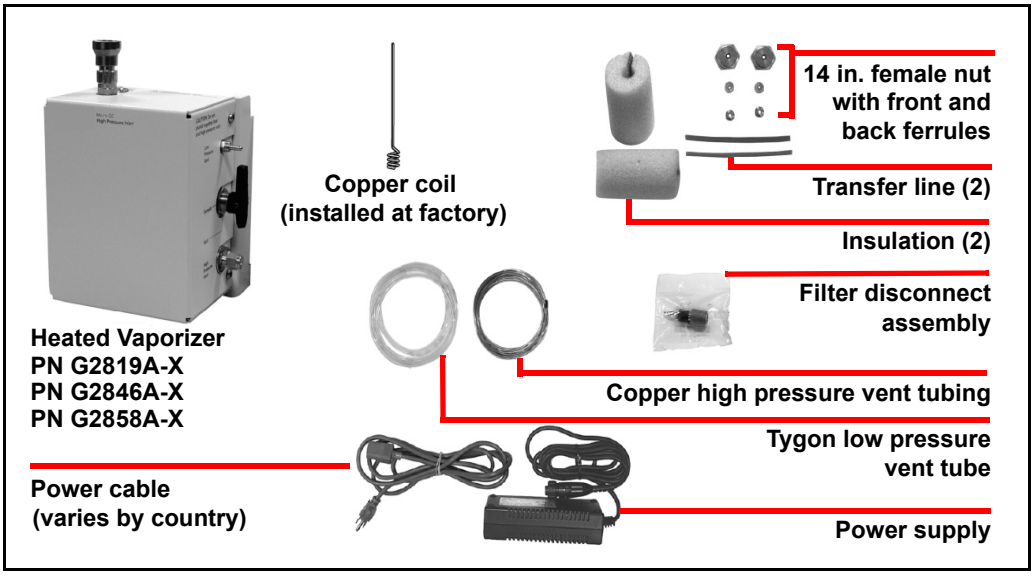
5.1.6.2.1 Heated Vaporizer Accessory Contents

Table 5-8 Heated vaporizer accessory contents (PN G2819A-X/G2846A-X/G2858A-X)

Description	Quantity
Heated Vaporizer assembly, with copper coil extension installed	1 ea
Copper high pressure vent tubing	1 ea
Tygon low pressure vent tubing	1 ea
Power supply and cable	1 ea
Filter disconnect assembly (includes inline filter and disconnect fitting)	1 ea
Transfer line kit (two each transfer lines, insulation, 1/16 in. nut with front and back ferrules, and 1/4 in. female nuts with front and back ferrules)	1 ea

Figure 5-25 Heated vaporizer accessory kit



5.1.6.3 Installation

The heated sample introduction accessory can be installed on any 3000 Micro GC that has a heated injector.

5.1.6.3.1 Tools and Supplies Required

- A power source rated for 100 to 240 V (ac), 50/60 Hz, 2 A
- 5/16 in. open-end wrench

5.1.6.3.2 User Supplied Parts

- T20 Torx screwdriver
- 1/16 in. stainless steel tubing for low pressure venting
- 1/8 in. copper tubing for high pressure venting (rated for the maximum supply pressure)

5.1.6.3.3 Prepare the 3000 Micro GC and Sample Introduction Accessory

1 Turn off 3000 Micro GC and allow the sample inlet fitting to cool.

WARNING

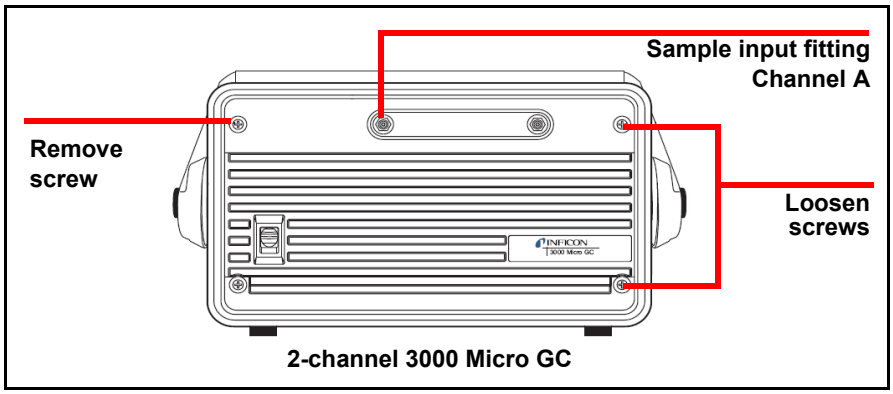
3000 Micro GC has inlets which can be heated to 140°C. Touching the inlets at operating temperatures can result in injury. Extreme care should be taken to avoid touching the heated inlet surfaces.

2 Move the 3000 Micro GC handle fully away from the front cover.

3 Remove any fittings or hardware currently installed on the 3000 Micro GC sample fitting.

4 Remove the upper left cover screw and loosen the two right-most screws so that the heated sample introduction accessory mounting plate will slide beneath them. See Figure 5-26.

Figure 5-26 Preparing to mount the accessory (2-channel 3000 Micro GC shown)



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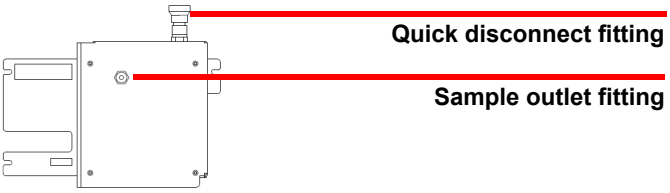
5.1.6.3.4 Installing the Transfer Line

1. The sample outlet fitting on the heated sample introduction accessory contains a nut and ferrule set and should be ready for transfer line installation. See Figure 5-27.

Figure 5-27 Sample outlet fitting nut

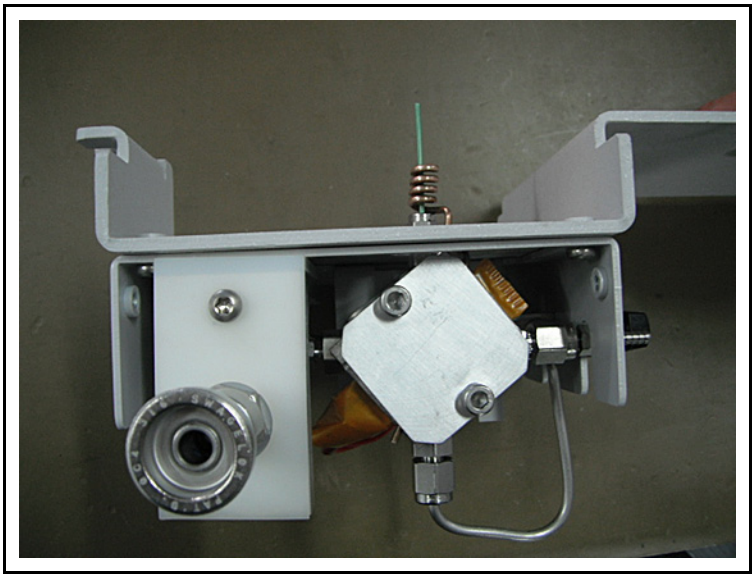


2. Before mounting the heated sample introduction accessory, the transfer line must be inserted into the sample outlet fitting. Verify that the transfer line can slide into the nut and ferrule set. Loosen the nut if necessary.

3. Insert the transfer line into the sample outlet fitting as far as possible, then back it out about 1 mm.

4. Finger-tighten the nut, then make an additional 1/8 turn with the 5/16 in. open-ended wrench. See Figure 5-28.

Figure 5-28 Transfer line installed on a heated regulator



5.1.6.3.5 Mounting the Heated Sample Conditioners

1 Add female nut, front ferrules and back ferrules to the transfer line as shown in Figure 5-29.

Figure 5-29 Installing female nut, back, and front ferrules onto transfer line

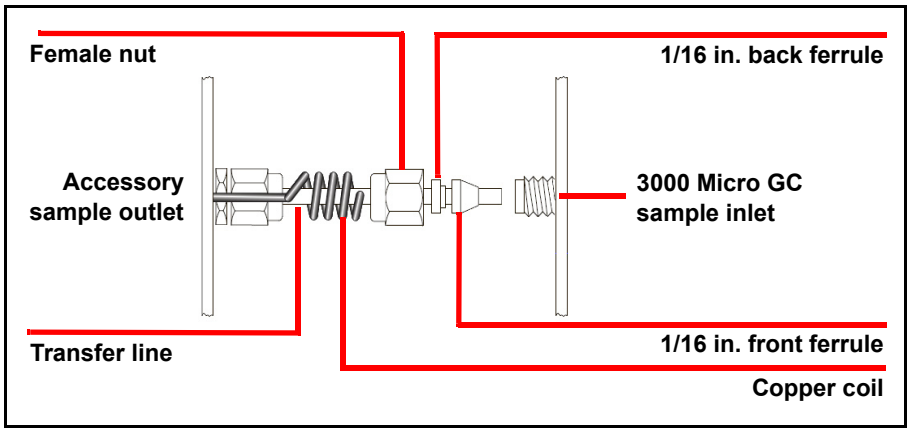
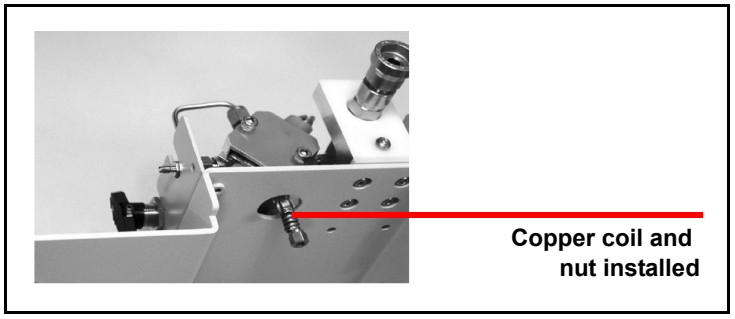


Figure 5-30 Accessory with copper coil and nut installed



2 Hold the heated sample introduction accessory at an angle to the instrument and slide the right side screw slots under the loosened 3000 Micro GC cover screws. See Figure 5-31 and Figure 5-32.

Figure 5-31 Installing the mounting plate onto the 3000 Micro GC (2-Channel 3000 Micro GC shown, top view)

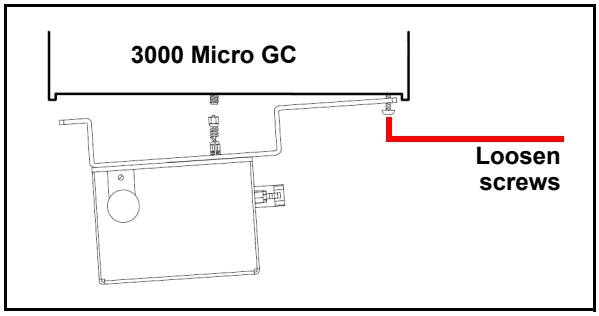


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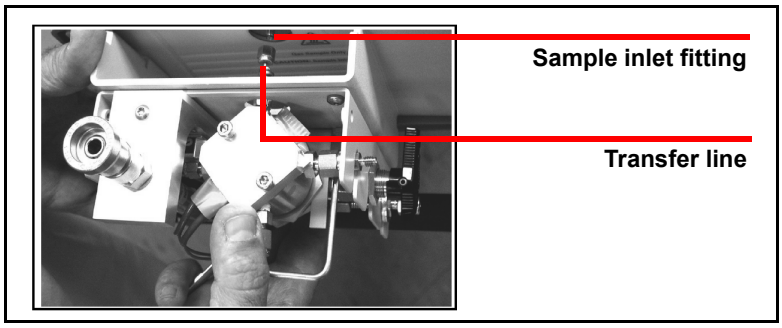
Figure 5-32 Installing the heated sample instroduction accessory on 3000 Micro GC



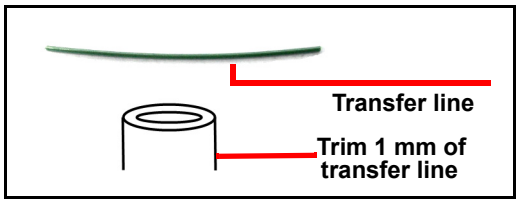
3 Tighten the 3000 Micro GC cover screws.

4 Insert the transfer line into the 3000 Micro GC sample inlet fitting as far as possible, then back it out about 1 mm.

5 Finger tighten the female nut, then tighten an additional 1/8 turn with the 5/16 in. open-ended wrench.

6 If the transfer line is kinked, remove the sample introduction accessory and trim about 1 mm off the end of the transfer line. Make the cut square and perpendicular. Reassemble. See Figure 5-33.

Figure 5-33 Trimming the transfer line



7 Install and tighten the upper left cover mounting screw using T20 Torx screwdriver.

8 Tighten the remaining cover screws with a T20 Torx screwdriver.

9 Wrap one of the two pieces of insulation around the transfer line. Retain the remaining transfer line, insulation and extra mounting hardware as spares.

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5.1.6.3.6 Install the Vent Tubing and Connect to Power

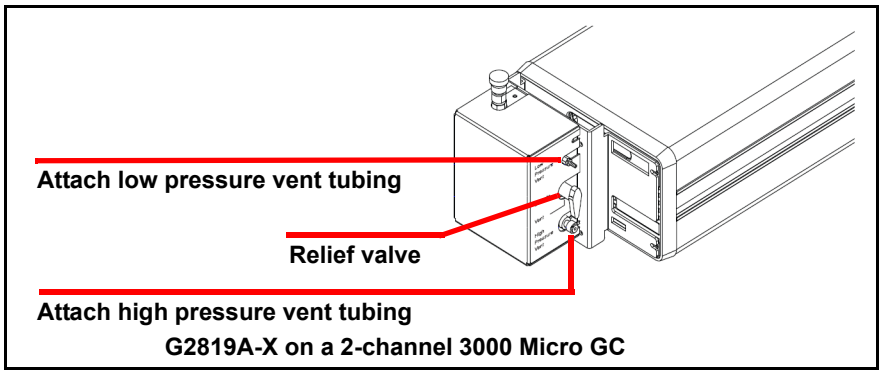
CAUTION

Never connect low and high pressure vent lines together. 3000 Micro GC will be damaged by back pressure.

1 Attach low pressure vent tubing to the low pressure vent on the heated sample introduction accessory. See Figure 5-34.

- For the Heated Vaporizer accessory (PN G2819A-X/G2846A-X/G2858A-X), use the clear tubing included in the kit
- For the Heated Regulator accessory (PN G2818A-X/G2845A-X/G2857A-X), use 1/16 in. stainless steel tubing (not provided)

Figure 5-34 Attaching the vent tubing



2 Attach the copper high pressure vent tubing to the high pressure vent. For the Heated Vaporizer accessory (PN G2819A-X/G2846A-X/G2858A-X), use the 1/8 in. copper vent tubing included in the kit.

WARNING

If a hazardous sample is used, the sample exhaust must be vented to a fume hood or other designated area for hazardous waste disposal.

If desired, install a flow meter inline from the low pressure vent tubing to check flow rates.

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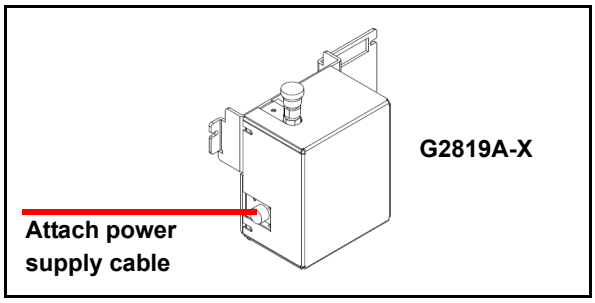
WARNING

Keep the power supply block away from gas inlets or other areas where gas may collect or leak.

3 Fasten the power supply cable to the heated sample introduction accessory. Connect the power supply to a power source. See Figure 5-35.

Figure 5-35 Connecting the power cord



4 Turn 3000 Micro GC on.

5.1.6.4 Installation for 3,4-Channel 3000 Micro GCs

Installation for the 3,4-channel 3000 Micro GC is essentially identical to that of a 1,2-channel 3000 Micro GC, except that the mounting bracket is longer. See Figure 5-36 and Figure 5-37.

Figure 5-36 3000 Micro GC, 3,4-channel 3000 Micro GC, front view

Figure 5-37 Example of G2846A-X heated vaporizer installed on a 3,4-channel 3000 Micro GC

G2846A-X on a 3,4-channel 3000 Micro GC

5.1.6.5 Heated Regulator/Vaporizer Part Numbers

The Heated Regulator and Heated Vaporizer are supplied with country specific power cords. Part numbers reflect the power cord provided with the sample conditioner. See Table 5-9.

Table 5-9 Heated regulator/vaporizer IPNs

PN	Power Cord	Description
G2818A-1	China	Heated Regulator for gas sampling:1,2-ch
G2818A-2	Europe	Heated Regulator for gas sampling:1,2-ch
G2818A-3	US	Heated Regulator for gas sampling:1,2-ch
G2818A-4	Japan	Heated Regulator for gas sampling:1,2-ch
G2818A-5	UK/HK/SG/MY	Heated Regulator for gas sampling:1,2-ch
G2818A-6	Australia/NZ	Heated Regulator for gas sampling:1,2-ch
G2818A-7	Korea	Heated Regulator for gas sampling:1,2-ch
G2819A-1	China	Heated Vaporizer for gas sampling:1,2-ch
G2819A-2	Europe	Heated Vaporizer for gas sampling:1,2-ch
G2819A-3	US	Heated Vaporizer for gas sampling:1,2-ch
G2819A-4	Japan	Heated Vaporizer for gas sampling:1,2-ch
G2819A-5	UK/HK/SG/MY	Heated Vaporizer for gas sampling:1,2-ch
G2819A-6	Australia/NZ	Heated Vaporizer for gas sampling:1,2-ch
G2819A-7	Korea	Heated Vaporizer for gas sampling:1,2-ch
G2845A-1	China	Heated Regulator for gas sampling:3,4-ch
G2845A-2	Europe	Heated Regulator for gas sampling:3,4-ch
G2845A-3	US	Heated Regulator for gas sampling:3,4-ch
G2845A-4	Japan	Heated Regulator for gas sampling:3,4-ch
G2845A-5	UK/HK/SG/MY	Heated Regulator for gas sampling:3,4-ch
G2845A-6	Australia/NZ	Heated Regulator for gas sampling:3,4-ch
G2845A-7	Korea	Heated Regulator for gas sampling:3,4-ch
G2846A-1	China	Heated Vaporizer for gas sampling:3,4-ch
G2846A-2	Europe	Heated Vaporizer for gas sampling:3,4-ch
G2846A-3	US	Heated Vaporizer for gas sampling:3,4-ch
G2846A-4	Japan	Heated Vaporizer for gas sampling:3,4-ch
G2846A-5	UK/HK/SG/MY	Heated Vaporizer for gas sampling:3,4-ch

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Table 5-9 Heated regulator/vaporizer IPNs (continued)

PN	Power Cord	Description
G2846A-6	Australia/NZ	Heated Vaporizer for gas sampling:3,4-ch
G2846A-7	Korea	Heated Vaporizer for gas sampling:3,4-ch
G2857A-1	China	Heated Regulator for gas sampling: portable
G2857A-2	Europe	Heated Regulator for gas sampling: portable
G2857A-3	US	Heated Regulator for gas sampling: portable
G2857A-4	Japan	Heated Regulator for gas sampling: portable
G2857A-5	UK/HK/SG/MY	Heated Regulator for gas sampling: portable
G2857A-6	Australia/NZ	Heated Regulator for gas sampling: portable
G2857A-7	Korea	Heated Regulator for gas sampling: portable
G2858A-1	China	Heated Vaporizer for gas sampling: portable
G2858A-2	Europe	Heated Vaporizer for gas sampling: portable
G2858A-3	US	Heated Vaporizer for gas sampling: portable
G2858A-4	Japan	Heated Vaporizer for gas sampling: portable
G2858A-5	UK/HK/SG/MY	Heated Vaporizer for gas sampling: portable
G2858A-6	Australia/NZ	Heated Vaporizer for gas sampling: portable
G2858A-7	Korea	Heated Vaporizer for gas sampling: portable

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5.2 The Remote Connector

For some applications, an external triggering device may be required for sampling. This can be accomplished by connecting 3000 Micro GC to the external triggering device via a Remote Start Cable (PN G2801-60618). This cable has a 15 pin connector on one end. The other end can be fitted with a desired connector type. See Table 5-10 and Figure 5-38.

When using EZ IQ control with no external trigger, runs begin and end automatically depending on **Work List** status (started, stopped, or paused) and 3000 Micro GC readiness. To have an external triggering device start or cancel a run, the Digital I/O module (PN G2847A) must be installed in 3000 Micro GC. If the Digital I/O module is not already installed, see *Installing the Digital IO Module Quick Start Guide*.

Table 5-10 Remote start/cancel connector pin outputs

Pin	Function	Wire Color
1	Provides 5 mA for remote input	Black
2	REMOTE_START input	White
3	REMOTE_START input	Red
4	Variable GND	Green
5	Provides "5 V pull up" for logic output	Orange
6	Provides "5 V pull up" for logic output	Blue
7	Contact closure output FAULT_OUT*	White/black
8	Contact closure output READY_OUT	Red/black
9	Provides 5 mA for remote input	Green/black
10	REMOTE_CANCEL input	Orange/black
11	REMOTE_CANCEL input	Blue/black
12	Variable GND	Black/white
13	GND	Red/white
14	Contact closure output FAULT_OUT*	Green/white
15	Contact closure output READY_OUT	Blue/white
*Not implemented		

Figure 5-38 Remote start/cancel connector pin outputs

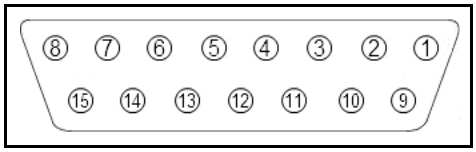

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Figure 5-39 shows the remote start cable.

Figure 5-39 G2801-60618 remote start cable

Figure 5-40 shows the remote start/cancel circuitry.

Figure 5-40 Remote start/cancel circuitry

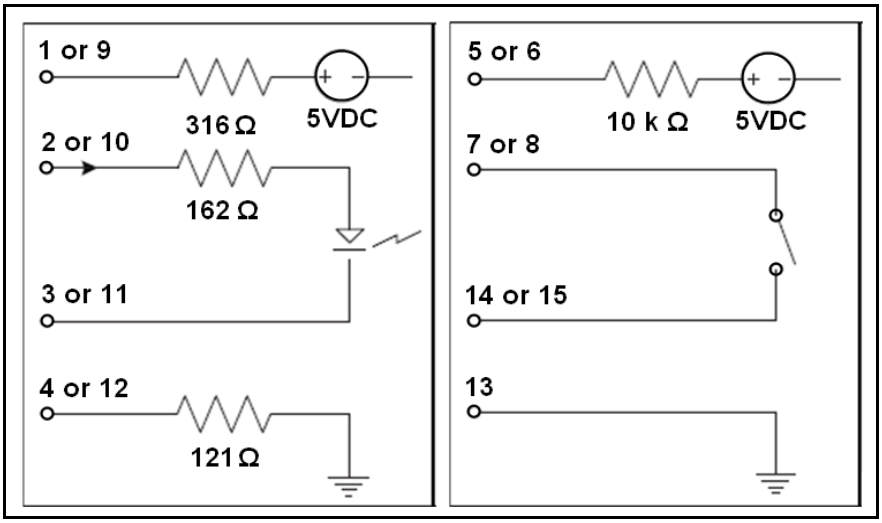

Table 5-11 shows the remote start/cancel action matrix.

Table 5-11 Remote start/cancel action matrix

Purpose	Pin Connection	Action
Remote Start	Pin 1 and pin 2	Connect together to activate circuit
	Pin 3 and pin 4	No action when open Trigger REMOTE_START when closed
Remote Cancel	Pin 9 and pin 10	Connect together to activate circuit
	Pin 11 and pin 12	No action when open Trigger REMOTE_CANCEL when closed

NOTE: When External Trigger is defined in EZ IQ, a 5 ms contact closure in the REMOTE_START circuit starts the 3000 Micro GC run and EZ IQ begins data acquisition.

NOTE: When 3000 Micro GC is ready to begin a run but a REMOTE_START signal has not been received, the READY_OUT contacts (i.e., pins 8 and 15) are closed. They remain closed until the run starts or the run is cancelled/aborted.

NOTE: If the REMOTE_CANCEL contacts are closed, 3000 Micro GC will open the READY_OUT relay (i.e., pins 8 and 15) to signal the connected device that the run is terminated.

5.2.1 EZ IQ Operation to Activate Remote Start/Cancel Function

For instructions on how to use an external trigger within EZ IQ, see section 7.14, EZ IQ Operation to Activate Remote Start/Cancel Function, on page 7-49.

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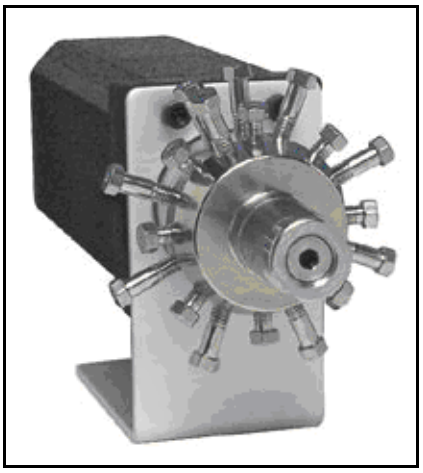
5.3 Multi-Position Valve Installation and Setup

3000 Micro GC can be equipped with a Valco (VICI) switching or sampling valve actuator to control the injection of multiple gas streams. EZ IQ software allows for control of this stream selection valve. See Figure 5-41.

Figure 5-41 Multiposition microelectric valve actuator and controller



In addition to the stream selection valve, the EMHCA-CE and EMTCA-CE (two position and multi-position) models of switching valve actuators with serial port interface manufactured by Valco Instruments, Inc. are supported.

NOTE: Only the serial port interface versions of the actuators are supported.

Consult the Valco valve operating manual for hardware installation instructions.

To activate the Valco valve application in EZ IQ, the Valco valve must be configured. See section 5.3.3 on page 5-34. After configuration, the Valco valve function can be programmed in the 3000 Micro GC method. See section 7.15.1 on page 7-52.

5.3.1 Valve Hardware/Software Requirements

- Multiposition Microelectric Valve Actuator and Controller
- VICI Valco Valve Rotor
- 3000 Micro GC
- Computer

  NOTE: For computer requirements, refer to the *074-538 EZ IQ Operating Manual*.

- EZ IQ VICI Valco Valve Driver, supplied with EZ IQ software

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5.3.2 Valve Hardware Connections

1. Assemble the multiposition microelectric valve actuator and controller connections according to the Valco operating manual.
2. Connect the Serial Port Cable (RS-232) to computer for valve control.

5.3.3 Valve Configuration

The Valco valve driver is built into the EZ IQ software package. For valve configuration steps, see section 7.3, Configuring EZ IQ to Use a Valco (VICI) Valve, on page 7-4.

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Chapter 6
Instrument Setup Through Embedded Web Page Operation

6.1 Overview

3000 Micro GC has an embedded web page for easy access to features such as viewing configuration information, IP Address modification, and carrier gas modification. The embedded web page is accessed via a web browser.

NOTE: 3000 Micro GC is not connected directly to the internet. 3000 Micro GC has an embedded web server. When a computer and 3000 Micro GC are connected via a crossover or a LAN cable, the web browser running on the computer will be connected to the 3000 Micro GC web server.

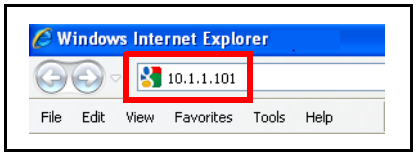
6.1.1 Determine Basic 3000 Micro GC Configuration

The embedded web page home page contains basic information on the configuration of 3000 Micro GC.

To access the basic configuration on the home page:

1. Ensure 3000 Micro GC is powered on.
2. Open a web browser on the computer. Microsoft Internet Explorer is recommended.
3. Type in the IP address of the instrument into the address bar. See Figure 6-1. 3000 Micro GC comes with a default IP address of **10.1.1.101**. Refer to section 4.3.2, IP Address Configuration, on page 4-16 for instructions on how to set up communication between the instrument and the computer.

Figure 6-1 Internet Explorer address bar



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The information listed on the home page will contain:

- 3000 Micro GC serial number
- Number of GC modules
- GC module information such as column, detector, and pump used
- Carrier gas type

Figure 6-2 3000 Micro GC embedded web page home page

Module	Inlet	Column (Film/ID/Len)	Detector	Pump	Gas
A	Backflush	Molsieve: 30.00µm/320.00µm/10m Pre Col: PLOTU: 30.00µm/320.00µm/3m	TCD	#1	carrier1: He
B	Variable	Molsieve: 30.00µm/320.00µm/10m	TCD	#2	carrier2: He
C	Fixed	PLOTU: 30.00µm/320.00µm/6m	TCD	#2	carrier2: He
D	Variable	OV1: 2.00µm/150.00µm/14m	TCD	#2	carrier2: He

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6.1.2 Determining 3000 Micro GC Advanced Configuration

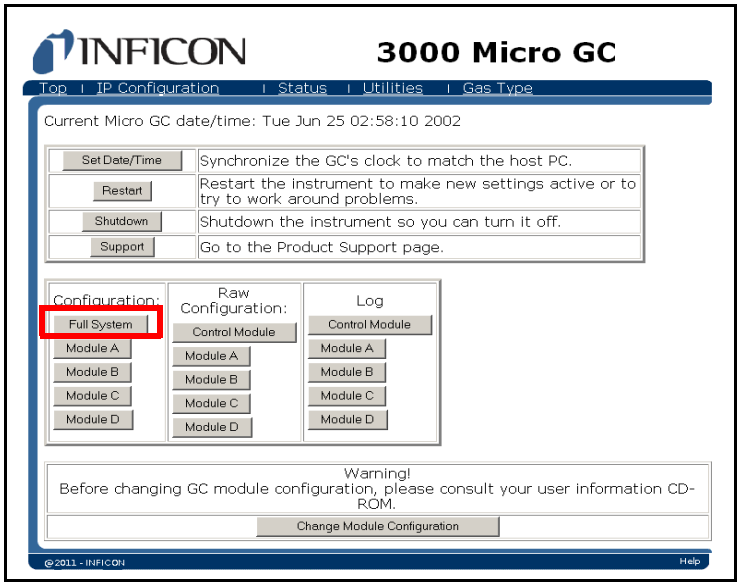
The embedded web page displays detailed configuration information in the **Utilities** tab.

1 On 3000 Micro GC home page, click the **Utilities** tab. See Figure 6-3.

Figure 6-3 Utilities tab on embedded web page

2 Under **Configuration**, click **Full System**. See Figure 6-4.

Figure 6-4 Full system on utilities tab

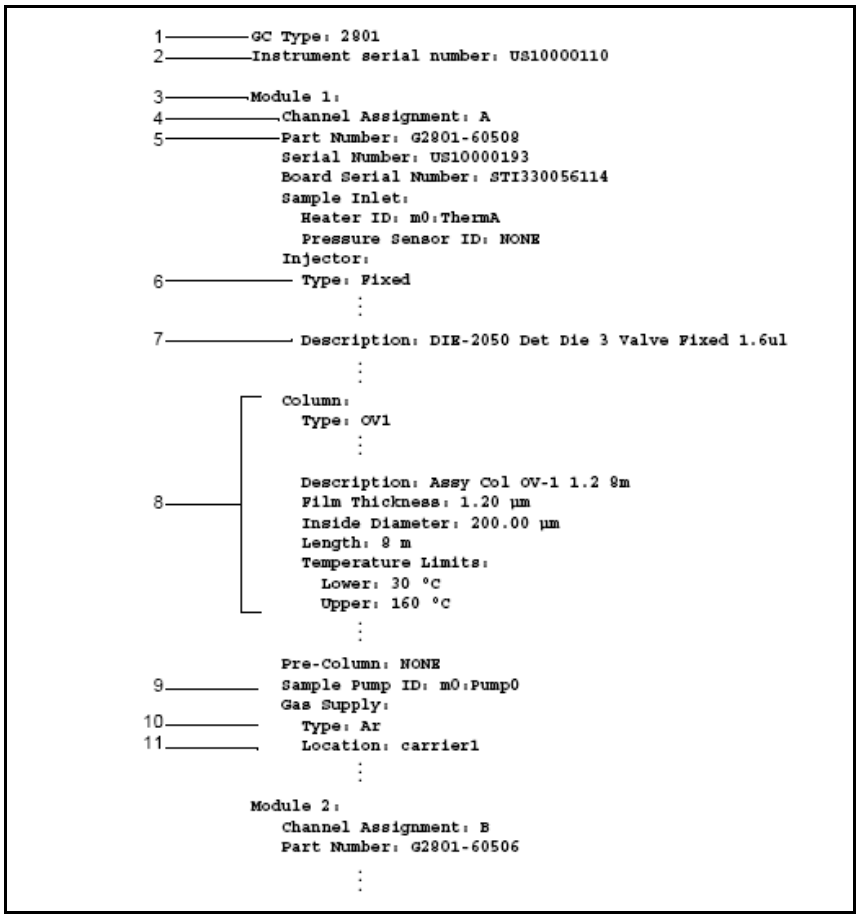


3 The 3000 Micro GC configuration is displayed. See Table 6-1 and Figure 6-5.

Table 6-1 Advanced configuration item numbers and description

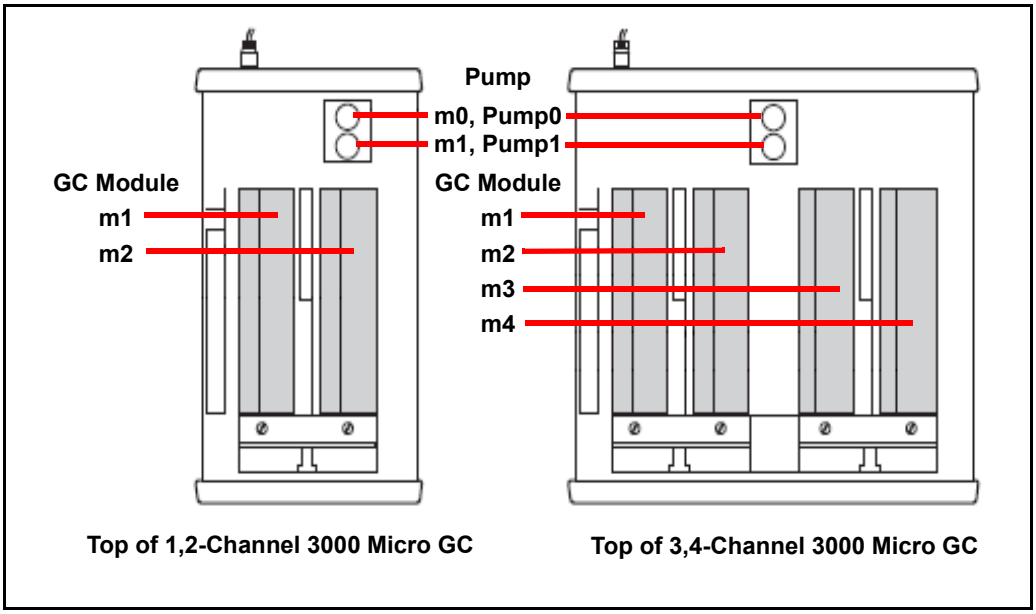
Item #	Description
1	3000 Micro GC Model
2	3000 Micro GC Serial Number
3	GC Module Communication Address
4	Channel Assignment for 3000 Micro GC Module
5	GC Module Part Number
6	Injector Type
7	Injector Description
8	Column Type and Description
9	Sample Pump Used
10	Carrier Gas Type
11	Carrier Gas Input Location

Figure 6-5 Full system and module configuration



Codes for GC modules, sample pumps, and GC module layout are displayed in Figure 6-6.

Figure 6-6 3000 Micro GC full system codes



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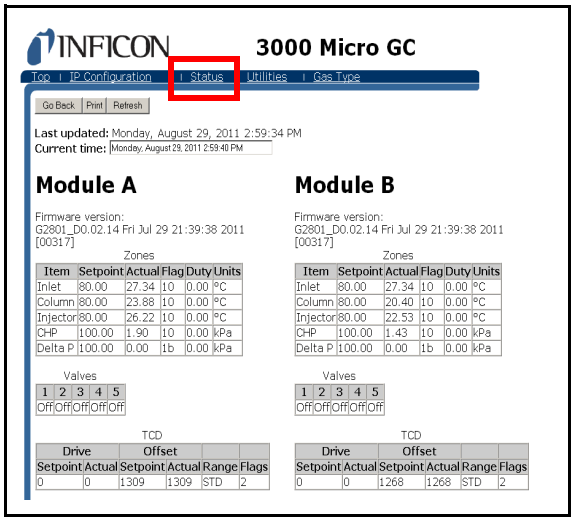
6.2 Status

6.2.1 Check GC Module Parameters

When EZ IQ software is used to download a method, the information is sent to 3000 Micro GC and is displayed in the **Status** tab. Temperatures and pressures for all GC modules will be listed. See Figure 6-7.

NOTE: Temperature and pressure settings cannot be edited in this view. Settings can only be edited within EZ IQ software.

Figure 6-7 GC module status



To check GC module parameters:

1 Open the browser and type in the 3000 Micro GC IP address.

2 Click the **Status** tab.

3 Compare the actual values against their set points. Do the actual values meet their setpoints?

3a YES—If all parameters meet set point values, proceed with section 6.2.2, Check the Duty Cycle, on page 6-7.

3b NO—If the parameter values do not meet their set point, or if there are flags (= 00), reset the 3000 Micro GC by closing the browser and then turning 3000 Micro GC off and on. Recheck the **Status** tab. If the actual values still do not meet their set points, contact INFICON.

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6.2.2 Check the Duty Cycle

1 The duty cycle should be approximately 30 to 40% for column head pressure (CHP) and Delta P (if fixed volume).

2 Is the Duty Cycle between 30 to 40%?

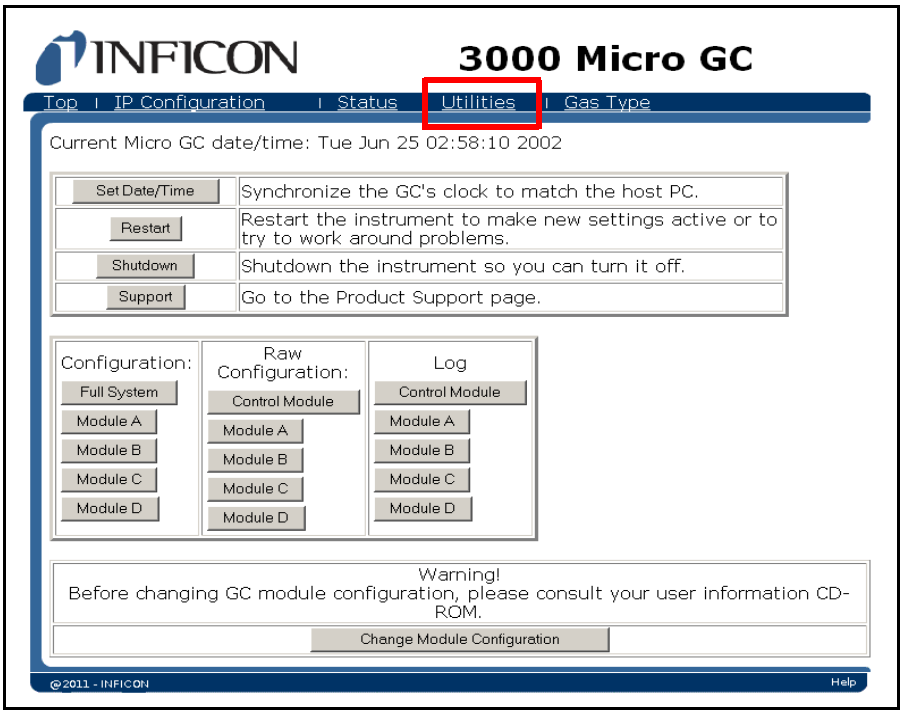
2a YES—Process with analysis.

2b NO—If the duty cycle is > 50%, check the carrier gas inlet pressure. Replace the carrier gas filter (PN 3150-0602). Recheck the Duty cycle. If it is still > 50%, contact INFICON.

6.3 Utilities

The **Utilities** tab is on the 3000 Micro GC embedded web page. See Figure 6-8.

Figure 6-8 Utilities tab



6.3.1 Set Date/Time

In the **Utilities** tab, click **Set Date/Time** to set the correct date and time for the 3000 Micro GC.

6.3.2 Restart

To restart the 3000 Micro GC:

1. On the **Utilities** tab, click **Restart**.
2. A countdown screen will count down three minutes.
3. After three minutes have passed, set the front panel power switch to the off position.
4. Set 3000 Micro GC front panel power switch back to the on position.
5. Wait at least three minutes for the 3000 Micro GC to fully reboot.

6.3.3 Shutdown

On the **Utilities** tab, click **Shutdown** to shut down 3000 Micro GC. A countdown screen will count down three minutes. After three minutes have passed, set the front panel power switch to the off position.

CAUTION

Do not turn off the power without waiting at least three minutes. 3000 Micro GC must update configuration files before power is turned off. If power is turned off too soon, the files could be corrupted, making 3000 Micro GC inoperable.

6.3.4 Support

On the **Utilities** tab, click **Support** to go to the **Product Support** page.

6.3.5 Remove or Replace a GC Module

A standard GC module change can be conducted through the embedded web page in the **Utilities** tab. See section 8.2, Remove and Replace a 3000 Micro GC Module, on page 8-5 for a detailed procedure.

6.3.6 Change GC Module Address

To change the address of a GC module:

1. On the embedded web page, click the **Utilities** tab.
2. Click **Change Module Configuration.**
3. Click **Change** and type the new GC module address.

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6.4 Change Carrier Gas Configuration

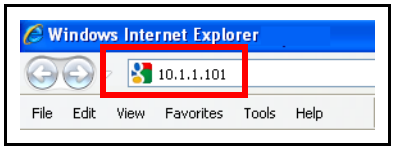
The type of carrier gas used for analysis can be changed through the embedded web page.

NOTE: If a carrier gas type is changed without following this procedure, inverted peaks will appear in the chromatogram.

1. Open the web browser.
2. In the address bar, type the current IP Address of the instrument. Press **Enter**. See Figure 6-9.

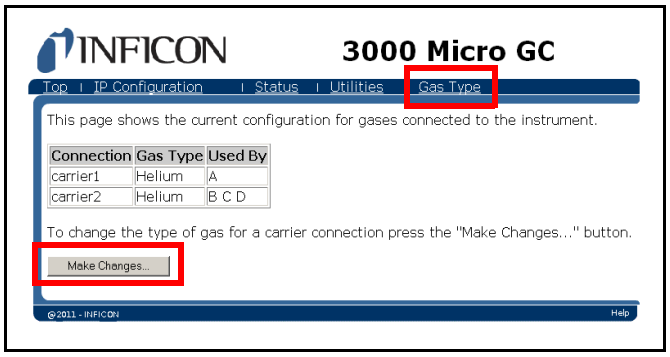
   NOTE: At the factory, the instrument IP address was set to **10.1.1.101**.

   Figure 6-9 Internet Explorer address bar



3. Click the **Gas Type** tab. A window will display that is similar to Figure 6-10. The current gas configuration for installed GC modules is shown.

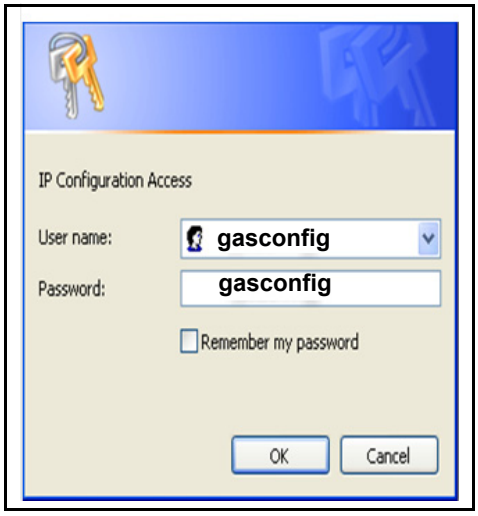
   Figure 6-10 Example gas type tab



4 Click **Make Changes**. See Figure 6-10.

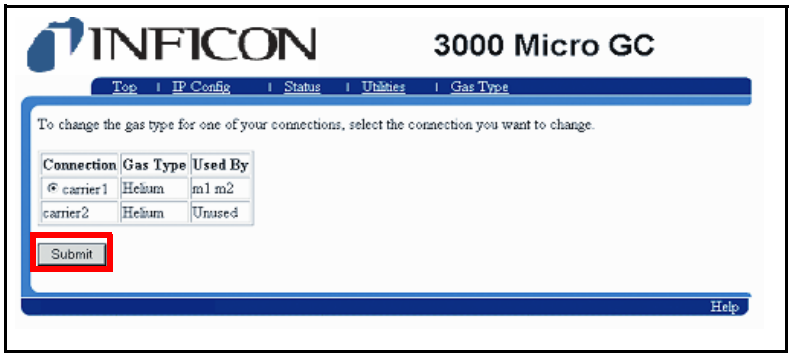
5 When prompted for a user name and password, type **gasconfig** for both. See Figure 6-11.

Figure 6-11 Gas type username and password



6 A window will then appear similar to Figure 6-12.

Figure 6-12 Example gas type selection window



NOTE: Entries **m1** and **m2** represent Channels A and B respectively. Entries **m3** and **m4** represent Channels C and D, if installed.

7 Select the carrier gas connection under **Connection** corresponding to the desired GC module. Click **Submit.**

NOTE: In the example shown in Figure 6-11, **carrier1** is assigned to modules **m1** and **m2**. **Carrier2** is unused.

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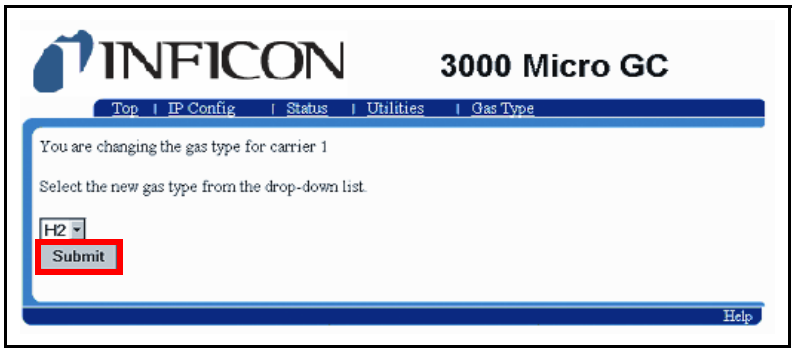
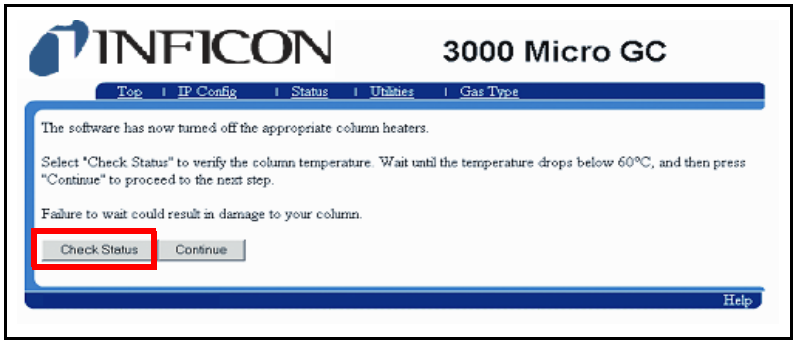
8 Select the new carrier gas type from the drop-down list. See Figure 6-13.

Figure 6-13 Selecting a new carrier gas type



9 Click **Submit**. This turns the column heaters off (to cool the columns and avoid thermal shock) and displays the **Check Status** view. See Figure 6-14.

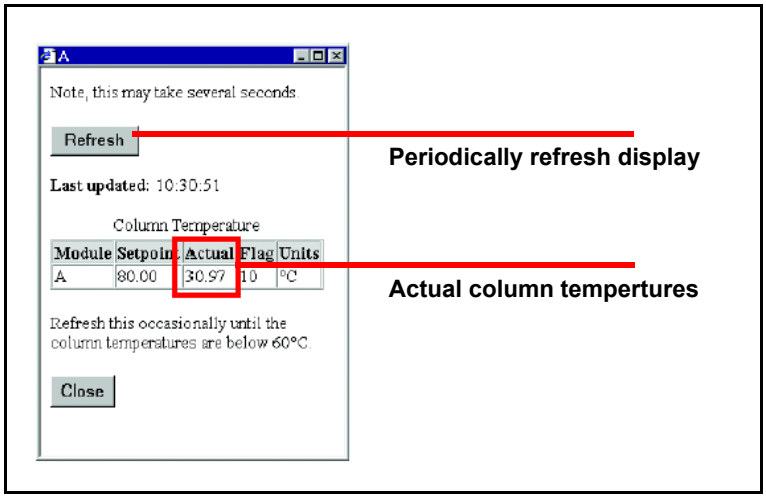
Figure 6-14 Check status view



10 Click **Check Status** to display a window which shows the current column temperature(s). When the column temperatures are below 60°C, **Close** the **Check Status** window. See Figure 6-15.

NOTE: Changes may be canceled up to this point by closing the browser or by using the browser back feature.

Figure 6-15 Example check status window



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11 Click **Continue** from the 3000 Micro GC status view to implement the configuration change.

12 Change the gas supply connections at the 3000 Micro GC back panel, and check for leaks.

13 Click **Restart.** See Figure 6-16. Wait at least three minutes before shutting down the instrument.

CAUTION

Do not turn off the power without waiting at least three minutes. 3000 Micro GC must update configuration files before power is turned off. If power is turned off too soon, the files could be corrupted, making 3000 Micro GC inoperable.

Figure 6-16 Restart screen for gas configuration

14 Turn on 3000 Micro GC and wait three minutes for it to fully boot up.

NOTE: To run samples using the reconfigured gas type, open **EZ IQ Config** and update the 3000 Micro GC configuration in EZ IQ. Refer to the *074-537 EZ IQ Installation Guide* for details.

NOTE: A new EZ IQ method must now be created for the instrument.

NOTE: Changing the gas type turns off the detector filaments. Turn on the filament(s) before use.

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6.5 Change IP Address

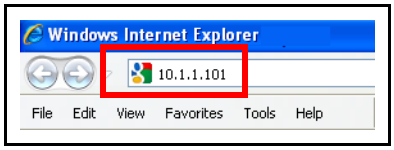
6.5.1 IP Configuration

The 3000 Micro GC IP address can be changed through the embedded web page.

1. Open the web browser.
2. In the address bar, type the current IP Address of the instrument. Press **Enter**. See Figure 6-17.

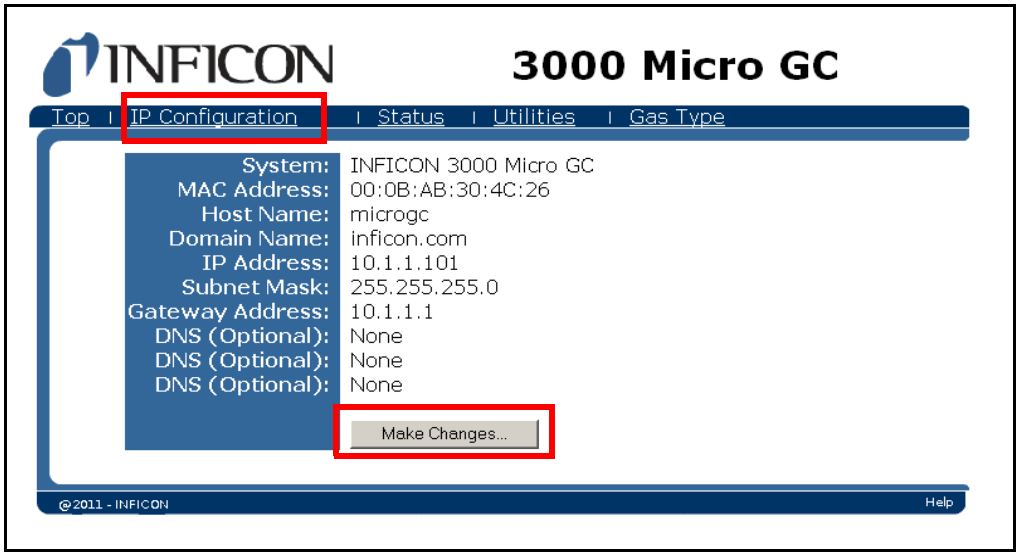
   NOTE: At the factory, the instrument IP address was set to **10.1.1.101**.

Figure 6-17 Internet Explorer address bar



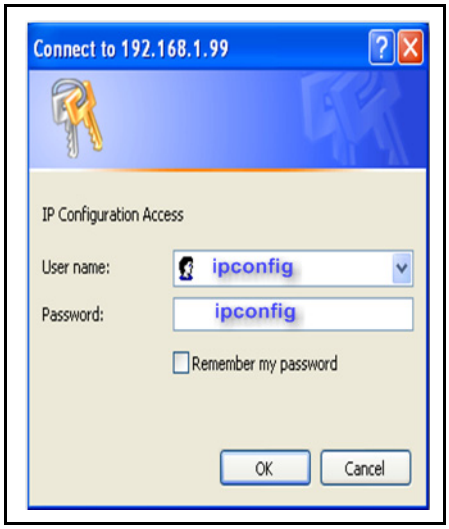
3. The instrument embedded web page will display. Click the **IP Configuration** tab. See Figure 6-18.
4. Click **Make Changes**. See Figure 6-18.

Figure 6-18 IP configuration page



5 When prompted for a user name and password, type **ipconfig** for both. See Figure 6-19.

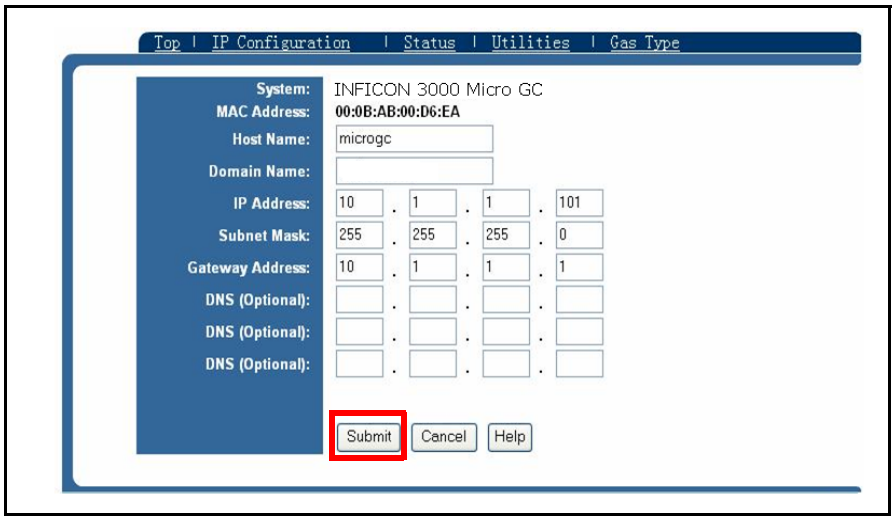
Figure 6-19 IP configuration access



6 Type the desired changes to the **IP Address** and click **Submit.** See Figure 6-20.

NOTE: Consult an IT professional to assist with IP settings.

Figure 6-20 IP configuration changes



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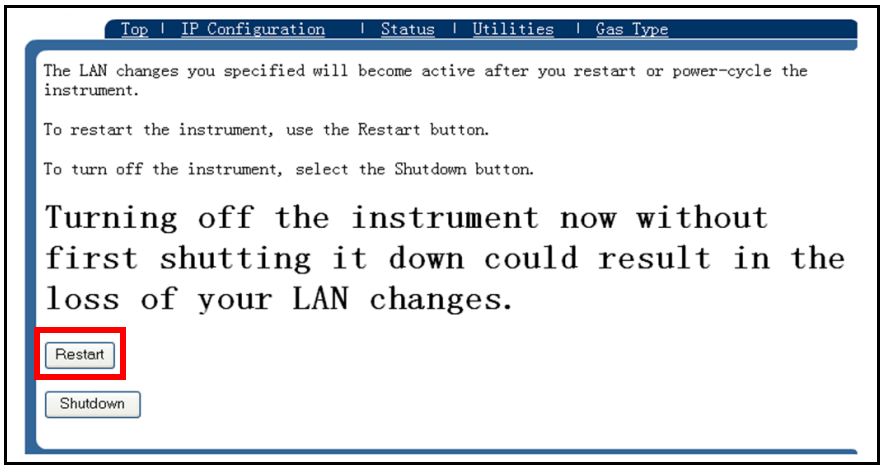
7 A window will prompt to restart 3000 Micro GC. Click **Restart** and wait at least three minutes before shutting down the 3000 Micro GC. See Figure 6-21.

CAUTION

Do not turn off the power without waiting at least three minutes. 3000 Micro GC must update configuration files before power is turned off. If power is turned off too soon, the files could be corrupted, making 3000 Micro GC inoperable.

Figure 6-21 IP configuration - restart



8 Turn off 3000 Micro GC.

9 If needed, reconfigure the computer's IP address for local LAN use.

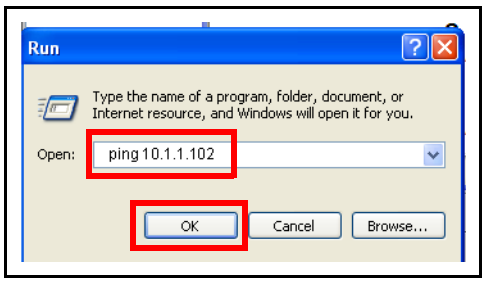
10 If needed, disconnect the crossover cable, and connect the 3000 Micro GC and the computer to the local LAN using standard LAN cables (PN G1530-61495).

11 If needed, reboot the computer.

12 Turn on 3000 Micro GC.

13 Reconnect to 3000 Micro GC using the new IP address. Ping the new IP Address. For example, if the new IP address is 10.1.1.102, click **Start >> Run** and type **ping 10.1.1.102.** Click **OK** to ping the instrument. See Figure 6-22.

Figure 6-22 Ping new IP address



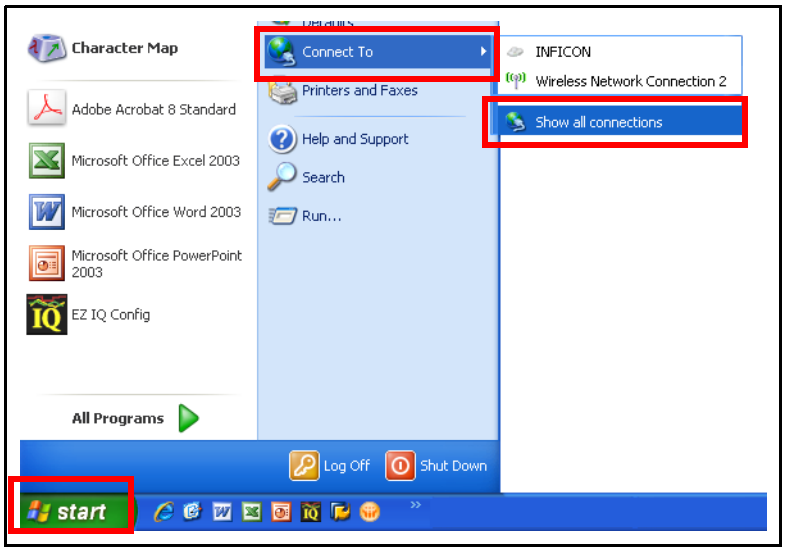
6.5.2 Access the Embedded Web Page Via a Fixed IP Address

If the embedded web page cannot be accessed, and the IP address of the 3000 Micro GC cannot be determined, follow the instructions below to access the web page via a fixed IP address.

1. Connect the 3000 Micro GC to the computer via the crossover cable (PN 5183-4649).
2. Click **Start >> Connect To >> Show All Connections.** See Figure 6-23.

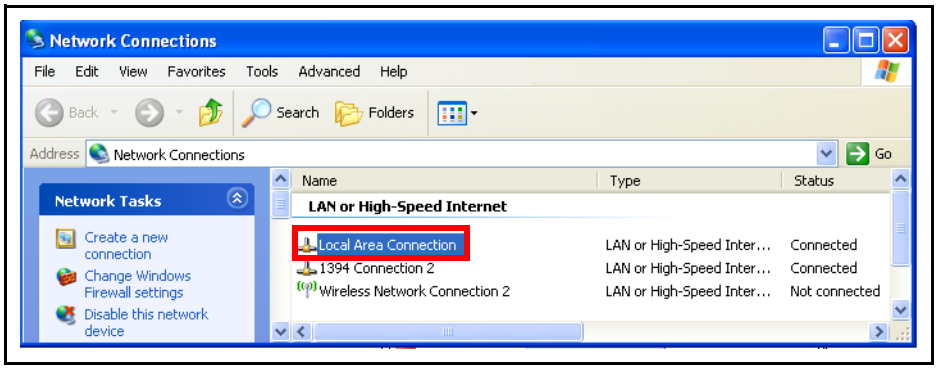
   NOTE: This step may differ slightly if a different Windows version is used.

Figure 6-23 Show all connections



3. Double-click **Local Area Connection**. See Figure 6-24.

Figure 6-24 Local area connection



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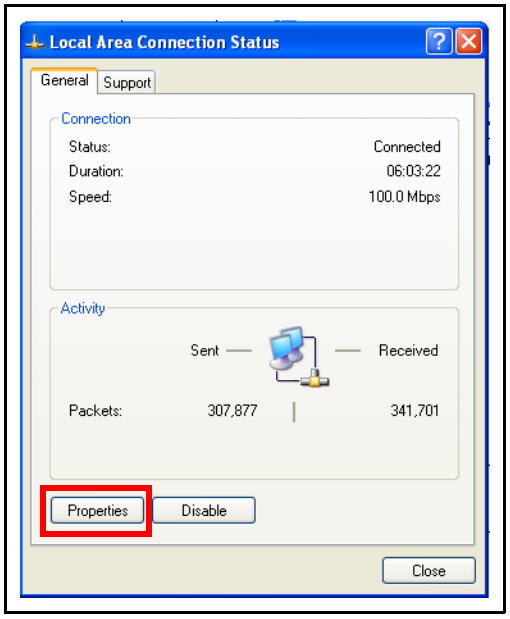
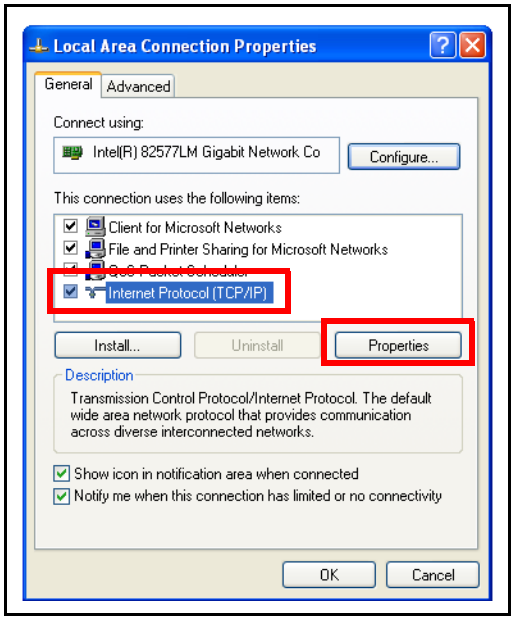
4 On the **Local Area Connection Status** window, click **Properties**. See Figure 6-25.

Figure 6-25 Local area connection status window



5 On the **Local Area Connection Properties** window, select **Internet Protocol (TCP/IP)** from the list, then click **Properties.** See Figure 6-26.

Figure 6-26 Local area connection properties dialog box



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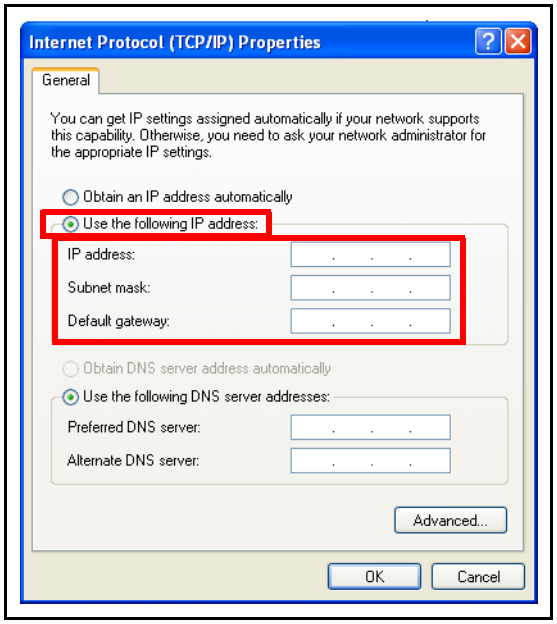
6 In the **Internet Protocol (TCP/IP) Properties** window, click **Use the following IP address**. See Figure 6-27.

Figure 6-27 Internet protocol (TCP/IP) properties window



7 Type the **IP address** and **Subnet mask** as follows:

IP address: 192.168.1.100

Subnet mask: 255.255.255.0

Default gateway*:

* Do not type anything here. Gateway and DNS server entries are not used for direct connection.

8 Click **OK** to exit the **Internet Protocol (TCP/IP) Properties** window.

9 Click **OK** to exit the **Local Area Connection Properties** window.

10 Click **Close** to exit the **Local Area Connection Status** window.

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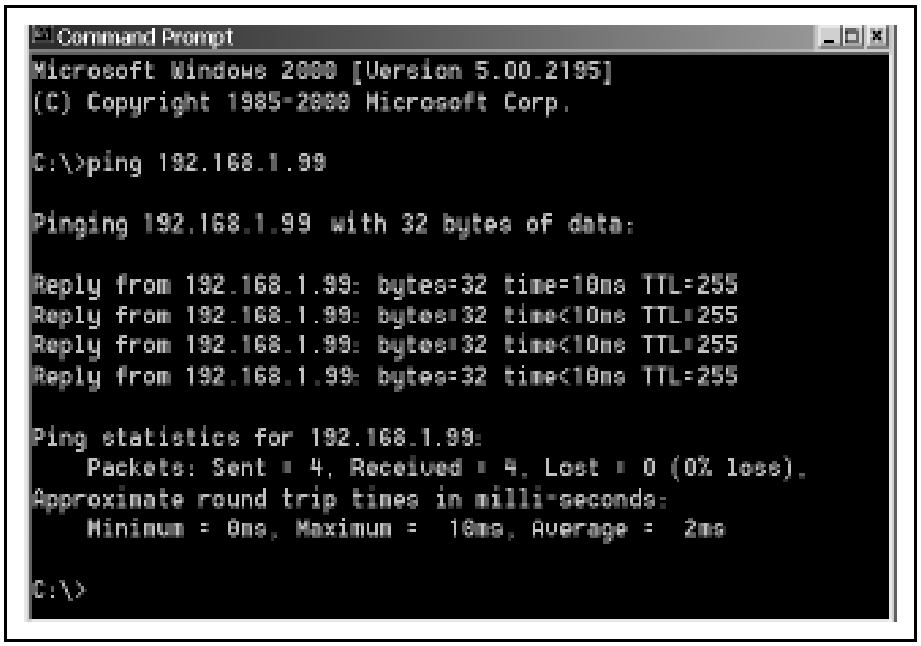
11 Click **Start >> Run**.

12 Type **ping 192.168.1.99**.

This will open the **Command Prompt** window. The instrument should populate the window as shown in Figure 6-28.

Figure 6-28 Fixed IP address ping



13 Type **192.168.1.99** into the web browser address bar. Press **Enter**. The instrument embedded web page home page will display.

14 Click **IP Configuration**.

15 Review the **IP Address**.

NOTE: If connection cannot be established, verify all LAN connections and IP addresses. If there is still no communication, contact INFICON.

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Chapter 7
Basic EZ IQ Operation

7.1 Introduction

EZ IQ is powerful chromatography software running under the Microsoft Windows operating system with an easy to use graphical user interface. EZ IQ supports three languages: English, Chinese, and Japanese. This chapter describes the basic functions of EZ IQ. For more detailed information, refer to the *074-538 EZ IQ Operating Manual*.

The procedure and screen captures in this chapter are representative of operation using the 3000 Micro GC Enhanced Driver. For operation using the 3000 Micro GC Classic Driver, refer to the *074-538-P1(A) EZ IQ Operating Manual*.

7.2 Connecting EZ IQ with 3000 Micro GC

Before connecting EZ IQ with 3000 Micro GC, ensure:

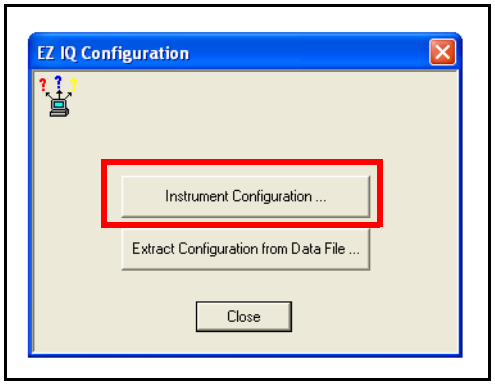
- EZ IQ installation is completed successfully on a designated computer
- 3000 Micro GC is powered up
- The EZ IQ computer and 3000 Micro GC are physically connected via Ethernet, either through direct connection by crossover cable or through a LAN network

  NOTE: If the EZ IQ computer and 3000 Micro GC are connected via LAN network, they should either be configured in the same IP subnet, or properly routed through a corporate IP router.

To connect EZ IQ with 3000 Micro GC:

1. Click **Start >> All Programs >> Chromatography >> EZ IQ Config**.
2. The **EZ IQ Configuration** window will display. Click **Instrument Configuration...**. See Figure 7-1.

Figure 7-1 EZ IQ configuration window



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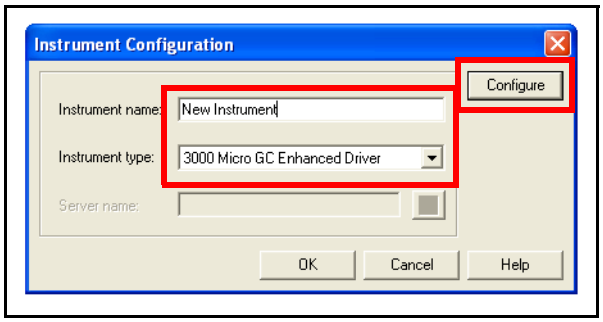
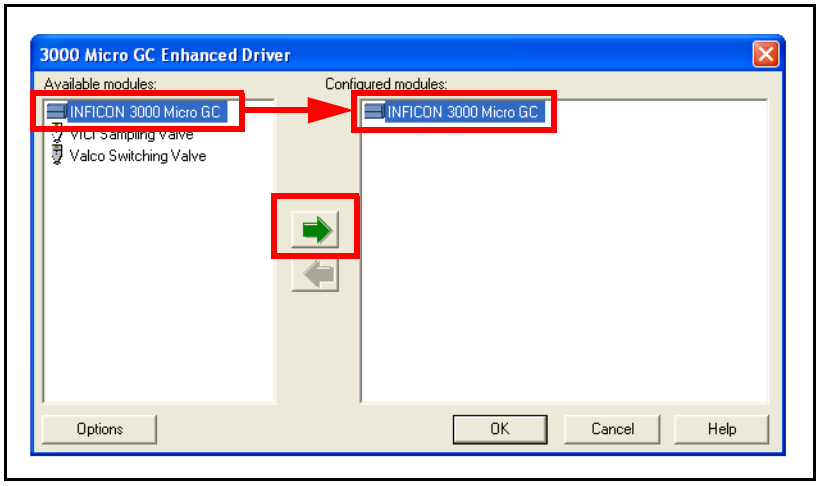
3 On the **Instrument Configuration** window, type the desired **Instrument Name**, select **Instrument type: 3000 Micro GC Enhanced Driver**, and click **Configure**. See Figure 7-2.

Figure 7-2 Instrument configuration window



4 The **3000 Micro GC Enhanced Driver** window will display. Click the **INFICON 3000 Micro GC** icon. Click the ➔ arrow to move the **INFICON 3000 Micro GC** icon from **Available modules** to **Configured modules**. See Figure 7-3.

Figure 7-3 3000 Micro GC enhanced driver window



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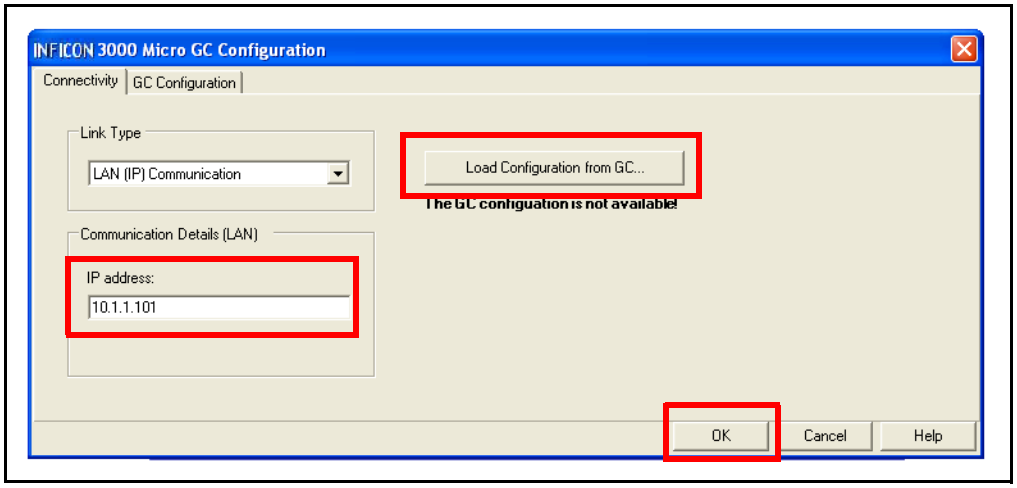
5 Double-click the **INFICON 3000 Micro GC** icon in the **Configured modules** pane to open the **INFICON 3000 Micro GC Configuration** window. See Figure 7-4.

6 On the **INFICON 3000 Micro GC Configuration** window, click the **Connectivity** tab. Type the 3000 Micro GC **IP address**. Click **Load Configuration from GC…**. Once the 3000 Micro GC configuration has been properly loaded into EZ IQ, a **Configuration loaded successfully from GC device** message will be displayed.

Figure 7-4 3000 Micro GC configuration window



7 Click **OK** to exit the **INFICON 3000 Micro GC Configuration** window.

8 Click **OK** to exit the **INFICON 3000 Micro GC Enhanced Driver** window.

9 Click **OK** to exit the **Instrument Configuration** window.

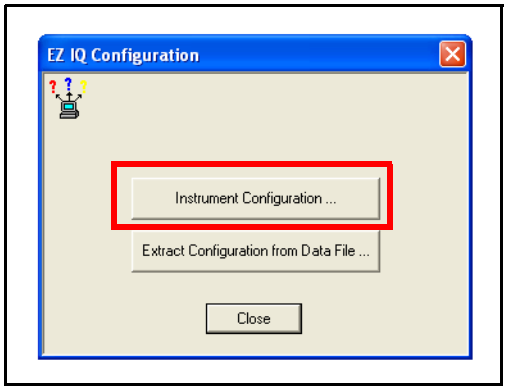
10 Click **Close** to exit the **EZ IQ Configuration** window.

7.3 Configuring EZ IQ to Use a Valco (VICI) Valve

To configure an EZ IQ data system to use a Valco (VICI) valve:

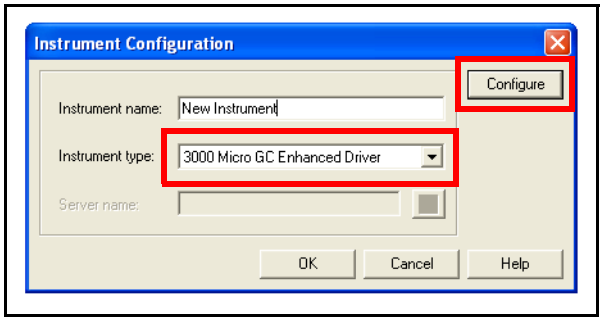
1. Click **Start >> All Programs >> Chromatography >> EZ IQ Config**.
2. The **EZ IQ Configuration** window will display. Click **Instrument Configuration...**.See Figure 7-5.

Figure 7-5 EZ IQ configuration window



3. On the **Instrument Configuration** window, type the desired **Instrument name:**, select **Instrument type: 3000 Micro GC Enhanced Driver**, and click **Configure**. See Figure 7-6.

Figure 7-6 Instrument configuration window



For a Valco (VICI) Switching Valve, follow instructions in Configuring a Valco (VICI) Switching Valve, see section 7.3.1 on page 7-5.

For a Valco (VICI) Sampling Valve, follow instructions in Configuring a Valco (VICI) Sampling Valve, see section 7.3.2 on page 7-7.

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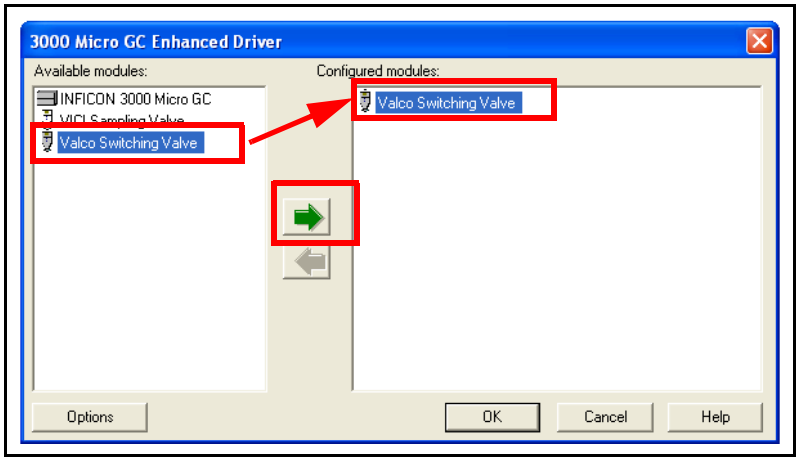
7.3.1 Configuring a Valco (VICI) Switching Valve

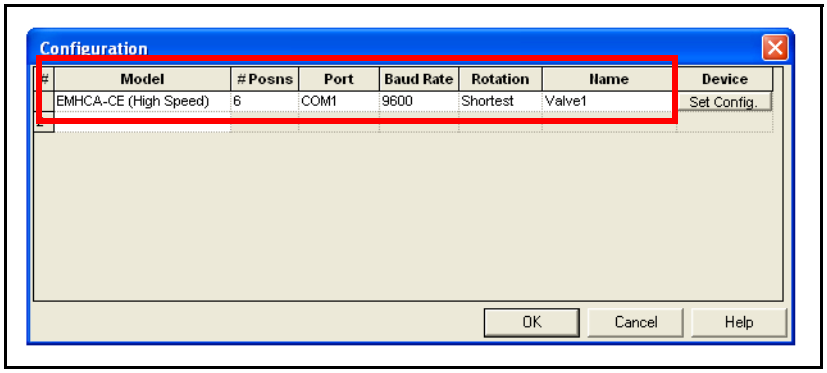
1. The **3000 Micro GC Enhanced Driver** window will display. Click the **Valco Switching Valve** icon. Click the ➔ arrow to move the **Valco Switching Valve** icon from **Available modules** to **Configured modules**. See Figure 7-7.
2. Double click on **Valco Switching Valve** under **Configured Modules**. See Figure 7-7.

Figure 7-7 3000 Micro GC enhanced driver window - Valco switching valve



3. The **Configuration** window will appear. See Figure 7-8.

Figure 7-8 Valco (VICI) switching valve configuration window



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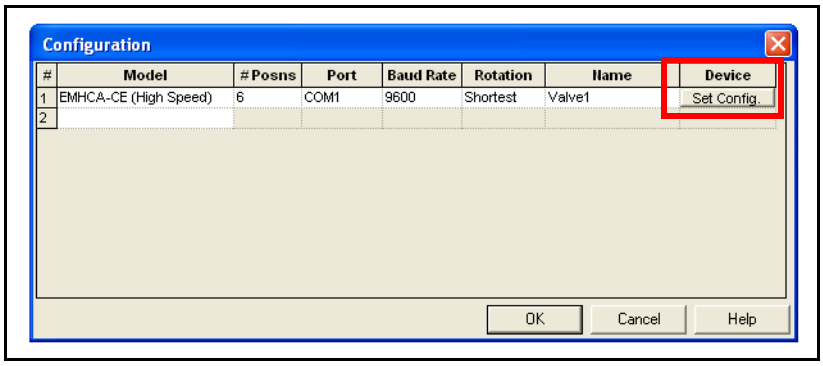
4 Select the desired parameters. See Table 7-1 for a list of parameters.

Table 7-1 Parameters

Name	Description
Model	Identifies the name of the valve model. Other configuration items will be unavailable until the **Model** is selected.
# Posns	Number of ports for the valve, from the drop-down list.
Port	Communications **Port** for the valve, from the drop-down list.
Baud Rate	**Baud Rate**, or symbols per second, for communicating with the valve. Consult valve documentation.
Rotation	Specifies what direction the valve will rotate when it changes positions.
Name	Identifies the user-supplied name for the valve.

5 Click **Set Config** to set the configuration of the valve. See Figure 7-9.

Figure 7-9 Configuration window - set config



6 The **VICIValve** window will display to confirm configuration completion. Click **OK**. See Figure 7-10.

Figure 7-10 VICIValve window - set config done

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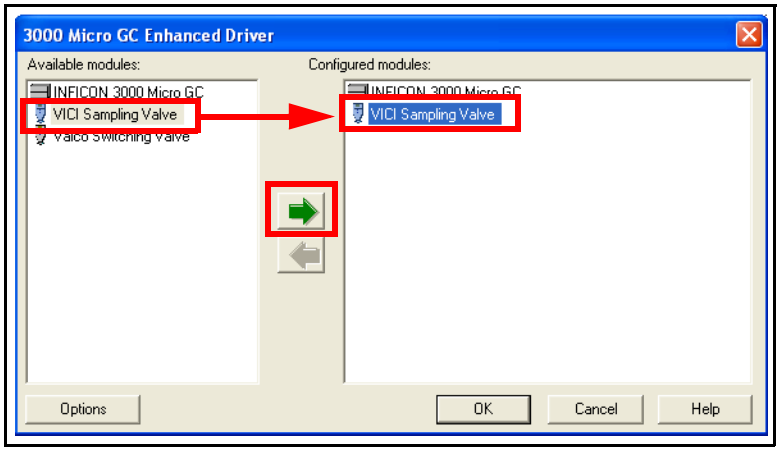
7.3.2 Configuring a Valco (VICI) Sampling Valve

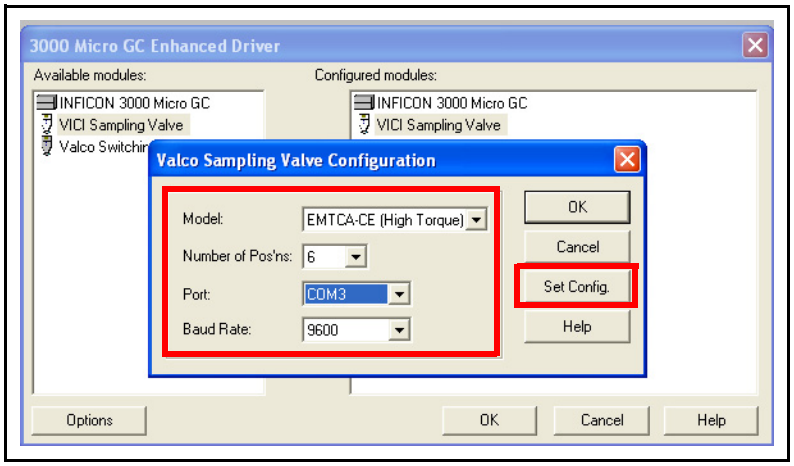
1. The **3000 Micro GC Enhanced Driver** window will display. Click the **VICI Sampling Valve** icon. Click the ➔ arrow to move the **VICI Sampling Valve** icon from **Available modules** to **Configured modules**. See Figure 7-11.
2. Double click **VICI Sampling Valve** under **Configured Modules**. See Figure 7-11.

Figure 7-11 3000 Micro GC enhanced driver window - VICI sampling valve



3. The **Valco Sampling Valve Configuration** window will appear. See Figure 7-12.

Figure 7-12 Valco (VICI) sampling valve configuration window



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4 Select the desired parameters. See Table 7-2 for a list of parameters.

Table 7-2 Valco (VICI) sampling valve configuration parameters list

Name	Description
Model	Identifies the name of the valve model. Other configuration items will be unavailable until the **Model** is selected.
Number of Pos'ns	Corresponds to the number of ports for the valve from the drop-down list.
Port	Corresponds to the communications **Port** for the valve from the drop-down list.
Baud Rate	Corresponds to the **Baud Rate**, or symbols per second, for communicating with the valve. Consult the valve documentation.

5 Click **Set Config** to set the configuration of the valve. See Figure 7-12.

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7.4 Navigating EZ IQ

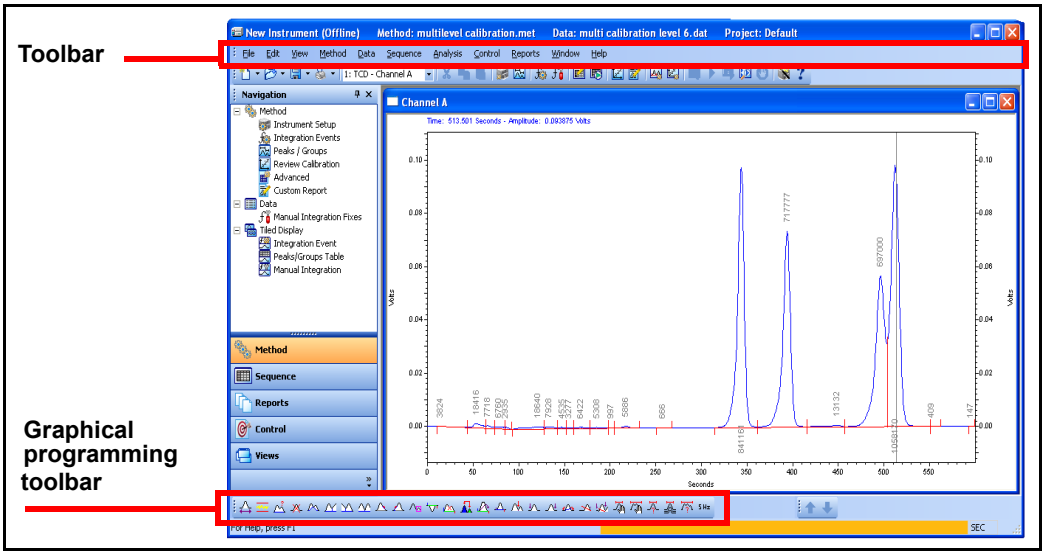
When EZ IQ is opened, the **Instrument Window** will display. From this window, all instrumental functions are available, including:

- Method development
- Integration
- Calibration
- Instrument control and data acquisition
- Analysis and review of data
- Reporting

EZ IQ contains toolbars which provide access to both basic and advanced features. The EZ IQ toolbar gives access to every task from the drop-down menus. See Figure 7-13.

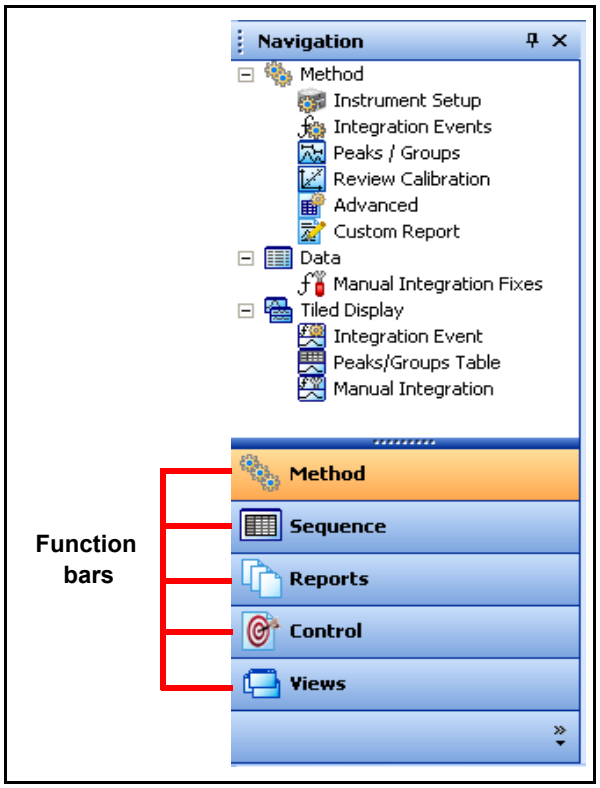
A graphical programming toolbar is located in the bottom left corner of the screen to provide access to more advanced graphical and integration options. See Figure 7-13.

Figure 7-13 EZ IQ instrument window



By default, a **Navigation** pane is displayed at the left side of the instrument window. This view enables the user to quickly switch between the major functions of the instrument window. A function can be accessed by clicking on one of the function bars located at the bottom of the **Navigation** pane. See Figure 7-14.

Figure 7-14 EZ IQ navigation pane



For information on **Navigation** pane options, see the *074-538 EZ IQ Operating Manual*.

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7.5 EZ IQ Workflow

The following steps outline the workflow for EZ IQ.

1. Basic Method Development and Creating a New Method. See section 7.6 on page 7-12.
2. Run a Sample. See section 7.7 on page 7-19.
3. Basic Sequencing. See section 7.8 on page 7-20.
4. Scheduling Runs. See section 7.9 on page 7-20.
5. Integrating the Chromatogram. See section 7.10 on page 7-21.
   - Add or Edit Integration Events. See section 7.10.3 on page 7-23.
6. Qualify Peaks. See section 7.11 on page 7-26.
7. Calibration. See section 7.12 on page 7-36.
   - Perform a Single Level Calibration. See section 7.12.3 on page 7-37.
   - Perform a Multiple Level Calibration. See section 7.12.4 on page 7-40.
   - Review Calibration. See section 7.12.5 on page 7-41.
8. Generate Standard Reports. See section 7.13 on page 7-42.

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7.6 Basic Method Development

A method is used whenever a data file is acquired and/or reprocessed. It contains instructions for:

- Data acquisition (run time, sampling rate, etc.)
- Integration
- Calibration
- Peak information
- Reports
- Optional functions such as data export and user programs

Each method is capable of acquiring multiple independent channels of data.

Each channel has its own complete independent parameters, including:

- Sampling rate
- Temperatures and Pressures
- Run time
- Integration events
- Calibration levels

Although the method file is a separate file, the information contained in the method is saved in the raw data file at time of acquisition. This way, the original method can be reproduced, even if the method file was subsequently modified.

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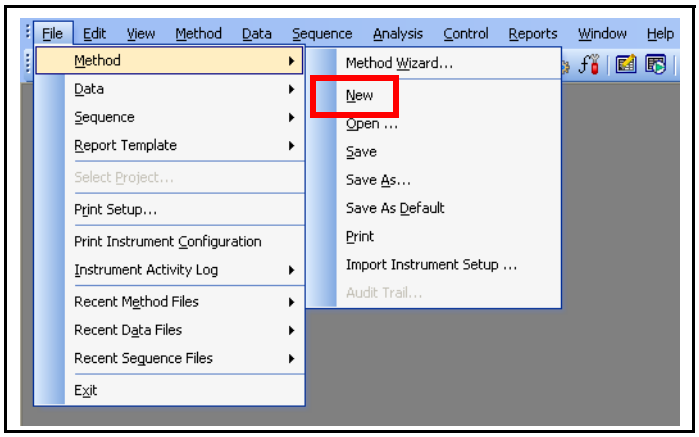
7.6.1 Creating a New Method

To create a new method:

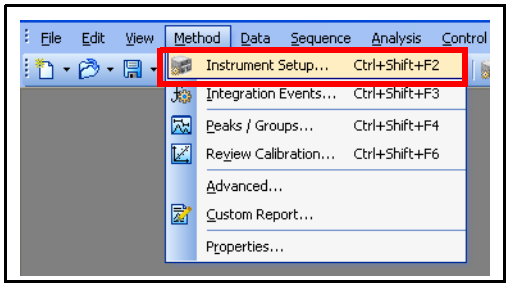
1. Open **EZ IQ**
2. Click **File >> Method >> New**.

Figure 7-15 Create a new method



3. To edit method parameters, click **Method >> Instrument Setup.** See Figure 7-16.

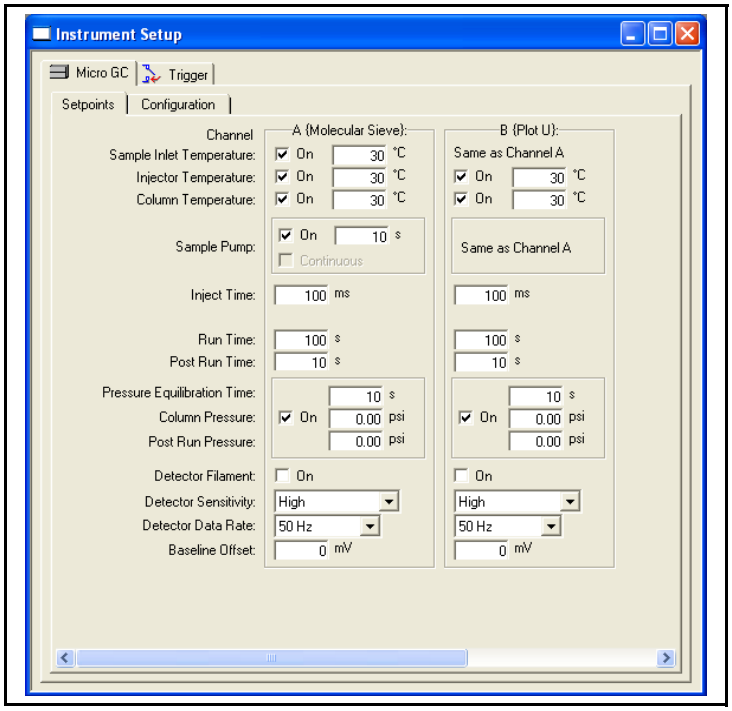
Figure 7-16 Instrument setup



4 The **Instrument Setup** window will display parameters that can be changed. See Figure 7-17.

NOTE: The **Instrument Setup** window is configuration dependent.

Figure 7-17 Instrument setup window



5 Enter sample acquisition parameters as desired, such as **Injector Temperature**, **Column Temperature**, **Sample Pump** time, **Column Pressure**, etc. Ensure that the **Run Time** is long enough for the last expected peak to elute. If the elution time is unknown, conduct a run and verify the presence of the last expected peak. If necessary, increase the **Run Time**.

The default **Inject Time** should be set between:

- 0-50 ms for a fixed volume injector
- 0-100 ms for a variable volume injector
- 0-400 ms for a variable large volume injector (LVI)
- 0-250 ms for a backflush injector

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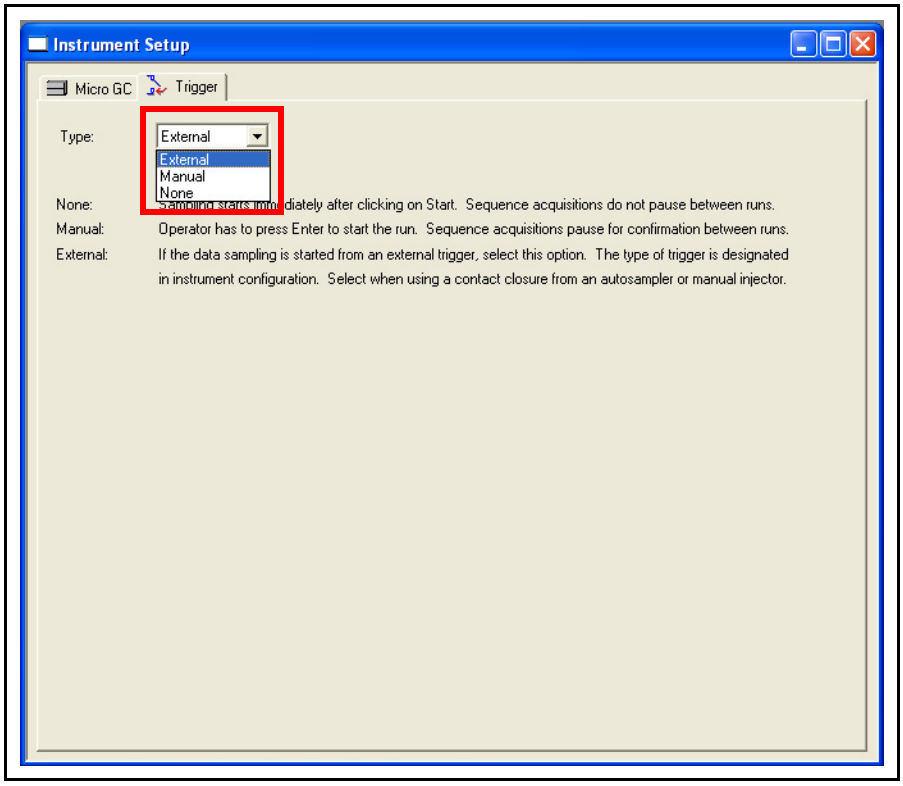
6 Click the **Trigger** tab and select the trigger **Type** for the type of remote start installed in 3000 Micro GC. If there are no triggers on the system, select **None**. See Figure 7-18. For instructions on how to use a trigger within EZ IQ, refer to section 7.14, EZ IQ Operation to Activate Remote Start/Cancel Function, on page 7-49.

Figure 7-18 Instrument setup window - trigger tab



7 To save the method, click **File >> Method >> Save** or **Save As**.

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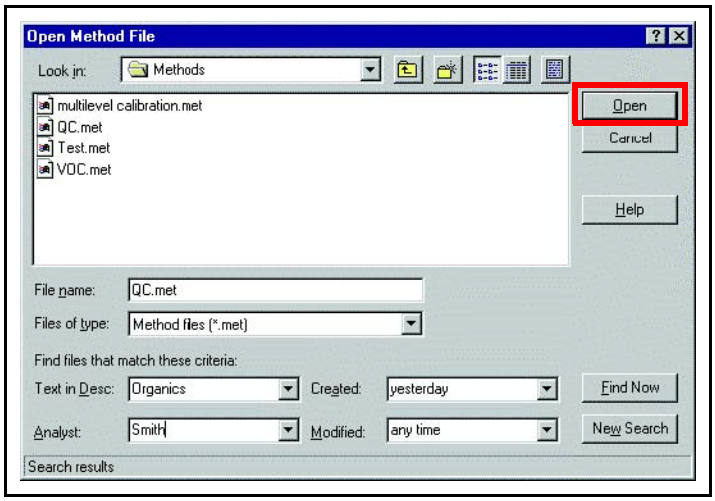
7.6.2 Opening a Method

To open a method,

1. Click **File >> Method >> Open**.
2. The **Open Method File** window displays to allow selection of the method file. Select a method file, then click **Open**. See Figure 7-19.

Figure 7-19 Open method files window



The criteria used to search for specific method and sequence files include selection of specific text found in the file description (**Text in Desc.**), **Analyst** name, and date **Created** or last **Modified**.

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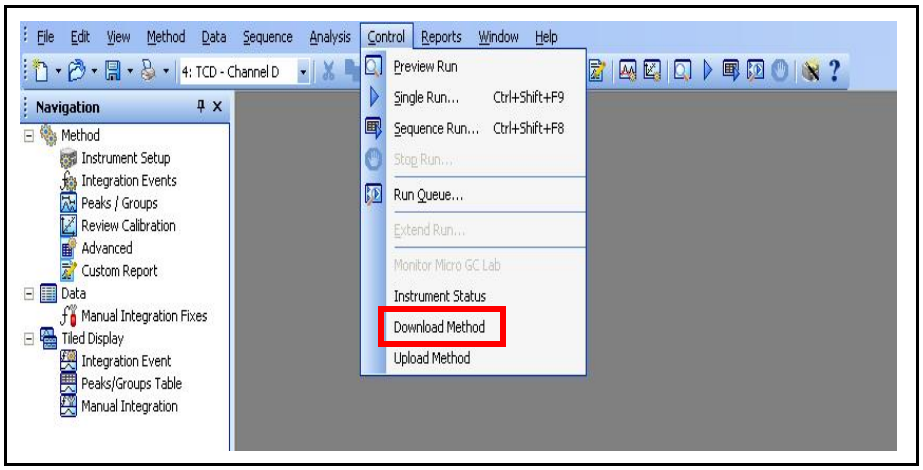
7.6.3 Downloading a Method

When a new method is created, or when a method is changed or opened, it must be downloaded to 3000 Micro GC.

1 Click **Control >> Download Method**. See Figure 7-20.

Figure 7-20 Downloading a method



2 3000 Micro GC status can now be viewed. See section 7.6.4, View Instrument Status, on page 7-18.

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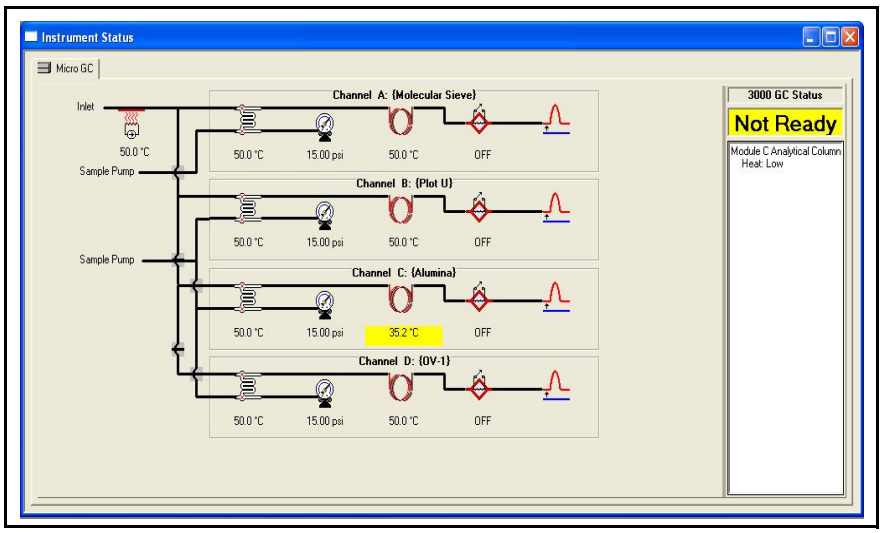
7.6.4 View Instrument Status

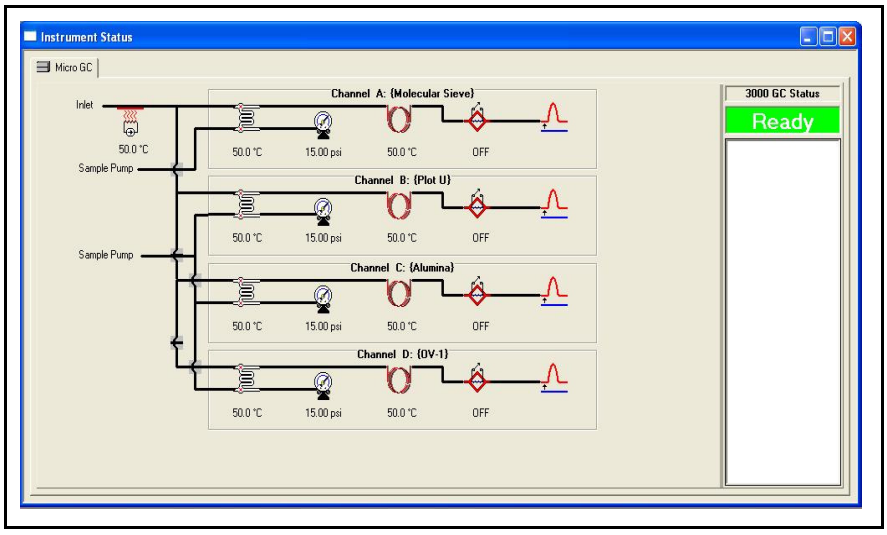
Click **Control >> Instrument Status** to view 3000 Micro GC status. See Figure 7-21.

Figure 7-21 Instrument status window - not ready



NOTE: The status will read **Not Ready** (highlighted in yellow) if parameters have not reached their set points. Parameters that are changing are highlighted in yellow. A run cannot be started unless the status reads **Ready** (highlighted in green). See Figure 7-22.

Figure 7-22 Instrument status window - ready



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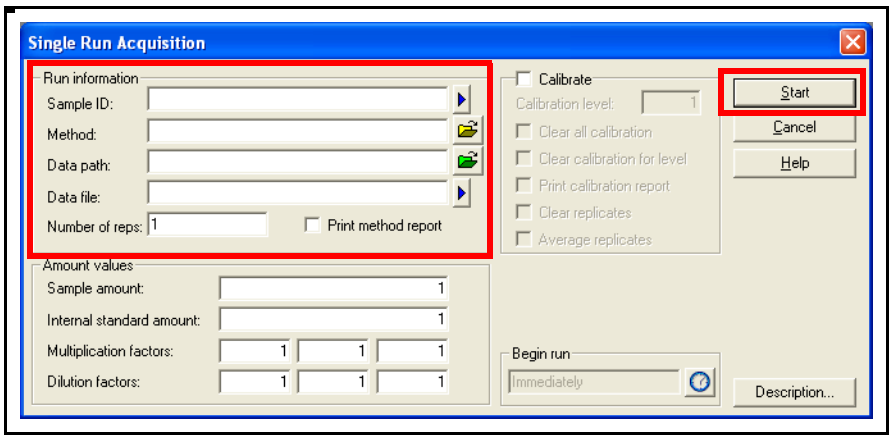
7.7 Run a Sample

Once a method has been downloaded to 3000 Micro GC, a data acquisition run can be performed.

1 To start the run, click **Control >> Single Run**. The **Single Run Acquisition** window will be displayed. See Figure 7-23.

Figure 7-23 Single run acquisition window



2 Type a **Sample ID** in the first box. See Figure 7-23.

3 The method will default to the method that is open at the time. To change the method, click the folder icon located on the right of the **Method** field. Refer to Figure 7-23.

4 Select a path for storage of data files by clicking the folder icon located on the right of the **Data path** field. See Figure 7-23.

5 The **Data file** box is used to create the filename. To automatically include certain descriptors such as **Sample ID**, **Method Name**, and **Date and Time**, click the blue arrow located to the right of the **Data file** field. Select the desired descriptors. See Figure 7-23.

6 Type the **Number of reps**. See Figure 7-23.

7 Click **Start** to begin the run. Data will be displayed in the chromatogram window. See Figure 7-23.

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7.8 Basic Sequencing

A simple way to sequence data runs is to change the **Number of reps** in the **Single Run Acquisition** window. Refer to Figure 7-23.

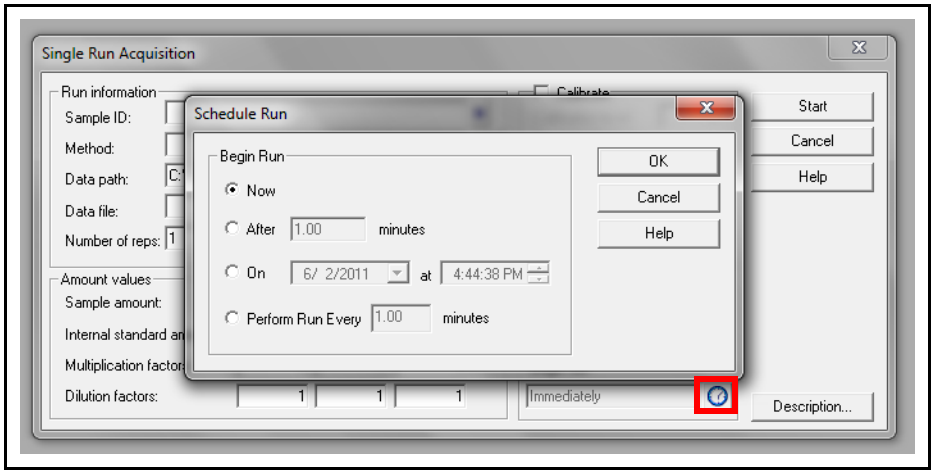
For more details on programming sequences in EZ IQ, refer to the corresponding chapter in the *074-538 EZ IQ Operation Manual*.

7.9 Scheduling Runs

Runs can be scheduled for a certain date or after a certain time interval.

1 Click the clock icon located on the bottom right corner of the **Single Run Acquisition** window. The **Schedule Run** window will display with scheduling options. See Figure 7-24.

Figure 7-24 Schedule run window



2 Select one of the options and edit the fields to enter the desired time information.

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7.10 Integrating the Chromatogram

EZ IQ provides integration of peaks for analysis of simple chromatograms. After a run is completed, the peaks will automatically be integrated. However, certain chromatography may require more elaborate treatment of the data, or special integration of specific peaks. Integration events are normally entered in the **Integration Events** window located under **Method >> Integration Events**, or by clicking **Integration Events** on the **Navigation pane**. This section describes how to optimize a method for proper integration of data files.

7.10.1 About Integration Events

Integration events are used to customize the integration of certain peaks or regions of the chromatogram.

When adding an integration event to the **Integration Events** table, the integration changes will be used on all subsequent samples analyzed using this method. *Save the method after making changes.*

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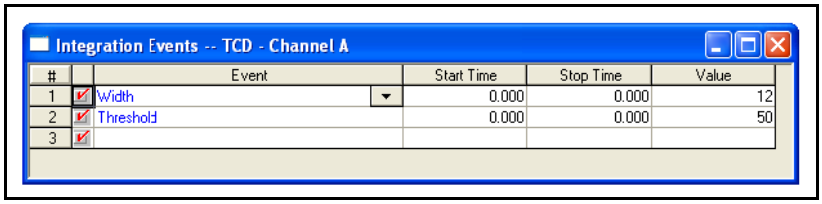
7.10.2 Common Integration Events

Frequently used event parameters are explained below. See the *074-538 EZ IQ Operating Manual* for more detailed information.

Figure 7-25 Integration events window



7.10.2.1 Width

The **Width** event is used to calculate a value for bunching, or smoothing, the data points before the integration algorithm is applied. Integration works best when there are 20 points across a peak. If a peak is over sampled (i.e., the sampling frequency was too high), the **Width** event will be used to average the data such that the integration algorithm sees only 20 points across the peak. In setting a **Width** value graphically, the narrowest peak in the chromatogram should be used.

A **Width** event will be applied to a given peak as long as it occurs before or on the apex of the peak.

The **Width** event is only used to correct for over-sampling. It cannot correct for data that was under-sampled (i.e., sampling frequency too low causing fewer than 20 points acquired across the narrowest peak).

NOTE: In most circumstances, an initial **Width** value based on the narrowest peak in the chromatogram will be adequate for proper integration of all peaks. However, a new **Width** timed event should be entered every time a peak width doubles.

The **Value** corresponds to the width in seconds or minutes of a peak. See Figure 7-25.

7.10.2.2 Threshold

This event is the first derivative, used to allow the integration algorithm to distinguish the start and stop of peaks from baseline noise and drift. When setting the **Threshold** value graphically, a section of baseline must be selected. The recommended **Threshold** value is based on the highest first derivative value determined in that section of the chromatogram.

The **Value** corresponds to the area, in microvolts, that the software will detect.

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7.10.2.3 Integration Off

The **Integration Off** event turns off the integration of the chromatogram from the **Start Time** to the **Stop Time**. This event is useful if there are regions of the chromatogram that are not of interest.

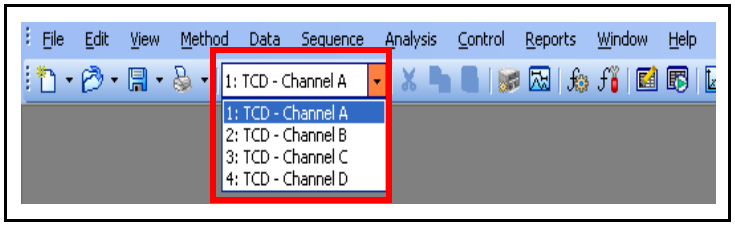
7.10.3 Add or Edit Integration Events

There are two ways to add or edit an integration timed event to a method. One way is to add or edit the integration events manually. The other is to use graphical programming options.

7.10.3.1 Manually Add or Edit Integration Events

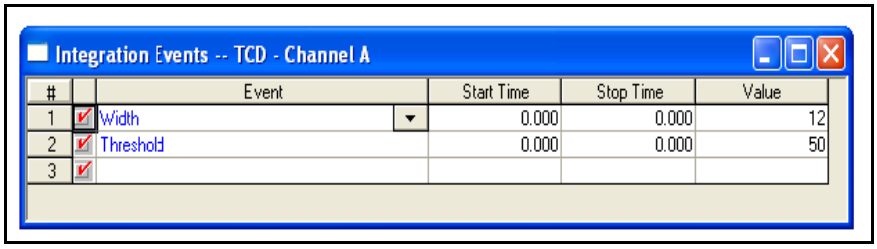
1. Select a channel to add or edit integration events. To change the channel, select the appropriate channel from the drop-down list on the toolbar. See Figure 7-26.

Figure 7-26 Changing channels



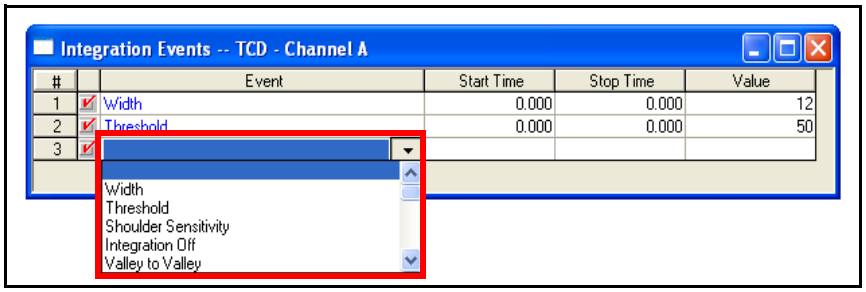
2. Click **Method >> Integration Events**. The **Integration Events** window will display the default integration events. See Figure 7-27.

Figure 7-27 Integration events window - default integration events



3. To add a new event, click on a blank field under **Event** in the table. Select the desired integration event from the drop-down menu. See Figure 7-28.

Figure 7-28 Adding integration events



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4 Set the integration **Start Time**, **Stop Time**, and **Value** as desired.

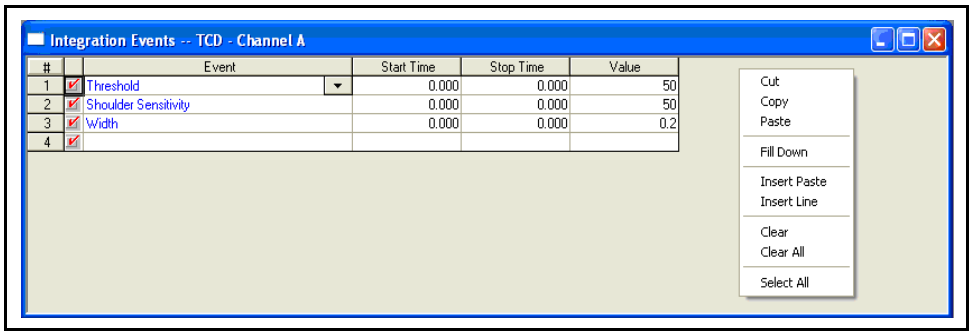
5 To save the method, click **File >> Method >> Save**.

NOTE: To disable an event parameter for a particular analysis, yet keep the event in the table, select the check box next to the event. Only events with a red check mark will be used in subsequent analyses.

To remove an event entirely from the table, click on the row number of the event, and press <**Delete>**.

Right-click anywhere in the table to produce a menu of commands for manipulating cells and rows in the table. See Figure 7-29.

Figure 7-29 Editing integration events options



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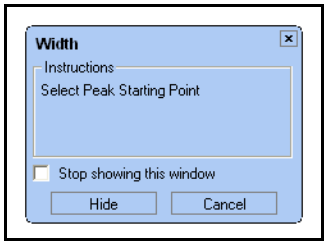
7.10.3.2 Graphically Programming Integration Events

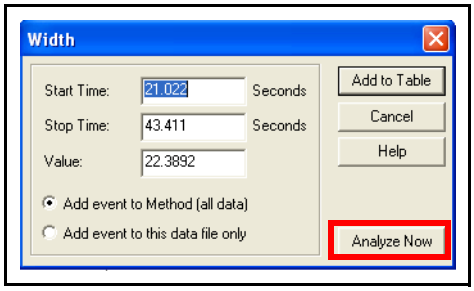
1. Right-click on the chromatogram and select the desired integration event under **Graphical Programming**.
2. A blue window will display (see Figure 7-30). Using the pointer, select a position for the **Start Time** and the **Stop Time** on the chromatogram for the specific event.

Figure 7-30 Blue window for graphical programming



3. Once **Start Time** and **Stop Time** are selected, a window will display with the times (see Figure 7-31). Verify the **Start Time**, **Stop Time**, and **Value**. Click **Analyze Now** to close the window.

Figure 7-31 Example window for graphical programming



All events added through **Graphical Programming** will be added to the method **Integration Events** table by default. There is an option to **Add event to this data file only**. Refer to Figure 7-31.

4. To save the method, click **File >> Method >> Save**.

7.11 Qualify Peaks

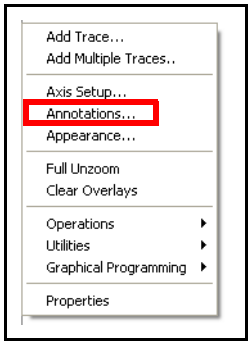
Use the following steps to qualify, or identify peaks.

7.11.1 Annotate a Chromatogram

To set annotations on a chromatogram, such as **Retention Time** and **Name**:

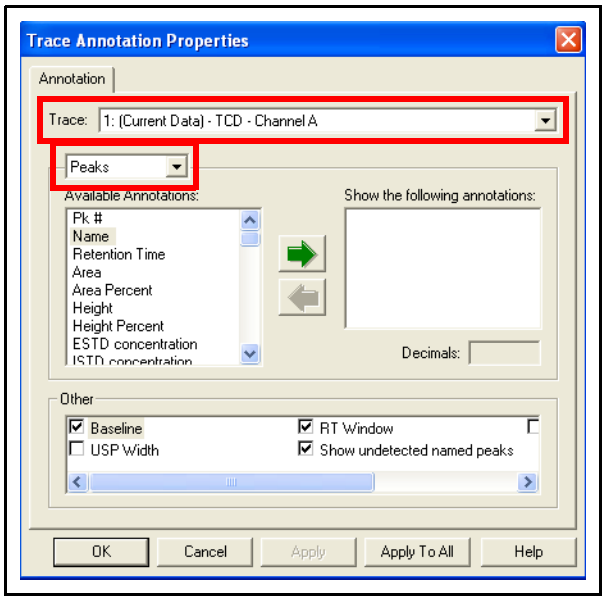
1 Right-click on a chromatogram and select **Annotations**. See Figure 7-32.

Figure 7-32 Chromatogram right-click options



2 The **Trace Annotation Properties** window will display. See Figure 7-33.

Figure 7-33 Trace annotation properties window



3 Select the desired chromatogram from the **Trace** drop-down list. Refer to Figure 7-33.

4 For the selected chromatogram, select **Peaks** or **Groups** from the drop-down list. Refer to Figure 7-33.

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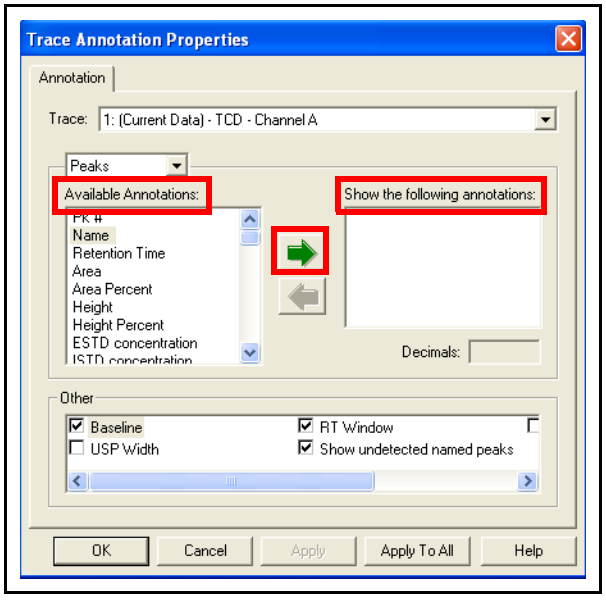
5 Click **Available Annotation** then select which features to annotate. For example, selecting **Retention Time** will display the retention times above the integrated peaks.

6 When an annotation is highlighted, click the green arrow to move the annotation from **Available Annotations** to **Show the following annotations.** Alternatively, double-click the annotation. See Figure 7-34.

NOTE: For certain annotations, the number of decimal places can be designated. Type this value in the **Decimals** box for the highlighted annotation.

Figure 7-34 Trace annotation properties window



7 Select the check box(s) to display **Baseline**, **USP Width**, **Retention Time Window**, **Show undetected named peaks**, and **Group Range** on the chromatogram.

NOTE: The **RT window** annotation displays the window set in the peak table. This window is not adjusted for relative retention time.

8 When finished selecting annotations, click **Apply To All** or **OK**.

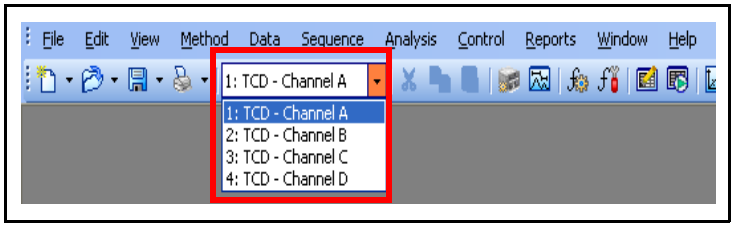
7.11.2 Adding Peak and Group Information

Peaks and groups can be identified in several ways. The information can be entered manually into the peak table, or the information can be gathered using graphical programming tools.

7.11.2.1 Manually Add Peak Information

1 Select a channel to add peak information from the drop-down list on the tool bar. See Figure 7-35.

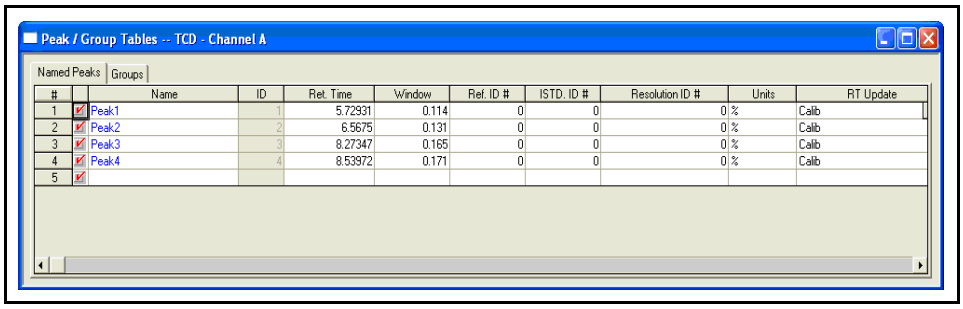
Figure 7-35 Changing channels



2 Click **Method >> Peaks/Groups**.

3 The **Peak/Group Tables** window will display. See Figure 7-36. There are tabs for **Named Peaks** and **Groups**.

Figure 7-36 Peaks/groups tables window



4 On the **Named Peaks** tab, enter the **Name**, **Ret.Time**, and retention time **Window** for each component in the channel.

5 Repeat Step 3 for all channels. Click **Analysis >> Analyze** from the toolbar to apply the changes.

6 Save the method by clicking **File >> Method >> Save**.

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7.11.2.2 Define Peaks Graphically

1 Click the **Define Single Peak** icon on the **Int Event** toolbar. See Figure 7-37.

NOTE: Alternatively, integration events (also known as graphical programming tools) can be selected by right-clicking on the chromatogram and selecting the desired **Graphical Programming** option. See Figure 7-38.

Figure 7-37 Int event tool bar - define single peak

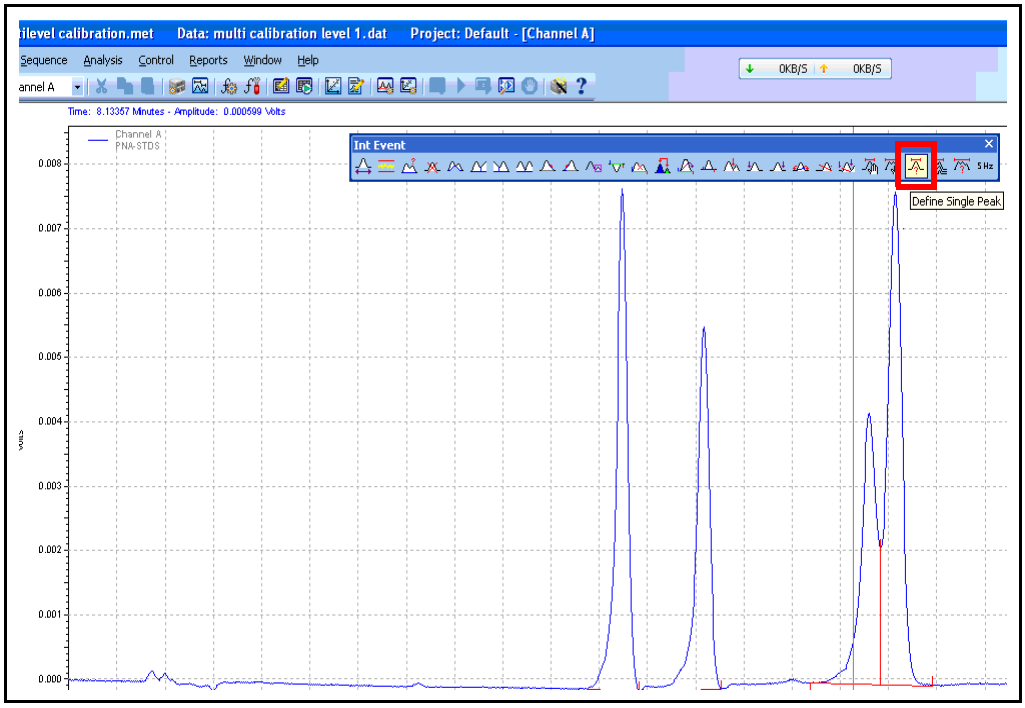
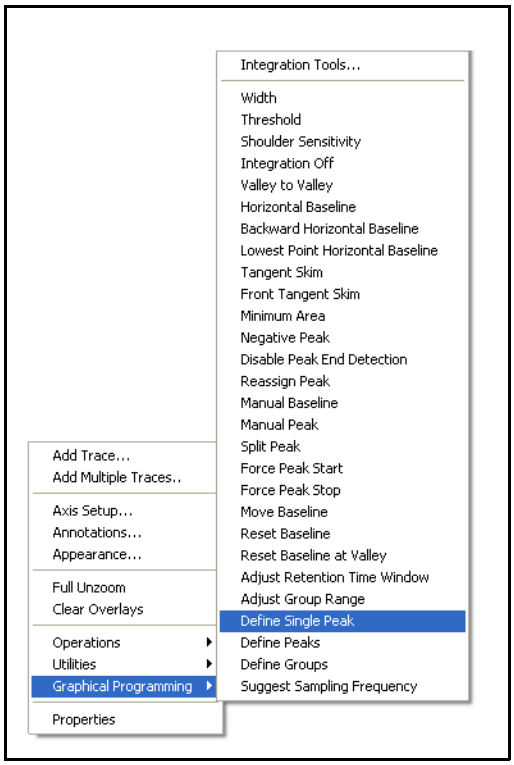
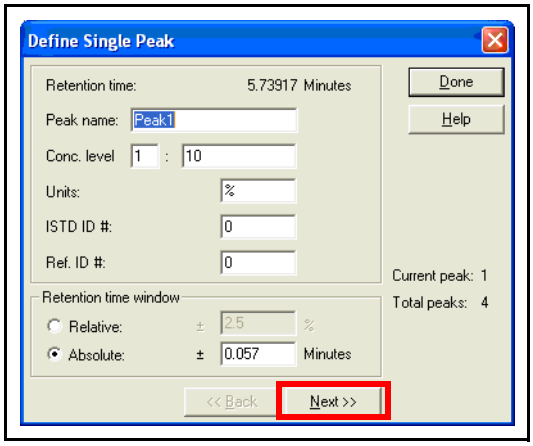


Figure 7-38 Define single peak through graphical programming



The **Define Single Peak** window will appear for the first detected peak in the chromatogram. See Figure 7-39.

Figure 7-39 Define single peak window



2 Verify the **Retention time** of the detected peak. If this peak is a component of interest, complete the boxes in the window.

3 Enter additional information in the boxes.

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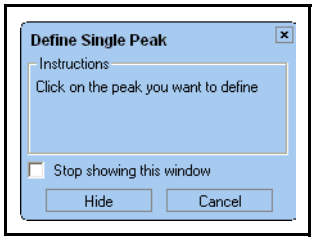
4 Click **Next >>** to move to the next detected peak. Click **<< Back** to move to the previously detected peak in the chromatogram.

NOTE: The current peak and total peaks in the chromatogram are displayed on the right of the window.

Alternatively, if a specific peak must be identified, click on the peak. The **Retention time** shown in the window will change to reflect the selected peak. A blue **Define Single Peak** window will display. See Figure 7-40.

Figure 7-40 Blue define single peak window



The **Define Single Peak** window will display the retention time for the selected peak.

5 When finished adding peaks to the peak table, click **Done**.

NOTE: For peaks that are not of interest, leave **Peak Name** blank and click **Next**.

The parameters in the **Define Single Peak** window are described in Table 7-3.

Table 7-3 Parameters

Parameters	Description
Peak name	Enter the name of the compound in this field.
Conc level	Concentration Level 1 is displayed. Enter the amount of this compound for this concentration level. **NOTE:** To set up more than one level for this compound, enter **2** for **Conc. level** and the amount for that level. Continue to enter level concentrations until completing the number of calibration levels desired.)
Units	Enter the desired units to be used for results.

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Table 7-3 Parameters

Parameters	Description
ISTD ID#	If an internal standard calibration will be performed, enter the ID # for the internal standard peak for this compound. The ID # refers to the peak **ISTD. ID #** from the **Peaks/Groups** table. If the **ISTD. ID #** is unknown, the information can be added in the peak table later.
Ref ID#	Enter retention time reference peak ID # to be used for this peak. The Ref ID # refers to the peak **Ref. ID #** from the **Peaks/Groups** table. If the **Ref. ID #** is unknown, the information can be added later in the peak table. Reference peaks are used to locate calibrated peaks when chromatographic conditions change such that retention times shift.
Retention time window	Select either **Relative** or **Absolute Retention time window**. The **Relative** option is based on a percent of the expected retention time of the peak. The **Absolute** option is based on a specified value. The retention time window compensates for slight deviations from the expected retention time.

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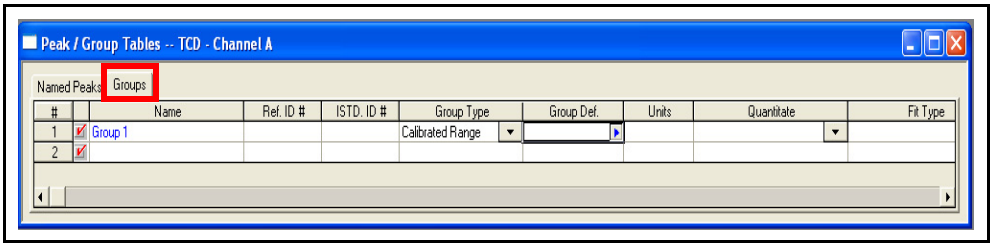
7.11.2.3 Adding Groups

To add a group:

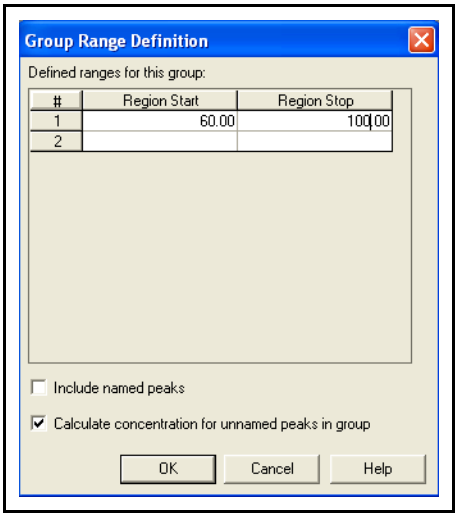
1. Click **Method >> Peaks/Groups** from the toolbar.
2. Click the **Groups** tab. See Figure 7-41.

Figure 7-41 Groups tab



3. Type the name of the group in a blank box.
4. In the **Group Type** list, select **Calibrated Range**.
5. Click the blue arrow on the right of the **Group Def.** field. The **Group Range Definition** window will display. See Figure 7-42.

Figure 7-42 Define group range



6. Type a **Region Start** and **Region Stop** in minutes or seconds.

   NOTE: In the example shown in Figure 7-41, the **Region Start** and **Region Stop** are displayed in seconds.

7. Select **Calculate concentrations for unnamed peaks in group**.
8. Click **OK** to return to the **Groups** tab.

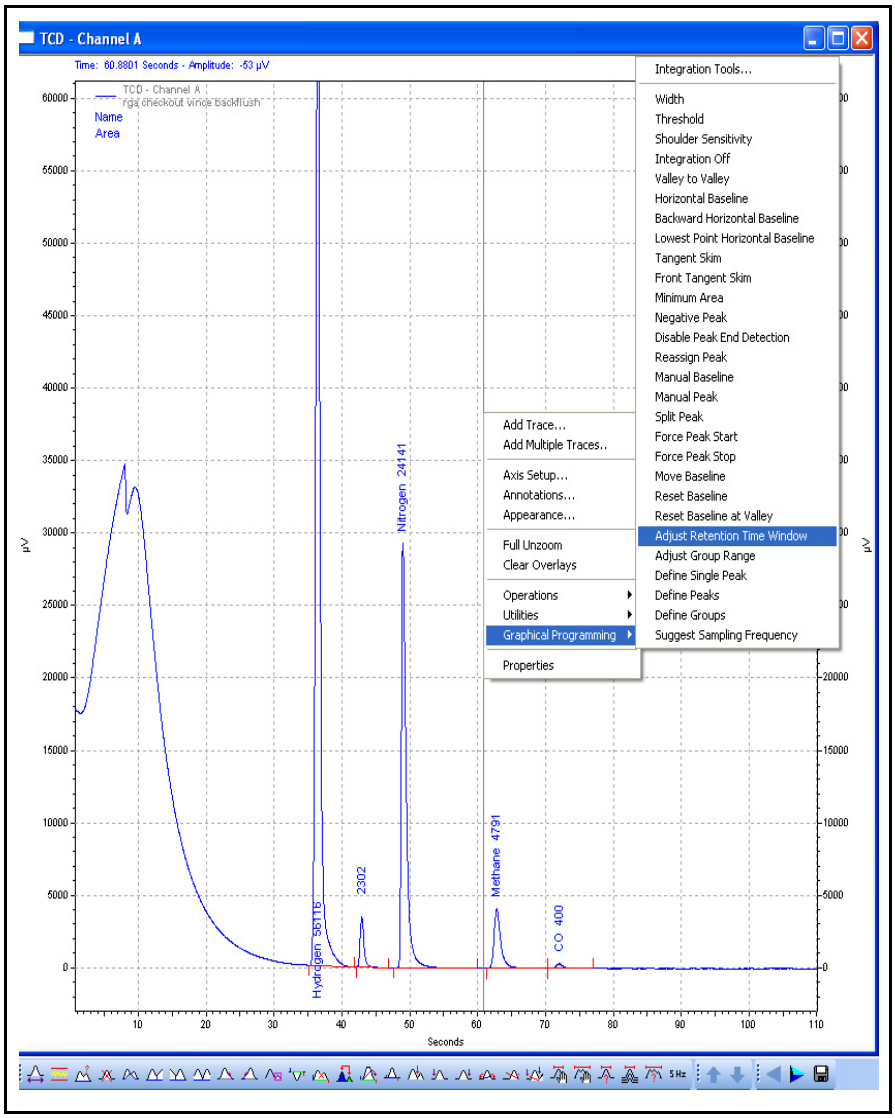
7.11.3 Adjust Peak Windows

Retention time windows will appear as red lines above peaks in the chromatogram. These can be adjusted manually by changing the **Window** value in the **Peaks/Groups** table. Alternatively, the windows can be adjusted graphically.

To adjust windows graphically:

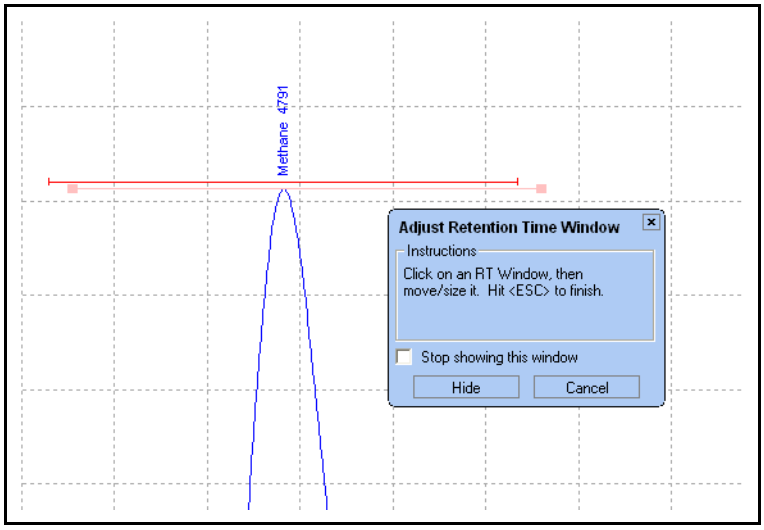
1 Click the **Adjust Retention Time Window** icon on the **Int. Events** tool bar. Alternatively, right-click on the chromatogram and select **Adjust Retention Time Window** from the **Graphical Programming** options. See Figure 7-43.

Figure 7-43 Adjust peak window locations



2 A blue **Adjust Retention Time Window** window will display. Click on the desired retention time window.

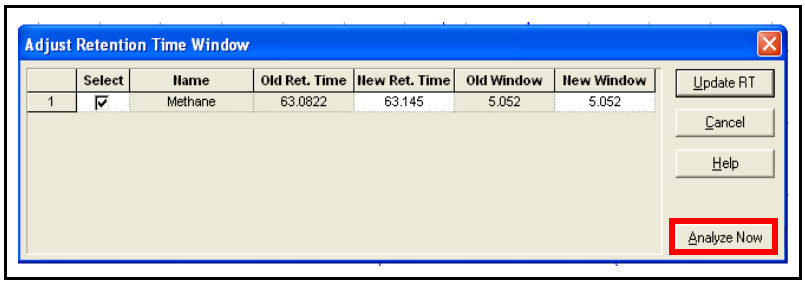
Figure 7-44 Retention time window select



3 Move the window, or adjust the size as desired. See Figure 7-44.

4 Press **<Esc>**. The **Adjust Retention Time Window** window will display. See Figure 7-45.

Figure 7-45 Adjust retention time window



5 Click **Analyze Now** to apply the changes and exit the window.

7.12 Calibration

A calibration must be performed to quantify a peak (i.e., determine the amount of a sample based on known standard gases). In this section, the procedure for setting up single level and multiple level calibration is described.

7.12.1 Obtain Preliminary Data for Calibration

To enter calibration peak data, run a sample of a calibration gas (i.e., a sample with known component concentrations). The generated data file can be used to define the calibration peaks.

1. Click **Control >> Single Run** to run the sample.
2. Type the desired **Sample ID** and click **Start**.
3. After the run is complete, ensure all peaks are integrated and annotated.

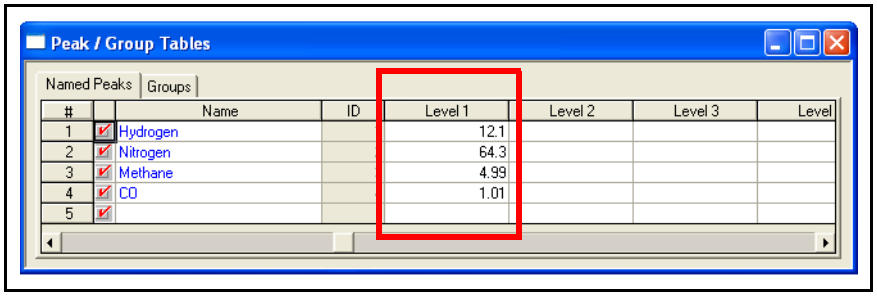
7.12.2 Enter Concentration Amounts in the Peaks/Groups Table

The known concentration of components in the calibration gas must be recorded in the **Peaks/Groups** table.

NOTE: If calibration concentrations were entered when defining single peaks (see section 7.11.2.2 on page 7-29), this step can be skipped.

1. Click **Method >> Peaks/Groups**.
2. Use the scroll bar to scroll until the **Level 1** column is visible. See Figure 7-46.

Figure 7-46 Level information in the peak table



3. Type the concentration of the component.
4. Repeat this for all peaks and groups in each of the channels.

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7.12.3 Perform A Single Level Calibration

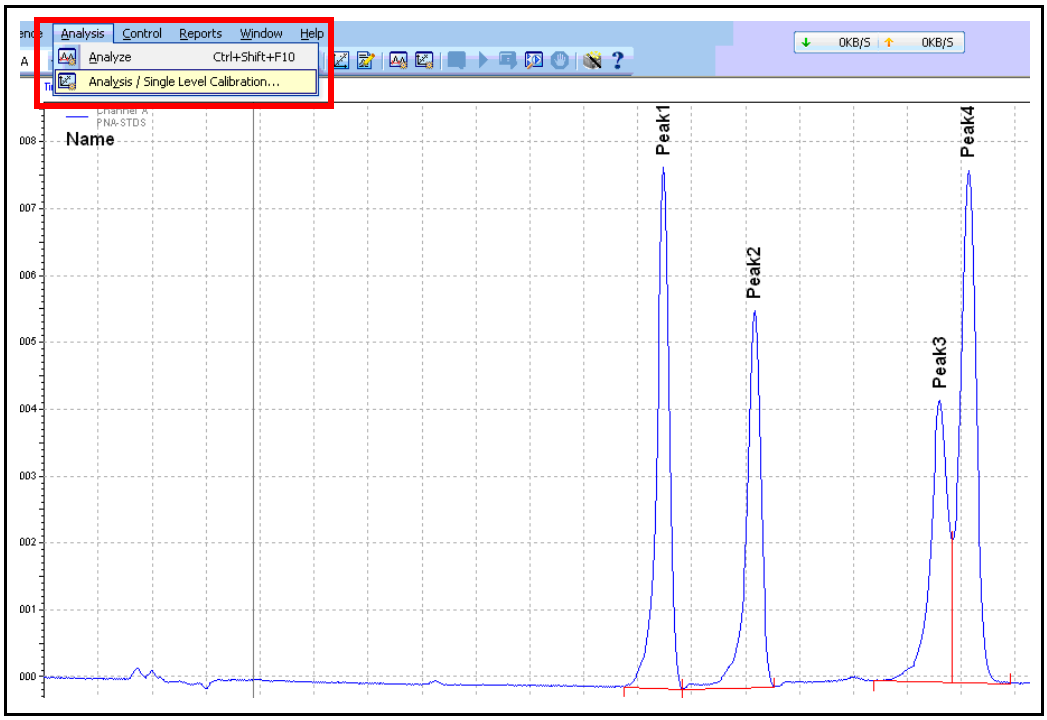
To quantify unknown samples, the method must contain the peak areas for each component in the standard calibration sample. To acquire the peak area information:

- Run the standard calibration sample and designate it as a calibration run following the steps below, or
- Calibrate the method using a stored run

To calibrate:

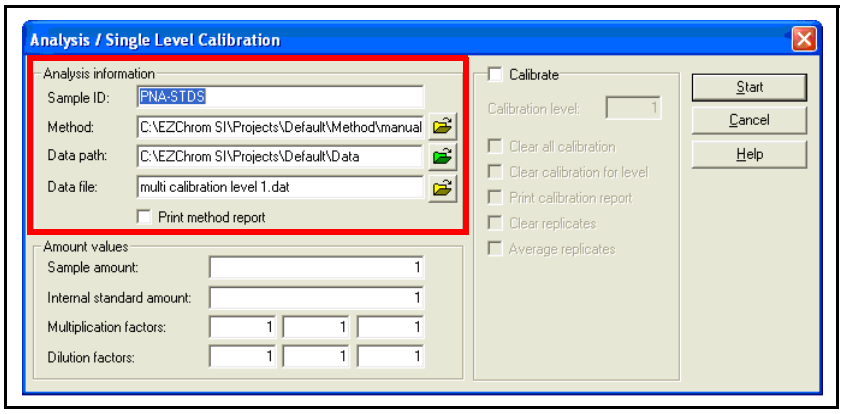
1 Click **Analysis >> Analysis/Single Level Calibration**. See Figure 7-47.

Figure 7-47 Menu bar location for analysis/single level calibration



2 The **Analysis/Single Level Calibration** window will display.

Figure 7-48 Analysis/single level calibration window - analysis information



3 Type the sample identification in the **Sample ID** box, if not already present. See Figure 7-48.

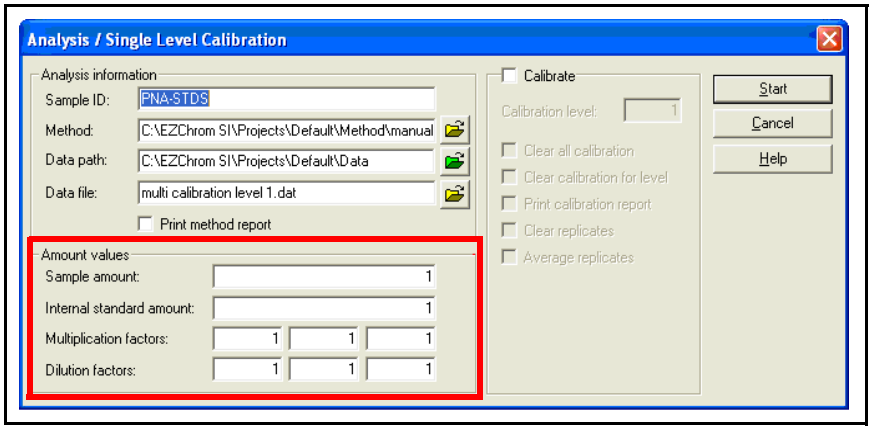
4 Select the name of the method to be calibrated, if not already present, by clicking the **Open file** icon adjacent to the box. See Figure 7-48.

5 Select the data path name, if not already present, by clicking the **Open file** button adjacent to the field. See Figure 7-48.

6 Select the name of the calibration data file in the **Data file** field. Select the file name, if not already present, by clicking the **Open file** button adjacent to the field. See Figure 7-48.

7 Leave the **Amount values** set to **1**. A value of **1** corresponds to a single level calibration. See Figure 7-49. For more information on each parameter within the **Amount values** frame, refer to the *074-538 EZ IQ Operation Manual*.

Figure 7-49 Analysis/single level calibration window - amount values



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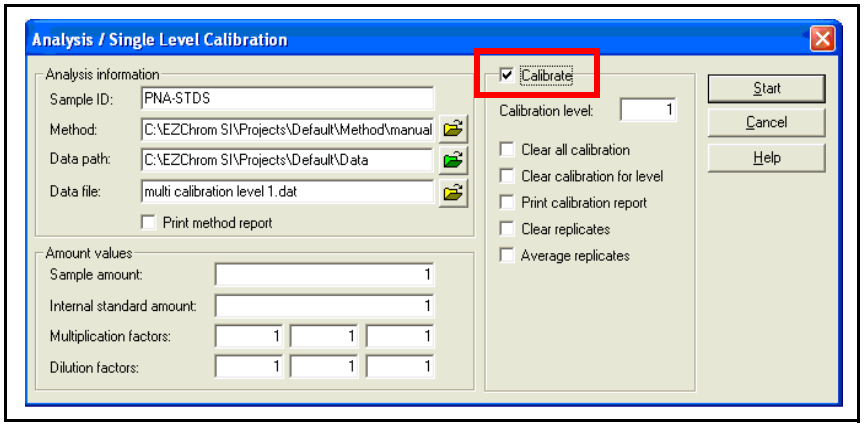
8 Select the **Calibration** check box and type **1** for **Calibration level**. See Figure 7-50.

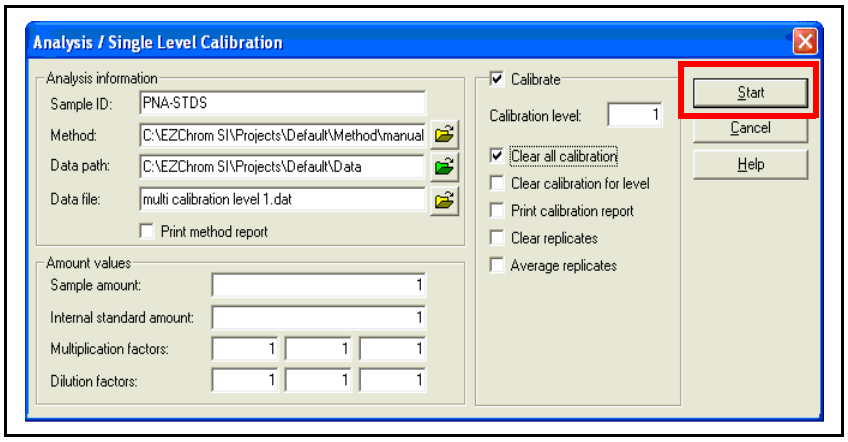
NOTE: For the initial calibration, clear any of the boxes involving calibrations or replicates. However, if the method was previously calibrated and the calibrated information needs to be replaced, select **Clear all calibration** before starting.

Figure 7-50 Analysis/single level calibration window - calibration check boxes



9 Click **Start** after completing the window. See Figure 7-51.

Figure 7-51 Analysis/single level calibration window - start



When the analysis is complete, the chromatogram will be integrated, and the areas for the peaks identified as calibration compounds will be entered into the method. In addition, a calibration curve will be generated using these areas. The method is now calibrated for a single level.

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7.12.4 Perform a Multiple Level Calibration

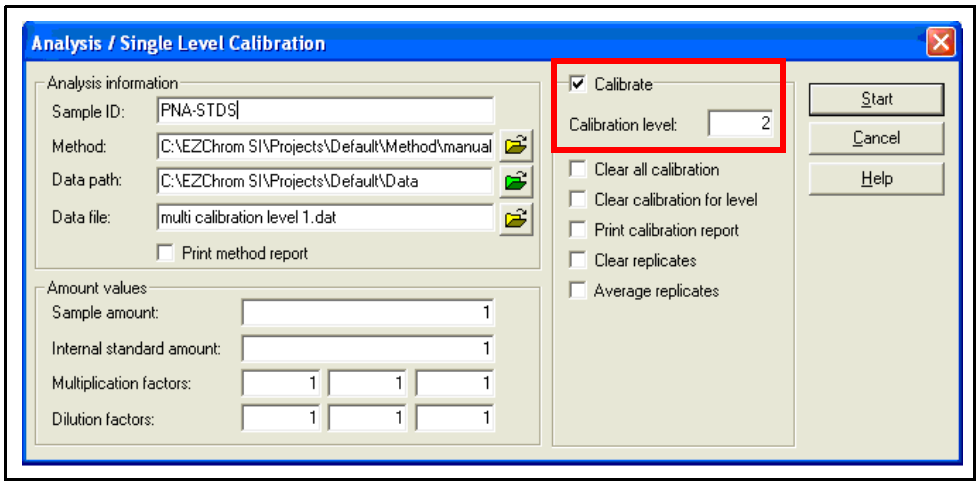
If a multiple level calibration is required, sample calibration standards of different concentration levels should be run.

NOTE: Update the **Method >> Peaks/Groups** table to include **Level 2**, **Level 3**, etc.

1 Repeat Steps 1 through 7 in section 7.12.3 on page 7-37.

2 Select the **Calibrate** check box and type a value in the **Calibration level** box for the corresponding level. See Figure 7-52.

Figure 7-52 Analysis/single level calibration window - multiple level calibration



3 Click **Start**.

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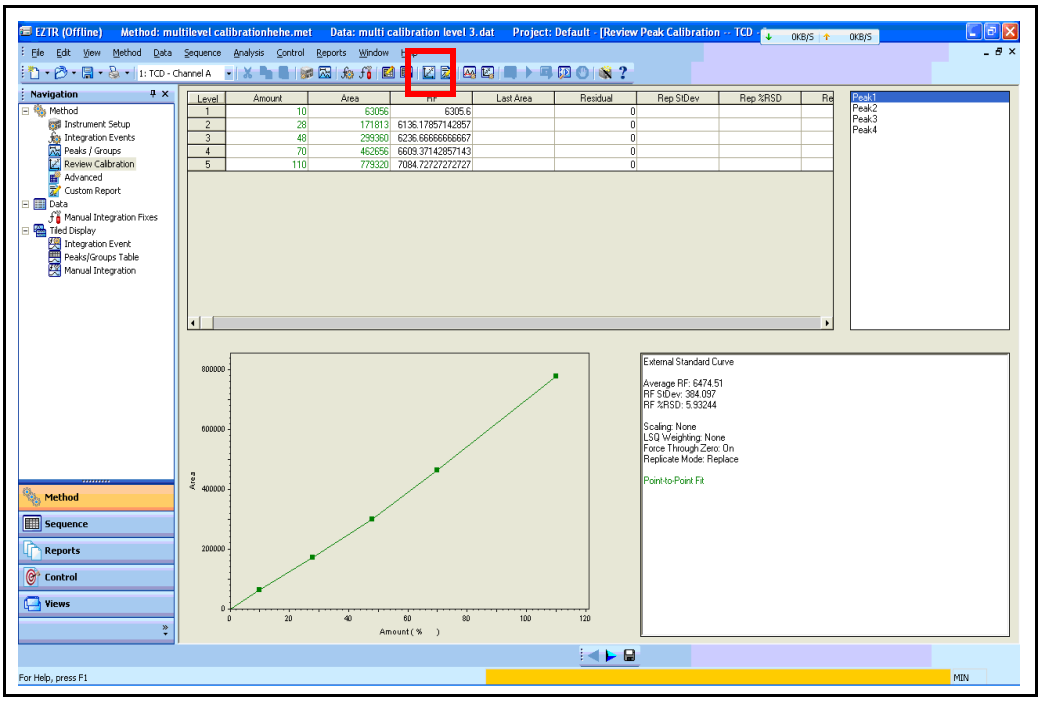
7.12.5 Review Calibration

After completing a calibration, a calibration curve and associated data can be reviewed by clicking **Method >> Review Calibration**. Alternatively, click the **Review Calibration** icon. See Figure 7-53.

Figure 7-53 Review calibration window



From **Review Calibration**,

- View the calibration curve for each calibrated peak
- Change and overlap calibration curve fit types
- Review the equations for curve fit types, and examine the R-squared (goodness of fit) value for each
- Temporarily remove any undesired points or outliers from the calibration curve
- View response factors, replicate areas, and standard deviation values
- Use the concentration calculator to calculate amounts from manually entered areas.

Refer to the *074-538-P1(A) EZ IQ Operation Manual* for a detailed description of each function.

The method is now calibrated and is ready to use.

7.13 Generate Standard Reports

EZ IQ provides various standard report templates, such as an **External Standard (ESTD) Report** to generate the desired report. To customize report layout and content, use the EZ IQ **Method >> Custom Report** function.

7.13.1 Method Reports

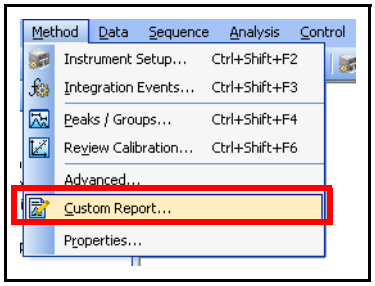
A method report is created and saved as part of method development. Once a method report is created, it will be saved as part of the method.

7.13.1.1 Customize a Method Report

The default method report is blank. To add fields, graphs, and data:

1 Click **Method >> Custom Report...**. See Figure 7-54.

Figure 7-54 Custom report option



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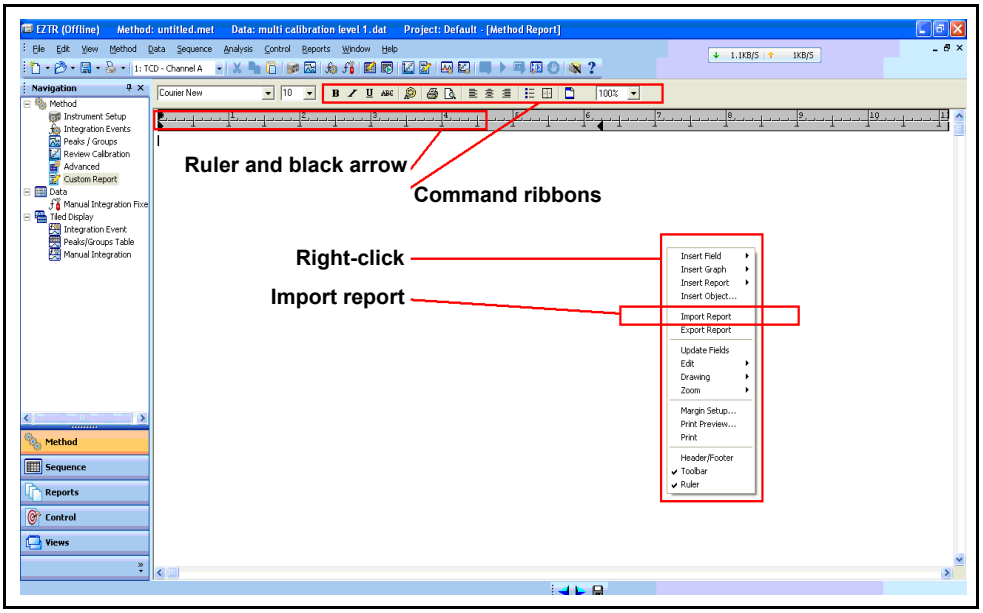
7.13.1.1.1 Custom Method Report Features

A number of features in the **Method Report** window are outlined. See Figure 7-55.

Figure 7-55 Custom method report

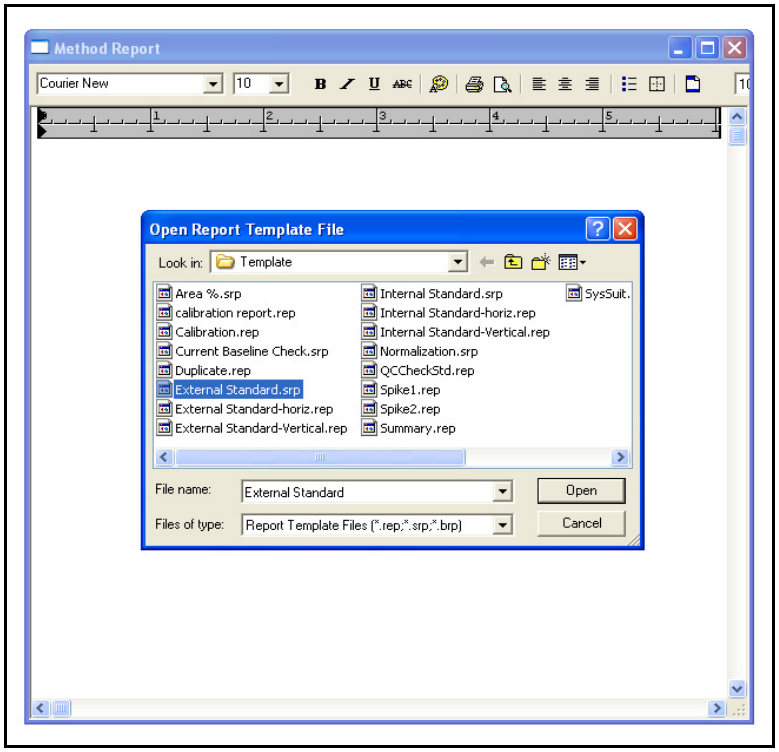


Feature	Description
Ruler	Shows the position relative to the page. Black arrows can be dragged to suit user needs.
Command ribbon	Contains frequently used commands for formatting. Icons include bold, italic, underline, strike-through, color, left justify, center, right justify, view header/footer, add icons, borders/shading, and zoom. When clicked, the formatting represented by these icons will be applied to any text or item currently selected. Once a formatting icon is clicked, it remains in effect for new text until the icon is clicked again.
Right-click	Opens access to menus for inserting chromatograms, report objects, method information, and electronic results sign off fields. Items inserted into the report must first be "activated" by clicking on them in order to edit or move them. Report tables can be removed with a right mouse click inside the table, followed by selecting the **Delete Table** command.
Import report	Imports a pre-existing report template. When a report is imported, it will replace the current custom report.

7.13.1.1.2 Importing a Template File

1. Right-click in the **Method Report** window.
2. Select **Import Report**.
3. The **Open Report Template File** window will prompt to open a template file. One example is the **External Standard.srp** file. See Figure 7-56.

Figure 7-56 Open a report template file to edit - example



4. Click **Open** to load the template file.
5. Edit the template by right-clicking and selecting options such as **Insert Fields**, **Insert Graphs**, **Insert Reports**, and **Insert Object**.

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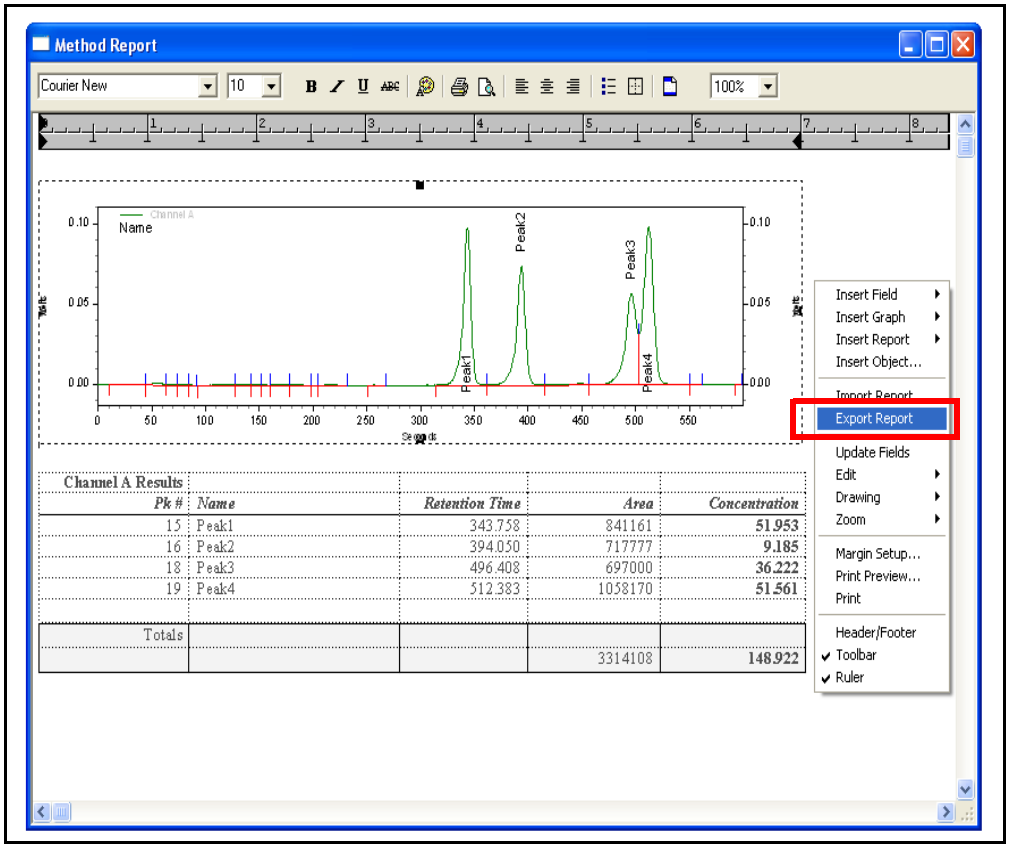
7.13.1.2 Save a Custom Method Report

1 Once all desired information has been modified or added, right-click in the **Method Report** and select **Export Report**. Figure 7-57.

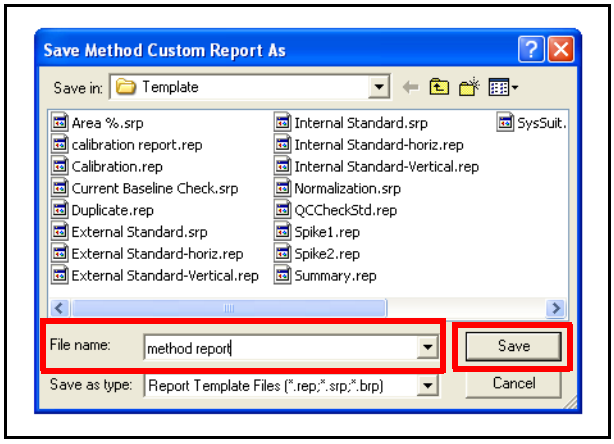
Figure 7-57 Report editor - export report



2 In the **Save Method Custom Report As** window, type a method report name in the **File name** field. See Figure 7-58.

3 Click **Save** to save the customized method report. Figure 7-58.

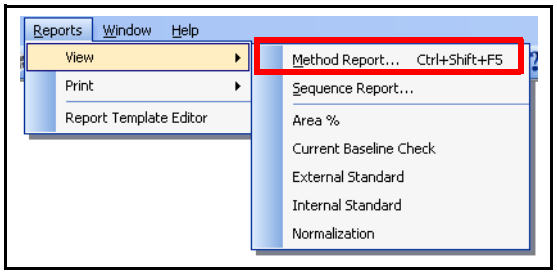
Figure 7-58 Save a customized method report



7.13.1.3 View or Print a Custom Method Report

1 To view the custom method report, click **Reports >> View >> Method Report**. See Figure 7-59.

Figure 7-59 View a custom method report



2 To print the custom **Method Report**, right-click over report area and select **Print**.

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7.13.2 External Standard (ESTD) Reports

An ESTD Report contains information on retention time, area, and mole percent concentration. It is not method specific. The same template will be applied to any method that is opened.

7.13.2.1 Customize an ESTD Report

An ESTD can be modified to specific needs.

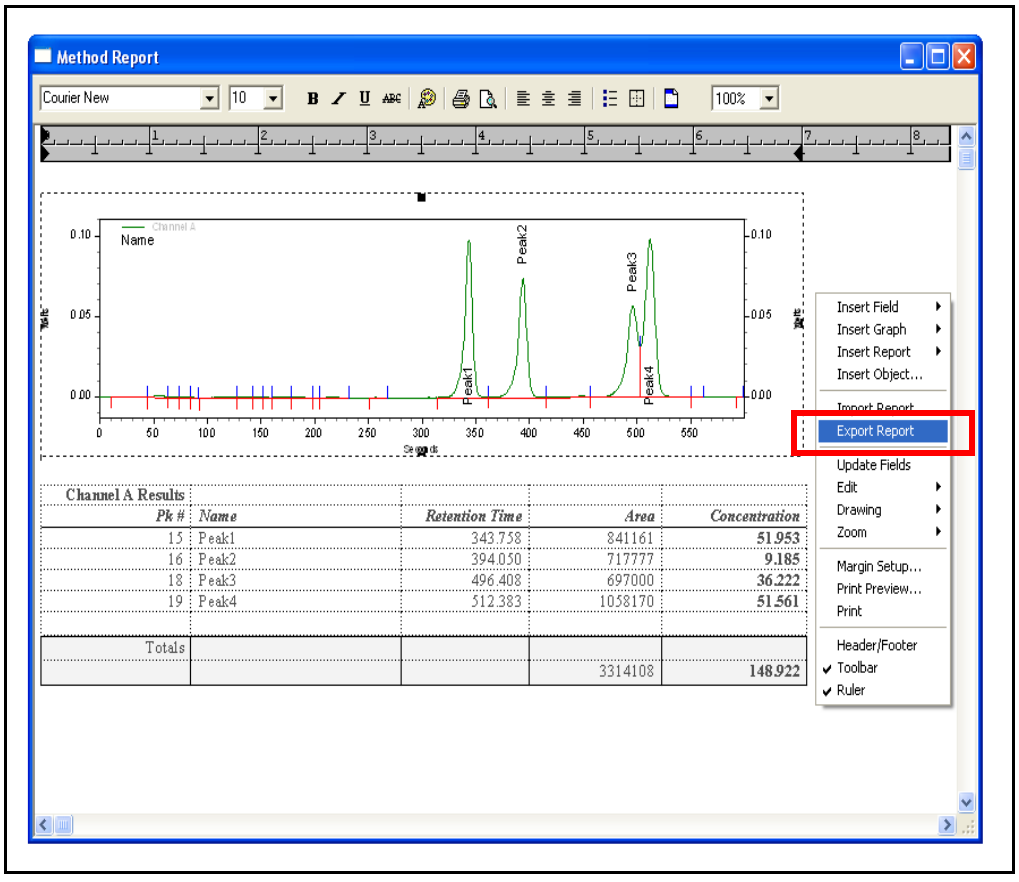
The ESTD Report can be changed in a similar manner as the method report. Once a change is made, it will apply to all methods.

Follow Steps 1 through 5 in Importing a Template File, see section 7.13.1.1.2 on page 7-44.

7.13.2.2 Save a Customized ESTD Report

1 Once all desired information has been modified or added, right-click in the **Method Report** window and select **Export Report**. See Figure 7-60.

Figure 7-60 Report editor - export report



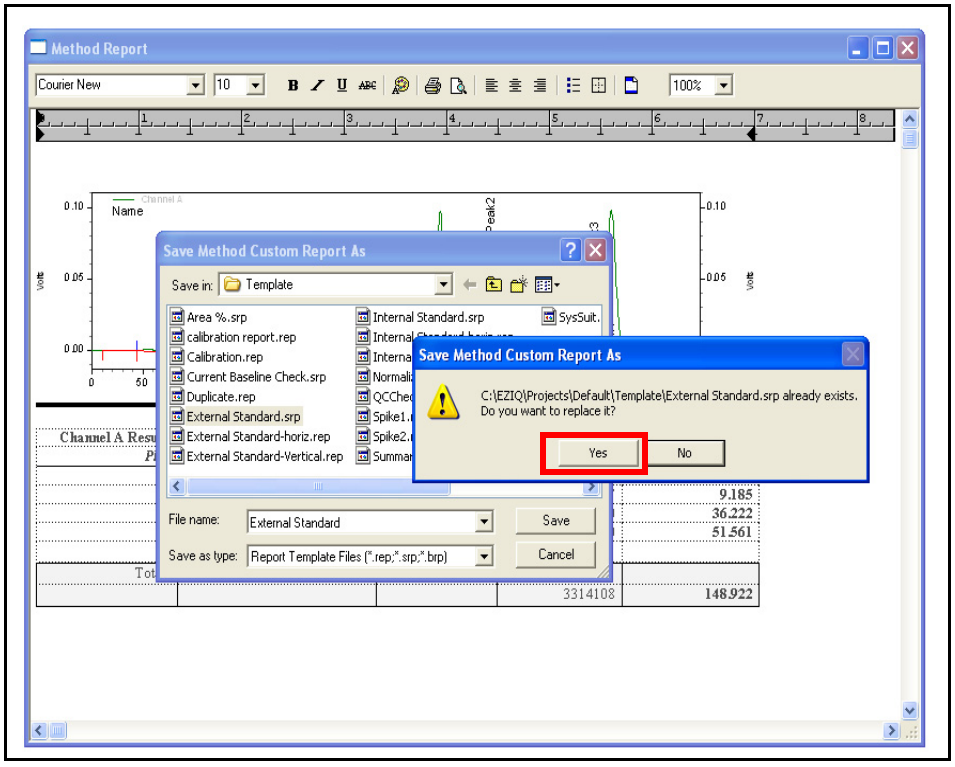
2 The **Save Method Custom Report As** window will display.

3 Click **External Standard.srp**.

4 Click **Save**.

5 Click **Yes** to overwrite the current file. See Figure 7-61.

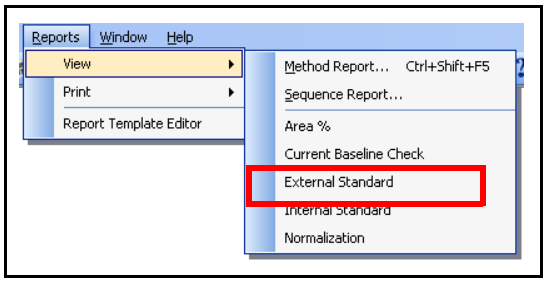
Figure 7-61 Save a customized ESTD report



7.13.2.3 View and Print an ESTD Report

1 To view the ESTD report, click **Reports >> View >> External Standard**. See Figure 7-62.

Figure 7-62 Opening an ESTD Report



2 To print the **ESTD Report**, right-click over the report area and select **Print**.

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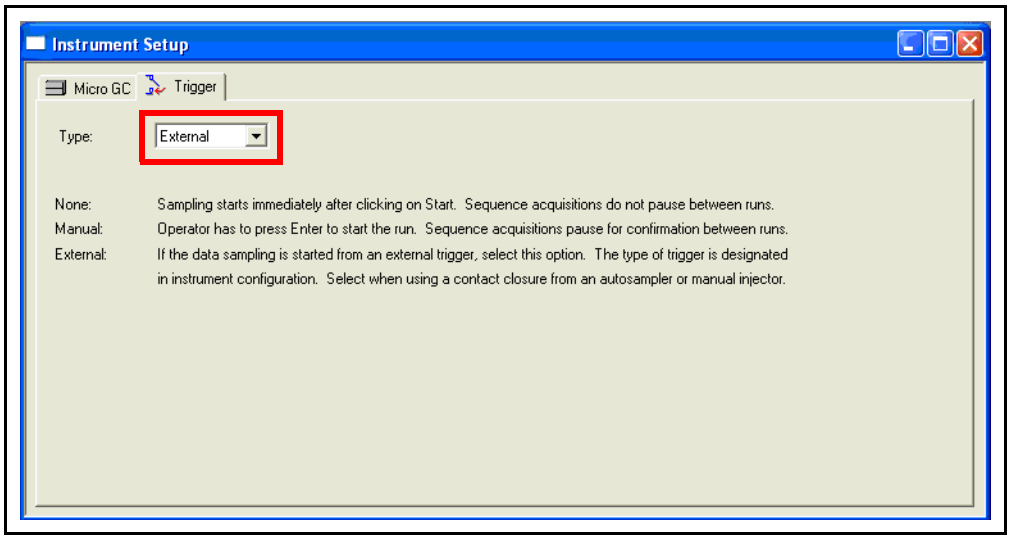
7.14 EZ IQ Operation to Activate Remote Start/Cancel Function

To use the remote connector function in EZ IQ:

1. Open **EZ IQ**.
2. Click **Method >> Instrument Setup** to display the **Instrument Setup** window.
3. On the **Trigger** tab, select **Type: External**. See Figure 7-63.

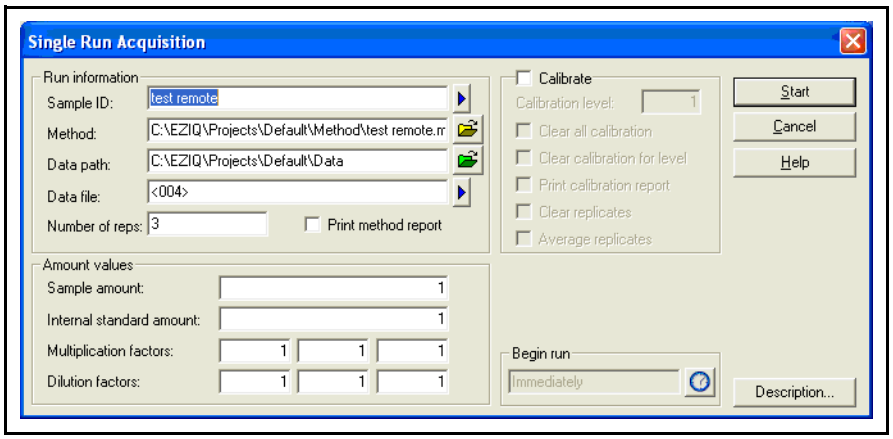
Figure 7-63 Select external trigger type in instrument setup window



4. Save the method by clicking **File >> Method >> Save**.
5. Download the method by clicking **Control >> Download Method**.
6. Enter **Sample ID** and enter **Number of reps**. See Figure 7-64.

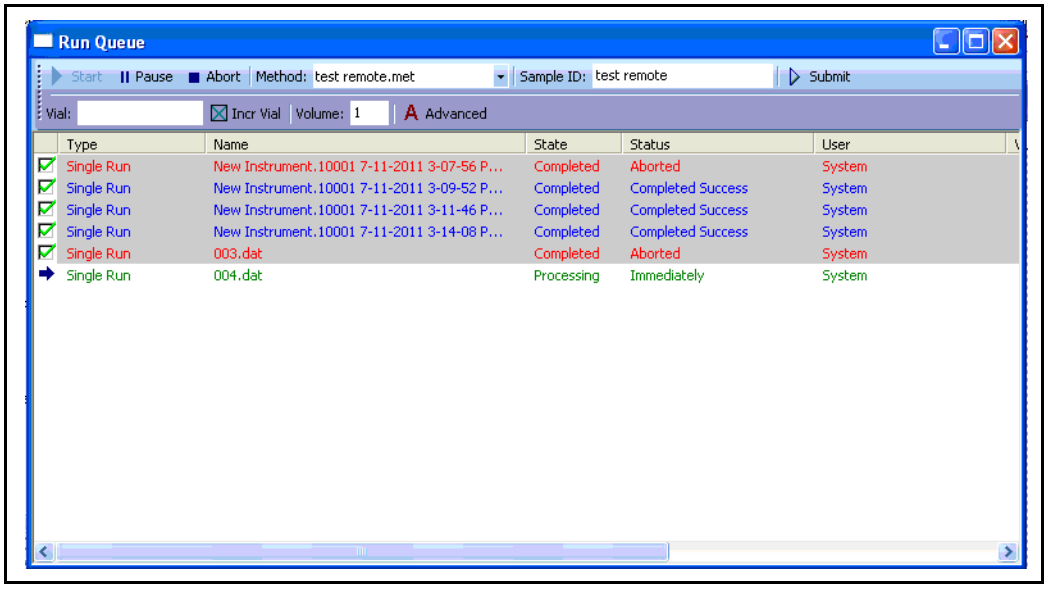
NOTE: When multiple sample injections are defined in the **Single Run Acquisition** window, it is required that each run be triggered by a **REMOTE_START** contact closure by an external system. Once a run is submitted, it will not start until the trigger is activated. Refer to section 5.2, The Remote Connector, on page 5-30.

Figure 7-64 Enter multiple samples into single run acquisition window



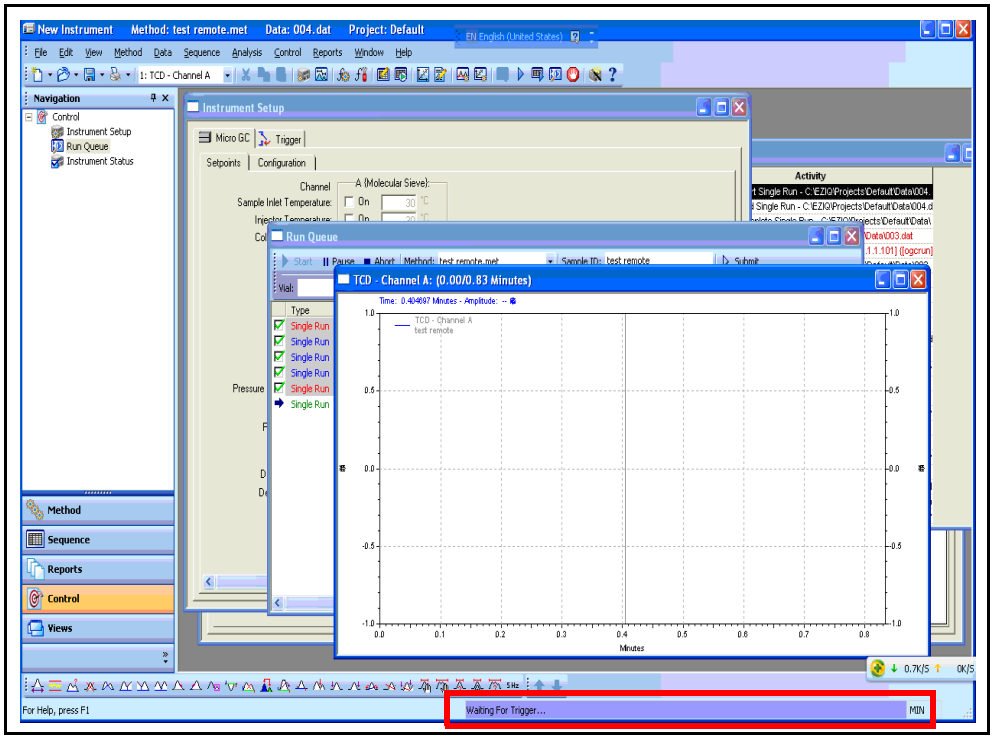
7 Click **Start** to begin sample acquisition. The run queue will be pending until the **REMOTE_START** contact is closed. See Figure 7-65.

Figure 7-65 Pending status shown in run queue window



NOTE: Waiting For Trigger will be displayed at the bottom right corner of the EZ IQ Instrument Window. See Figure 7-66.

Figure 7-66 Pending status shown in EZ IQ instrument window



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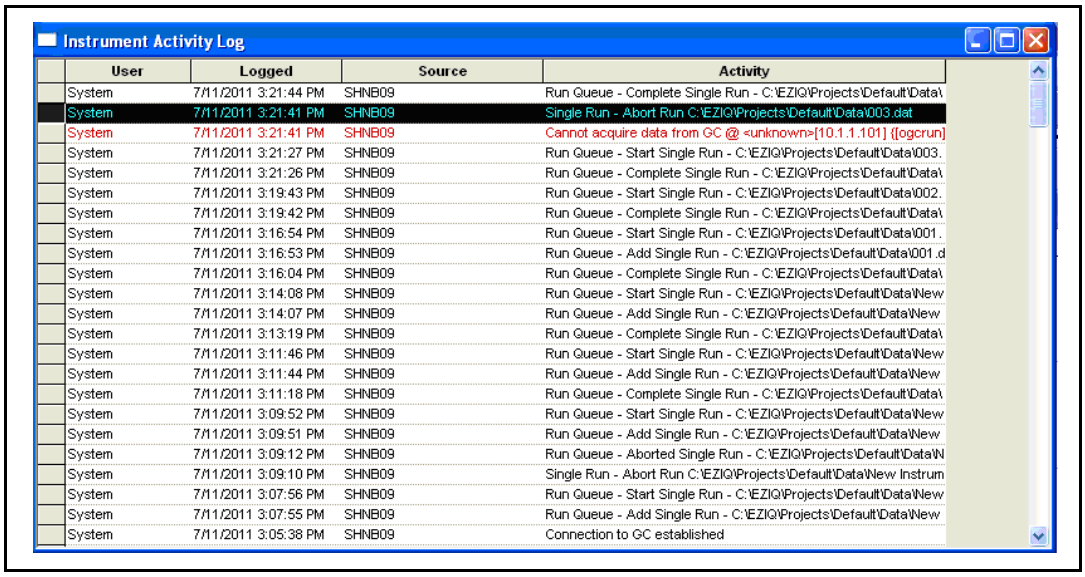
8 To abort the remaining runs in the run queue during a run. Close the **REMOTE_CANCEL** contact, which may be triggered by an external system, until the current run is completed. Once the current run is completed, the remaining runs will be aborted. See Figure 7-67.

Figure 7-67 Abort run status shown in instrument activity log window

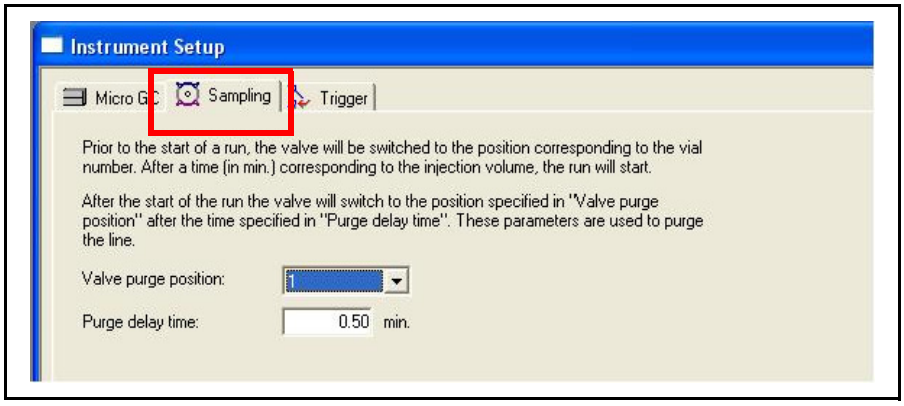


7.15 Apply the Valco Valve Program to EZ IQ Method

7.15.1 Valco Valve Setup in EZ IQ

1. In **EZ IQ**, click **Method >> Instrument Setup**.
2. Click the **Sampling** tab. See Figure 7-68.

Figure 7-68 Instrument setup window - switching



3. Select the **Valve purge position:** from the drop-down list. This is the initial valve position for purging before starting a single run in a sequence.
4. Type a **Purge delay time:**. This is the time defined for switching the valve to a position which is specified in the **Valve purge position** after starting a run.
5. Save the method by clicking **File >> Method >> Save**.

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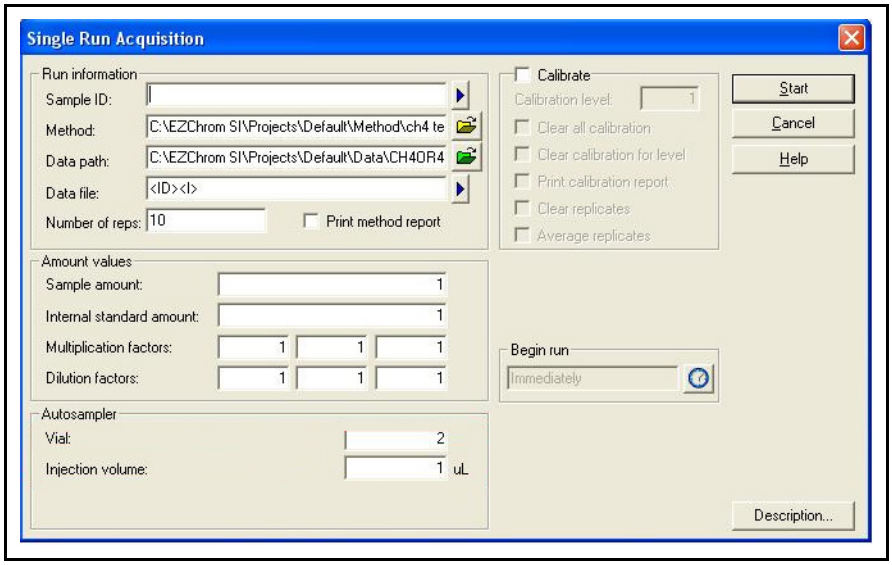
7.15.2 Running a Sample with a Valco Valve

1 In **EZ IQ**, click **Control >> Single Run** to display the **Single Run Acquisition** window. See Figure 7-69.

Figure 7-69 Single run acquisition window with valve control



2 Type a **Vial** number. This is the valve port position for the current single run.

3 Type an **Injection volume**. This is the line purge time for the current single run.

NOTE: Injection volume is labeled as **uL**. However, the value corresponds to time in minutes.

Use the above settings as an example:

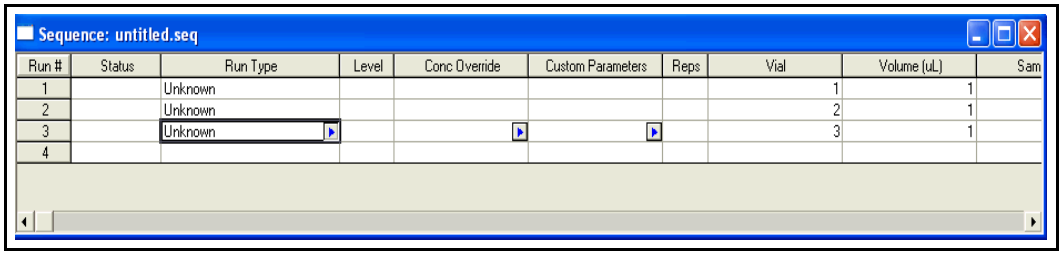
- Prior to the start of a run, the valve will switch to the position corresponding to the **Vial** number, **2** in this case. After the time defined in the **Injection volume**, **1** minute in this case, the run will start.
- After the run has started, the valve will switch back to the **Valve purge position** after the **Purge delay** time specified on the **Sampling** tab in **Method >> Instrument Setup**. See Figure 7-68.

7.15.3 Running a Sequence with a Valco Valve

A sequence of multiple runs with different valve positions can be scheduled by editing the sequence as below:

1. Click **Sequence >> Edit**.
2. The **Sequence** window will display. **Vial** number defines the port position for a single run. **Volume** defines the sample line purge time for a single run. See Figure 7-70.

Figure 7-70 Sequence window



Using the above sequence table as an example:

- Run #1 will switch to Port #1, purge for 1 minute, then return to the conditions specified in **Sampling** tab in **Method >> Instrument Setup** (see Figure 7-68)
- Run #2 will switch to Port #2, purge for 1 minute, then return to the conditions specified in **Sampling** tab in **Method >> Instrument Setup**
- Run #3 will switch to Port #3, purge for 1 minute, then return to the conditions specified in **Sampling** tab in **Method >> Instrument Setup**

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Chapter 8
Instrument Operations

8.1 Routine Operation

8.1.1 System Bakeout

Over time, small amounts of contaminants may accumulate in 3000 Micro GC. Contaminants in the chromatography column may cause peak tailing and retention time shifts. To clear the contaminants, create a bakeout method and run it:

- After the first installation
- After installing a replacement GC module
- After the 3000 Micro GC has been turned off or stored for an extended period of time
- After the 3000 Micro GC has been stored in a Shipping Case (PN G2801-81005) for an extended period of time
- Periodically as needed to refresh column performance

Proceed as follows to create and run a bakeout method.

1. In EZ IQ, click **Method >> Instrument Setup**.
2. Enter the following acquisition parameters.
   - Turn on **Detector Filaments**
   - Set **Column Temperature** as suggested in Table 8-1

Table 8-1 Bakeout temperatures for various columns

Column type	Column temperature, °C	Duration, hours	Recommended frequency for general use
Alumina PLOT	180	8–12	Weekly
MolSieve 5A PLOT	180	8–12	Weekly
OV-1	180	2	Weekly
OV-1701	180	2	Weekly
PLOT Q	160	8–12	Weekly
PLOT U	160	8–12	Weekly
Stabilwax-DB	180	2	Weekly

An example bakeout method is shown in Figure 8-1.

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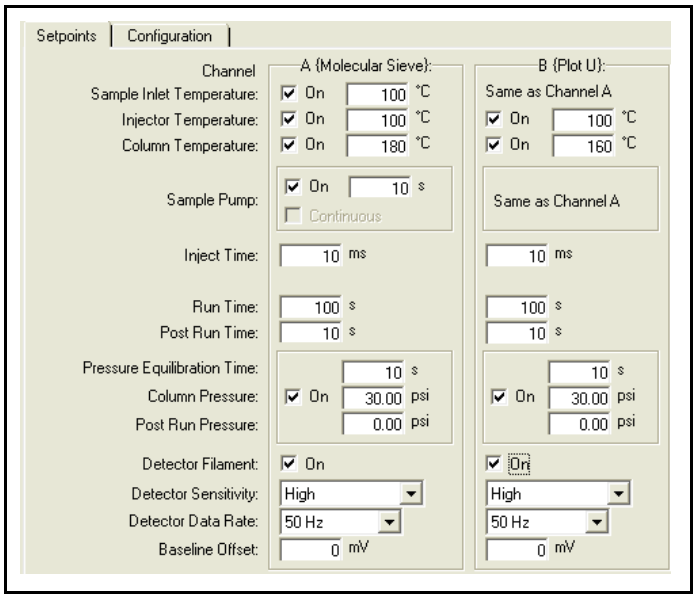
Figure 8-1 Example bakeout method



3 Click **File >> Method >> Save** to save the bakeout method. When prompted, type a unique name for the bakeout method.

4 Verify that the carrier gas is on and flowing. This will protect the column and TCD.

5 Click **Control >> Download Method** to download the bakeout method.

6 Allow the method to run for the duration listed in Table 8-1.

7 After the bakeout is complete, load an analytical method and run a set of calibration samples. Refer to section 7.7 on page 7-19 and section 7.12 on page 7-36.

8 Check the report. Adjust the calibration settings, retention times, and method settings as needed.

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8.1.2 Shutdown/Restart

CAUTION

Avoid shutting down 3000 Micro GC using the power switch on the front panel. This may cause a system integrity issue.

CAUTION

If a 3000 Micro GC is powered off when the column is at a high temperature, column contamination and degradation may result.

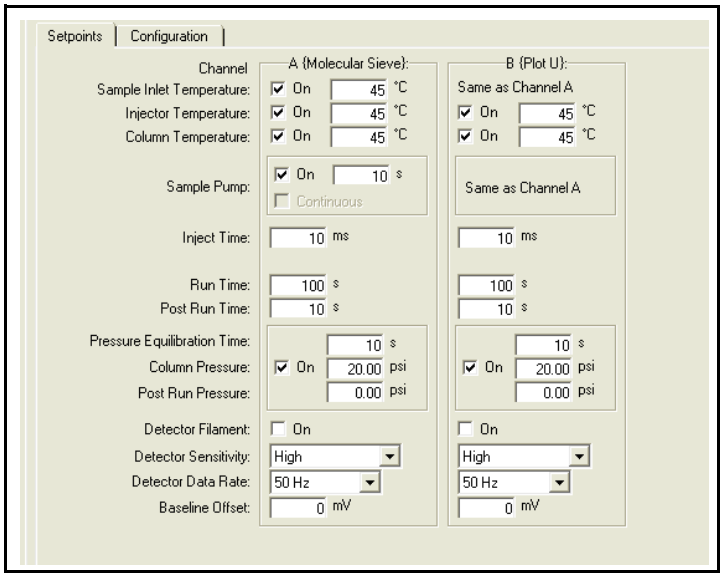
Proceed as follows to shutdown or restart a 3000 Micro GC.

1 Create a shutdown method:

- Turn off the **Detector Filaments**
- Lower the **Column Temperature** to 45°C
- Select **On** for **Column Pressure** and set to at least 20 PSI

A shutdown method is illustrated in Figure 8-2.

Figure 8-2 Example shutdown method



2 Download the method from **EZ IQ** onto the 3000 Micro GC.

3 Click **Control >> Instrument Status** to display the **EZ IQ Instrument Status** screen. Wait until the method setpoints are all reached (i.e., the 3000 Micro GC is **Ready**). Refer to section 7.6.4, View Instrument Status, on page 7-18.

4 Open the web browser and connect to the instrument via the embedded web page. See Chapter 6.

5 Click **Utility**.

6 Click **Shutdown** to shutdown the instrument.

7 After three minutes, set the front panel power switch to the off position.

CAUTION

Do not turn off the power without waiting at least three minutes. 3000 Micro GC must update configuration files before power is turned off. If power is turned off too soon, the files could be corrupted, making 3000 Micro GC inoperable.

8.1.3 Standby

Leave 3000 Micro GC power on with carrier gas flowing when 3000 Micro GC is not in use. This enhances instrument performance and lifetime.

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8.2 Remove and Replace a 3000 Micro GC Module

The following procedure will outline the steps necessary to fully remove and replace a module.

8.2.1 Types of Replacement Modules

In general, any type of GC module can be replaced with one of a different type. This includes modules with different columns, columns lengths, and injectors.

NOTE: Installing a GC module in a previously unused channel is not supported.

8.2.2 Performance Enhanced GC Module vs. Standard GC Module

There are two types of GC modules.

- **Standard GC module**: This module type must be decommissioned and given a new address via the embedded web page. The serial number can be identified by the label on the top of the module.

  A PN beginning with **G2801** identifies a standard module.

- **Performance Enhanced GC module**: This module type contains a dual inline package (DIP) switch that can be set for a specific module address. This eliminates the need to decommission a GC module first, so the GC module can be easily replaced. The serial number can be identified by the label on the top of the module.

  A PN beginning with **G2807** identifies a Performance Enhanced module.

  Features of the performance enhanced GC module:

  - Peaks return to the baseline faster for better separation
  - Better sensitivity
  - Easier to integrate low ppm peaks
  - DIP switch for convenience when replacing GC modules

  NOTE: Performance Enhanced GC modules do not have to be decommissioned or recommissioned. Section 8.2.4, Decommission a Standard GC Module, on page 8-7 and section 8.2.7, Commission a New Standard GC Module, on page 8-20 do not apply when replacing a Performance Enhanced module.

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8.2.3 Update the Instrument Firmware

Before installing a new GC Module, the 3000 Micro GC firmware must be updated. New GC modules have the most recent firmware installed. The most recent 3000 Micro GC firmware is included in the GC module replacement kit. To update the instrument firmware:

1. Insert the **Firmware Update** CD-ROM from the GC module replacement kit.
2. Browse the CD-ROM, and open the file named **readme.htm.**
3. Follow the instructions in the file.

CAUTION

During a firmware update, do not turn 3000 Micro GC off until prompted by the update program. Turning off power during the update can make 3000 Micro GC inoperable.

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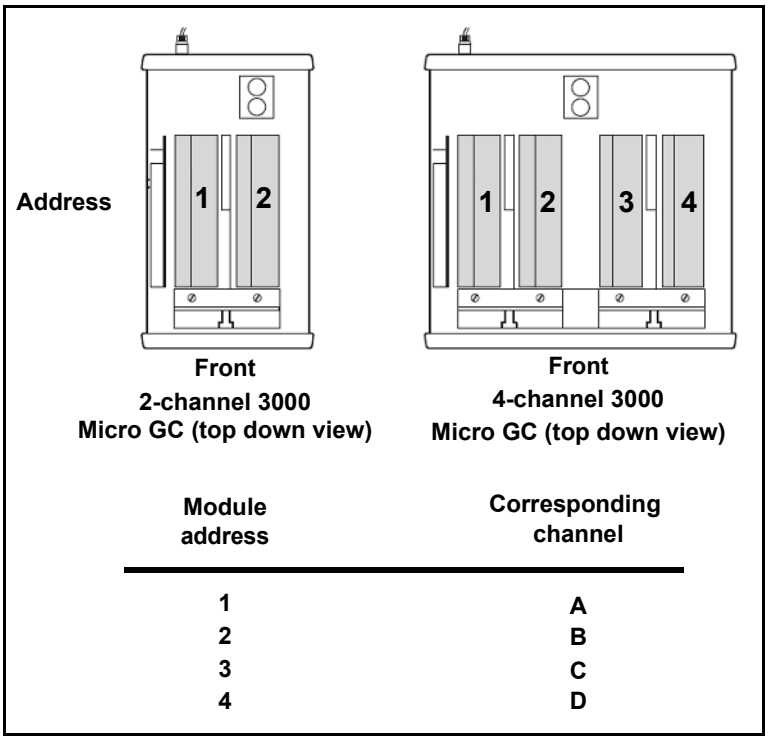
8.2.4 Decommission a Standard GC Module

A Standard GC module must be decommissioned within the embedded web page before it can be removed. 3000 Micro GC internally communicates to each installed GC module using a unique module address (see Figure 8-3).

- For a 1-2 channel or portable 3000 Micro GC, the module addresses are 1 and 2.
- For a 3-4 channel 3000 Micro GC, the module addresses are 1, 2, 3 and 4.

Decommissioning a standard GC module will disable the GC module's address.

Figure 8-3 Default GC module serial communication addresses



NOTE: For Performance Enhanced modules, skip to section 8.2.5, Remove a GC Module, on page 8-11.

NOTE: Only one Standard GC Module can be decommissioned at a time.

The procedure below describes the procedure for replacing the Standard GC module 1 (Channel A) in a 2-channel 3000 Micro GC. The process is similar for other configurations.

1. Open the web browser and type in the 3000 Micro GC IP Address. The embedded webpage will display.

   NOTE: At the factory, the instrument IP address was set to **10.1.1.101**.

2. Click the **Utilities** tab.
3. Click **Change Module Configuration**. See Figure 8-4.

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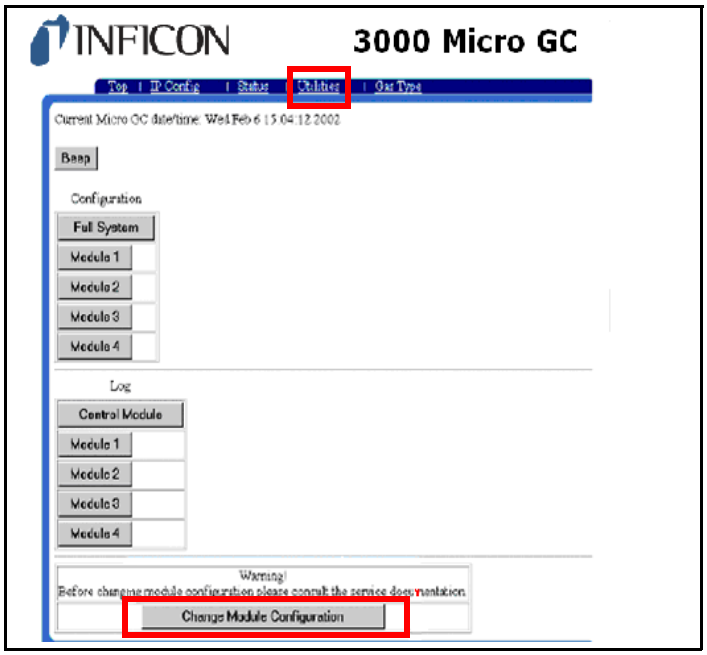
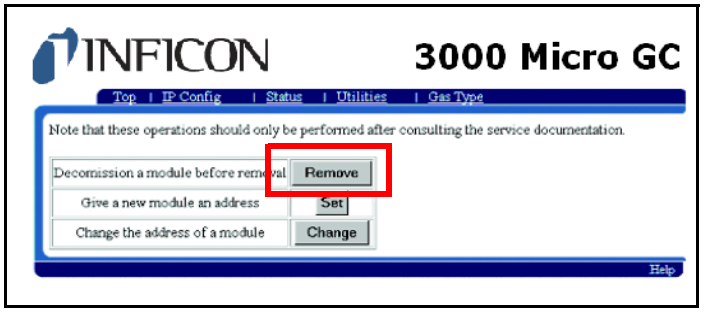
Figure 8-4 Change module configuration



4 Two caution messages appear. Read the caution, then click **OK** to continue.

5 Click **Remove.** See Figure 8-5.

Figure 8-5 Decommission a GC module - remove button



NOTE: Once a Standard GC module is decommissioned, it can no longer be used until it is recommissioned.

6 Click **Remove** next to the Standard GC module to decommission. A caution appears. Read the caution, then click **OK** to decommission the Standard GC module. See Figure 8-6.

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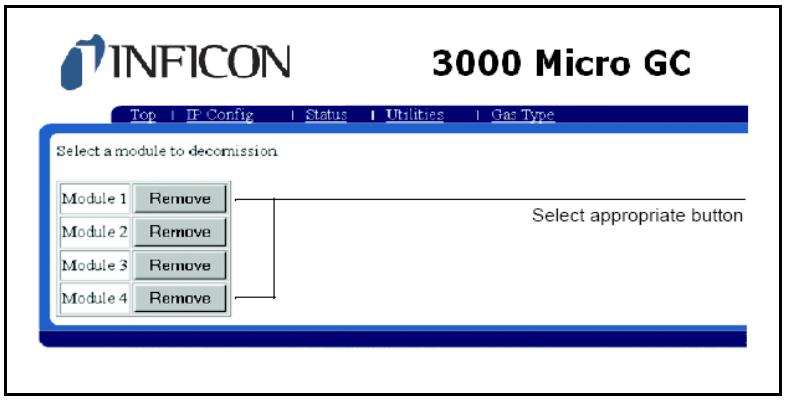
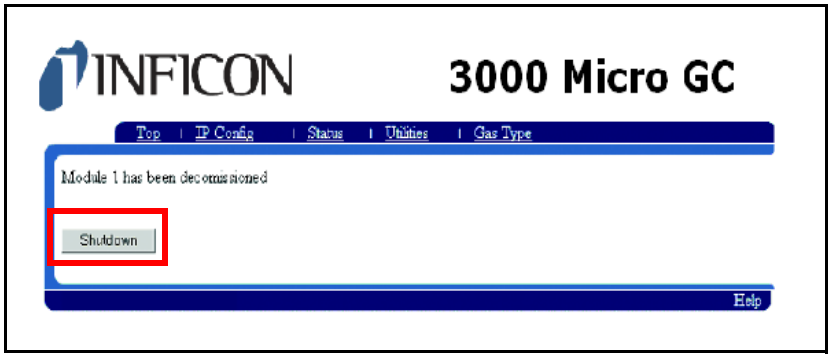
Figure 8-6 Decommission a GC module - remove options



7 Click **Shutdown** on the confirmation message. See Figure 8-7.

Figure 8-7 Decommission a module - shut down



CAUTION

Do not turn off the power without waiting at least three minutes. 3000 Micro GC must update configuration files before power is turned off. If power is turned off too soon, the files could be corrupted, making 3000 Micro GC inoperable.

8 Wait at least three minutes before shutting down 3000 Micro GC. See Figure 8-8.

Figure 8-8 Decommission a GC module - restart instrument countdown

9 Set the 3000 Micro GC front panel power switch to the off position.

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8.2.5 Remove a GC Module

The old GC Module must be physically removed from 3000 Micro GC before the new GC Module is installed. The following procedure outlines how to remove the left, or Channel A, GC module in a 2-channel 3000 Micro GC. The process is similar for any channel.

CAUTION

During the module removal process, 3000 Micro GC internal components will be exposed. To avoid damaging 3000 Micro GC, turn the power switch off and disconnect all external power.

CAUTION - Static Sensitive Device

Electrostatic Discharge can damage electronic components. Wear a grounded wrist strap to avoid damaging 3000 Micro GC. A disposable, grounded wrist strap is provided with each new module.

1. Make sure 3000 Micro GC is off (refer to section 8.1.2, Shutdown/Restart, on page 8-3).
2. Remove the top cover of the 3000 Micro GC.
3. Loosen the thumbscrews in the manifold cover plate. See Figure 8-9.
4. Remove the manifold cover plate. In the two screw design, slide the manifold cover plate towards the GC module to disengage the hook in the cover plate from the tab in the chassis.

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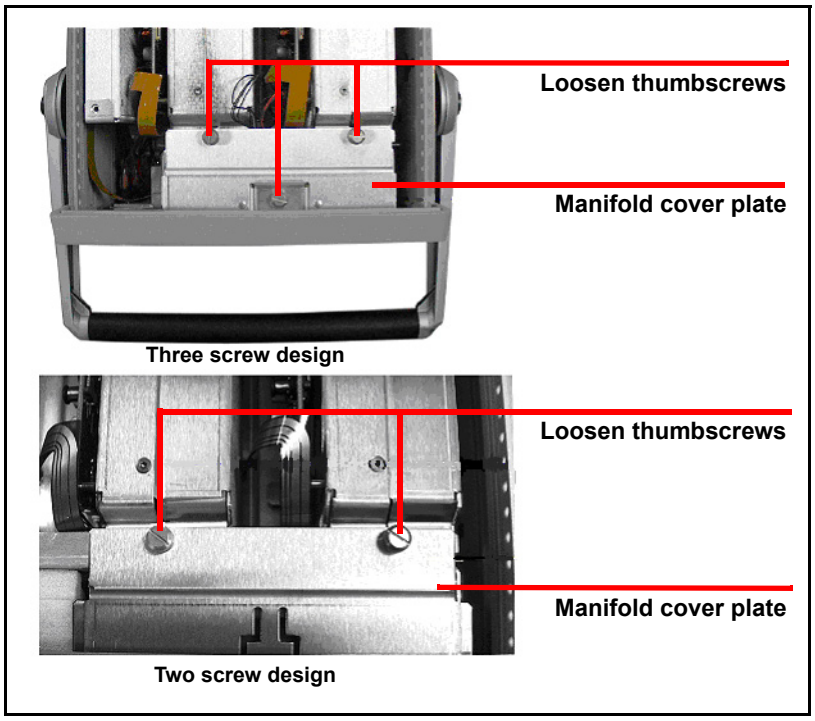
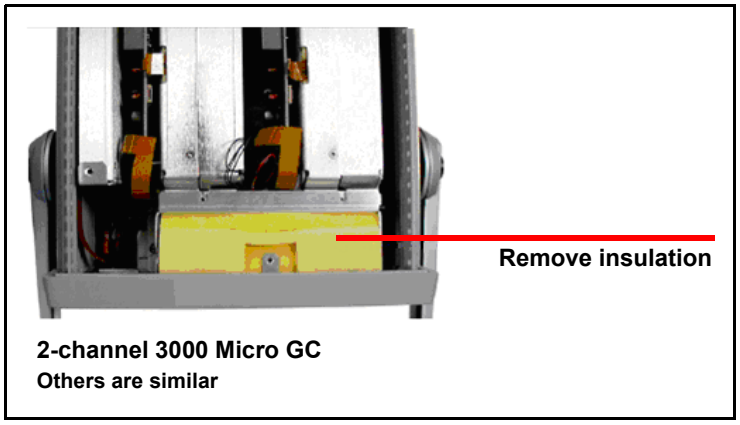
Figure 8-9 Thumbscrews on manifold cover plate



5 Carefully remove the manifold insulation. Save it for reuse. See Figure 8-10.

Figure 8-10 Inlet manifold insulation



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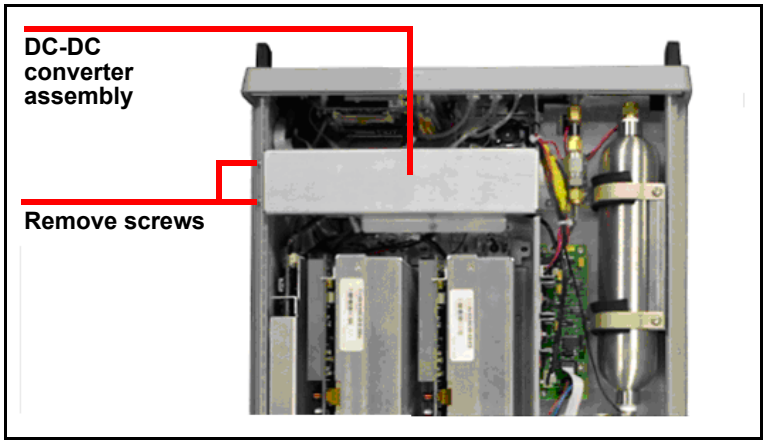
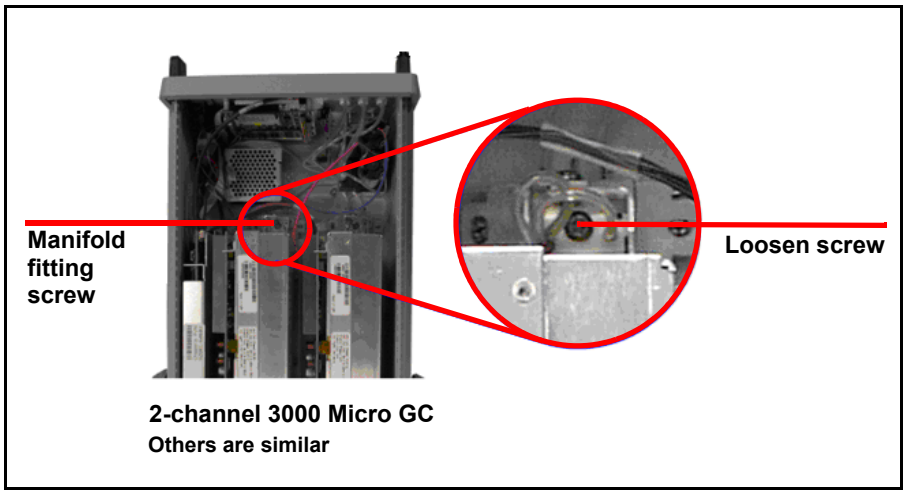
NOTE: In Portable 3000 Micro GC, the DC-DC converter assembly blocks access to the GC modules. Remove the screws that secure the DC-DC converter assembly to the side of the chassis. Without disconnecting any wires, slide the assembly off of the standoffs and gently lift it away from the GC modules. See Figure 8-11.

Figure 8-11 DC-DC converter assembly (Portable 3000 Micro GC only)



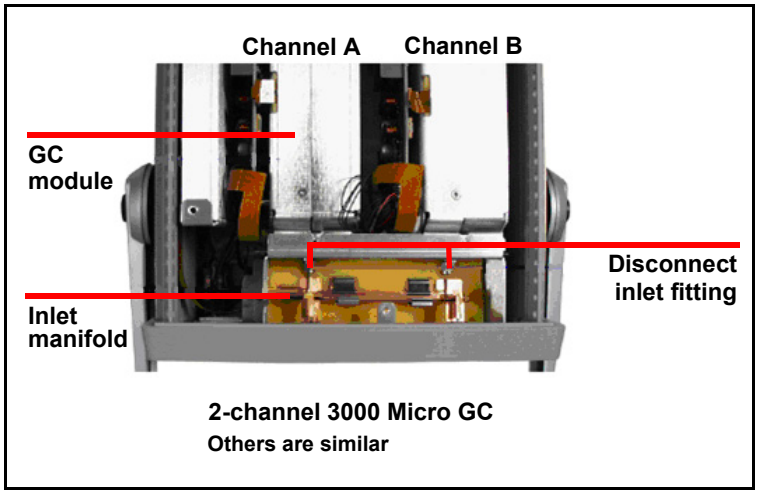
6 Loosen the screw in the inlet manifold fitting at the back of the GC module using a T-20 screwdriver. See Figure 8-12.

Figure 8-12 Disconnect GC module manifold fitting



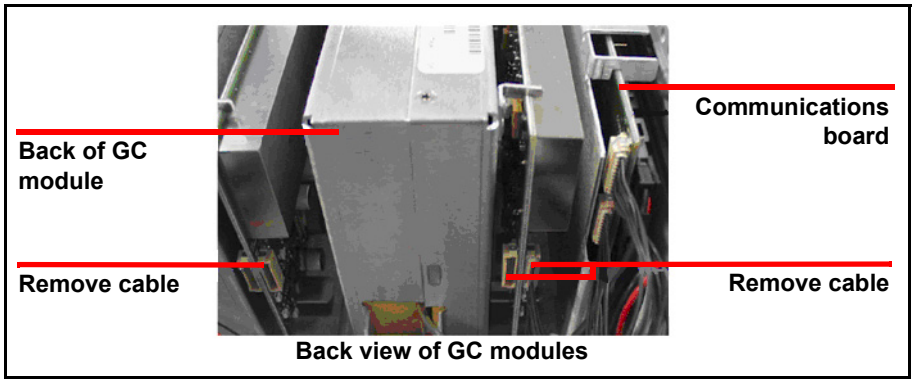
7 Disconnect the inlet manifold fitting from the GC module input fitting using a 1/4 in. open-ended wrench. See Figure 8-13.

Figure 8-13 Disconnect inlet fitting



8 Disconnect the communication cables leading from the GC modules, if present, to the communications board connectors for the GC modules. If necessary, disconnect the fan power cables. See Figure 8-14.

Figure 8-14 Disconnect communication cables



9 Tilt the back of the GC module up until the mounting flange clears the alignment pins. Slide the GC module towards the back of the chassis until it clears the inlet manifold frame and can be angled and removed from the front. See Figure 8-15.

CAUTION

Be sure to lift and remove the GC module from the front end of the GC to avoid damage to the sample pumps in the rear. Also, be careful to avoid damaging any nearby wires or cables.

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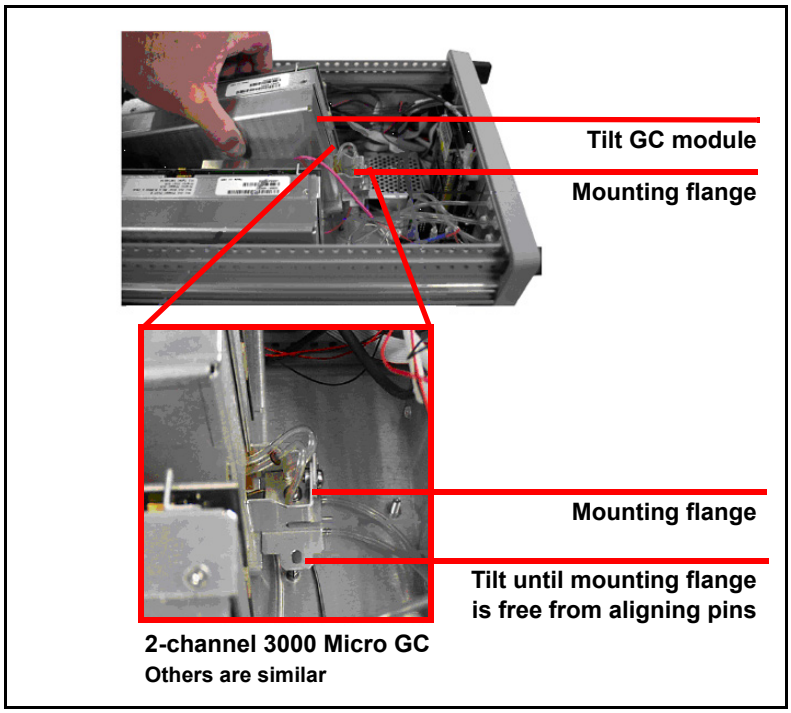
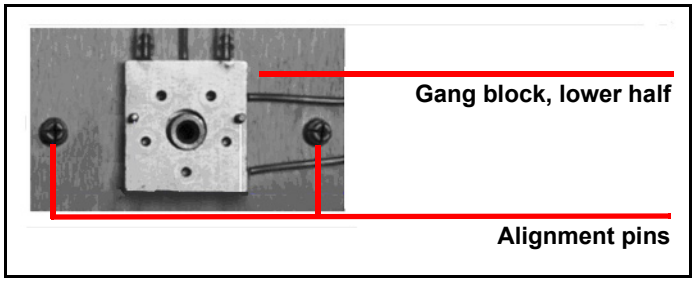
Figure 8-15 Remove the GC module



10 Inspect the gang block fitting on the bottom of the chassis to ensure the mating surface is clean. See Figure 8-16.

Figure 8-16 Gang block fitting



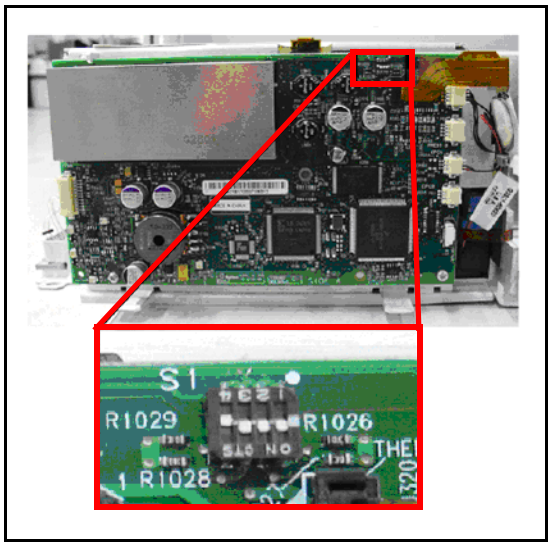
8.2.6 Install a GC Module

Once a module is removed, it can be replaced with another module. If the replacement module uses a different carrier gas, follow the procedure in section 6.4, Change Carrier Gas Configuration, on page 6-9.

NOTE: For the Standard GC Module, skip step 1 and proceed to step 2.

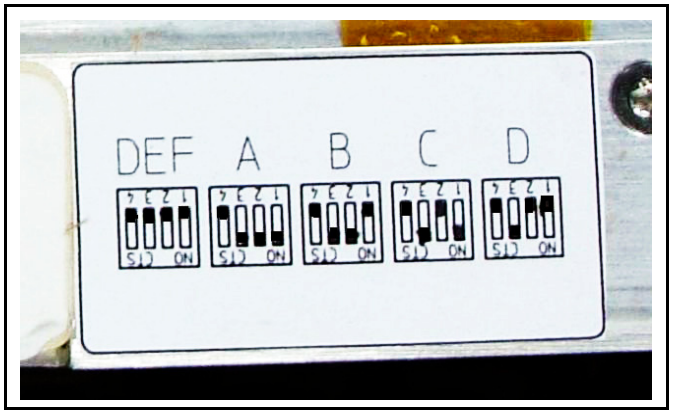
1 Set the Performance Enhanced GC module address by setting the DIP switch on the upper right of the D-board to the appropriate configuration. See Figure 8-17.

Figure 8-17 DIP switch position on the D-board



Each setting determines a unique module address. Refer to the label on the top of the module. **DEF** is the default DIP switch setting that is set in the factory. See Figure 8-18.

Figure 8-18 Module address label on top of a performance enhanced module



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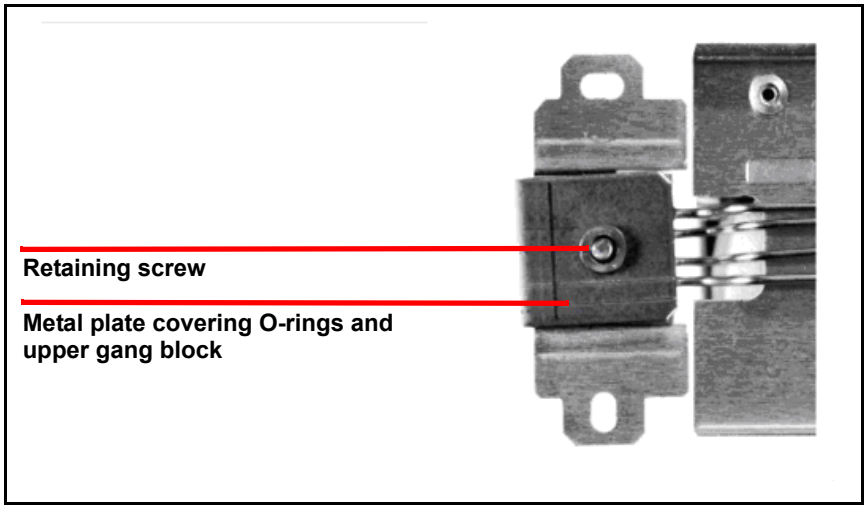
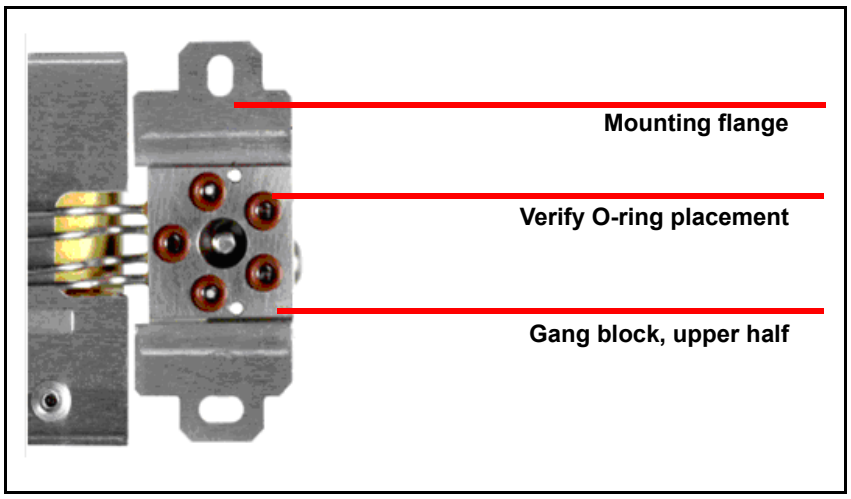
2 Remove the small metal plate covering the O-rings on the upper gang block. See Figure 8-19.

Figure 8-19 Protective plate on upper gang block



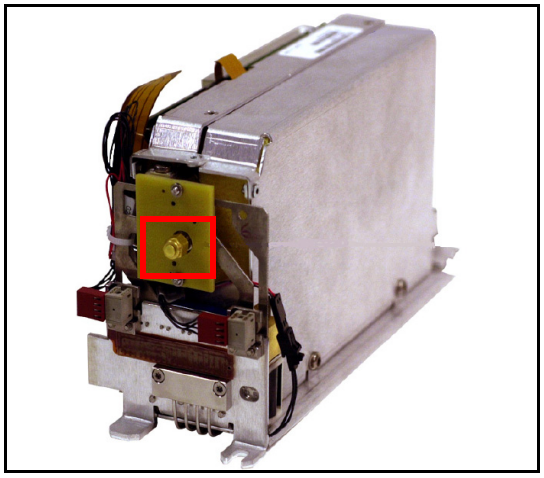
3 Inspect the GC module mounting flange fitting to verify all new O-rings on the replacement GC module are undamaged and seated properly. See Figure 8-20.

Figure 8-20 Inspect the new O-rings



4 Remove the protective 1/4 in. cap from the GC module inlet fitting. See Figure 8-21.

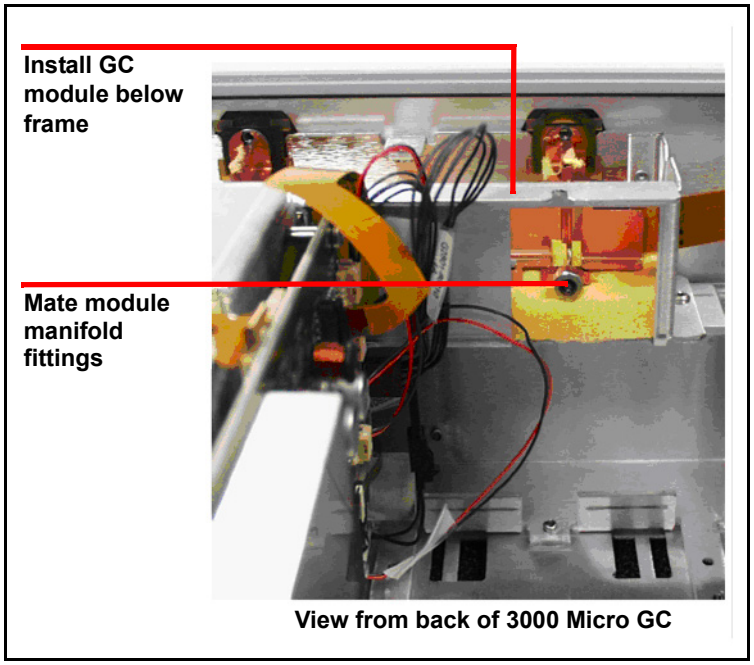
Figure 8-21 GC module inlet fitting with cap



5 Lower the back of the GC module into position, until there is enough clearance to position it into place under the lip of the inlet manifold frame. Simultaneously, make sure the GC module inlet fitting mates with the Swagelok fitting in the 3000 Micro GC inlet manifold. See Figure 8-22.

6 Slide the GC module towards the front of the chassis, until the GC module is fully seated into the Swagelok fitting in the 3000 Micro GC inlet manifold.

Figure 8-22 Install the new module



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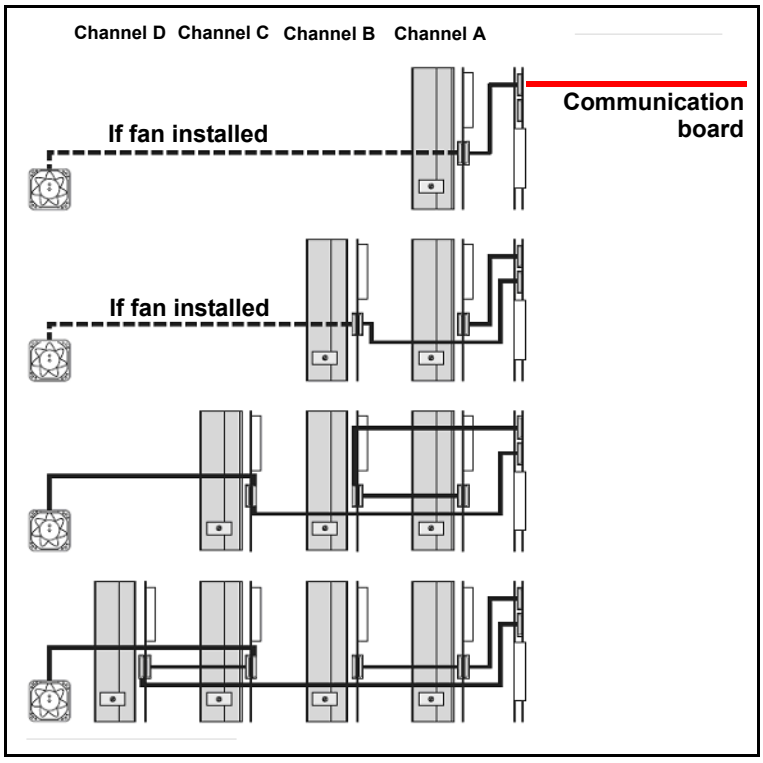
7 Reconnect the communications cables. See Figure 8-23.

NOTE: Do not connect more than two GC modules in series per communications board connection.

NOTE: The GC modules and communications board use parallel communications; both connectors on each item function similarly.

Figure 8-23 Examples of GC module cabling



8 Connect the inlet manifold to the GC module input fitting and tighten it finger tight. Using a 5/16 in. open-ended wrench, tighten 1/4-turn past finger tight.

9 Tighten the screw in the mounting flange.

10 Carefully replace the inlet manifold insulation.

11 Install the manifold cover plate and the top cover.

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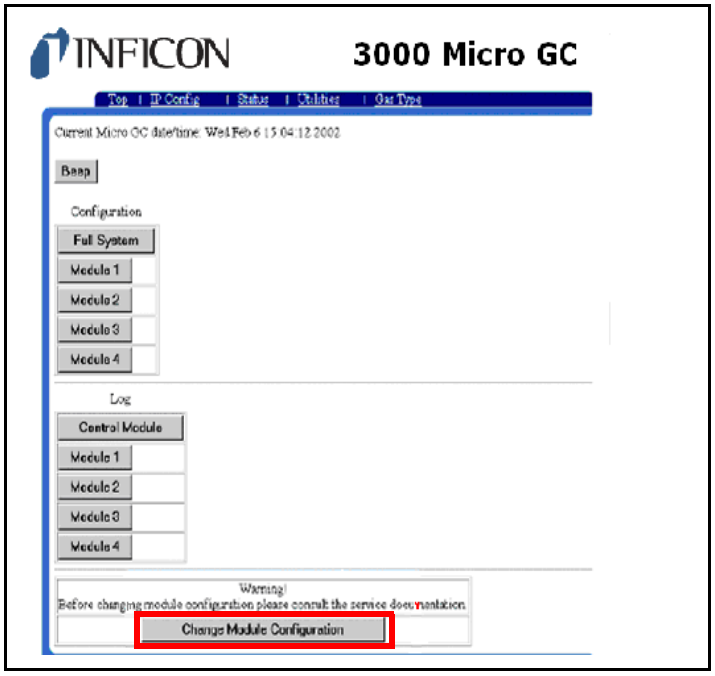
8.2.7 Commission a New Standard GC Module

For Standard GC modules, a new module IP address must be assigned to the newly installed GC module. This can be accomplished using the embedded 3000 Micro GC web page.

NOTE: For a Performance Enhanced GC module, these steps can be skipped. Proceed to section 8.2.8, Enable the Instrument in EZ IQ, on page 8-22.

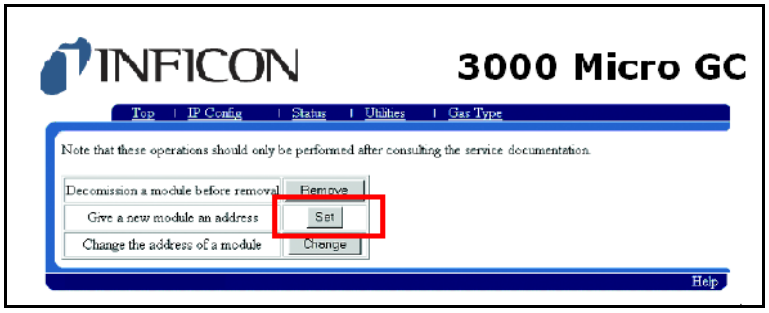
1. Turn 3000 Micro GC on
2. Wait three minutes for the instrument to fully power up.
3. In the web browser address bar, type the 3000 Micro GC IP address.
4. Click the **Utilities** tab.
5. Click **Change Module Configuration**.

Figure 8-24 Change module configuration



6. Click **Set**. See Figure 8-25.

Figure 8-25 Commission a standard GC module - set



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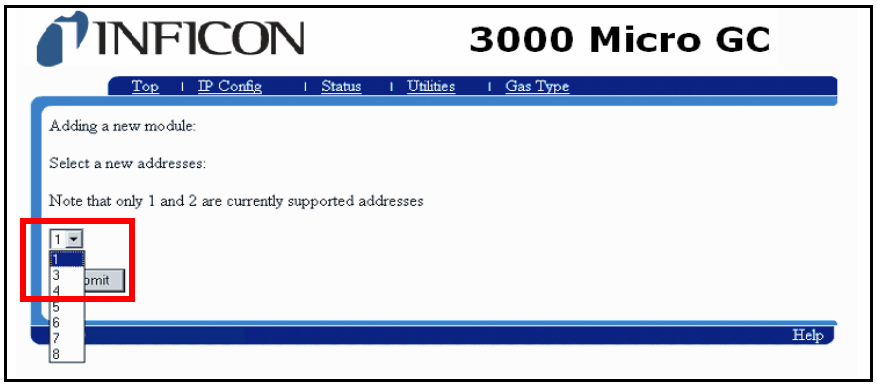
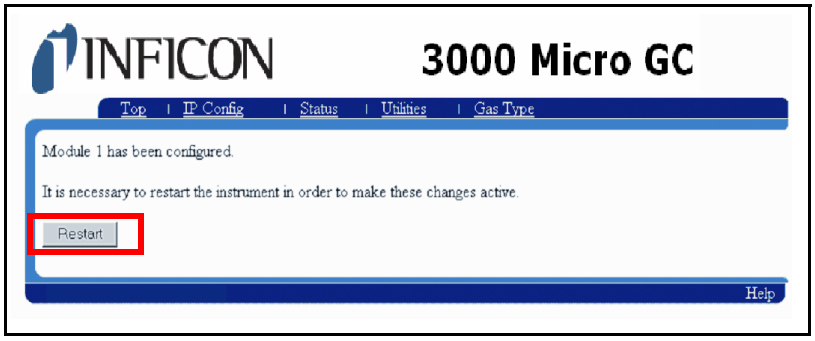
7 Select the correct module address for the new standard GC module from the drop-down list (see Figure 8-26) to . Each module address corresponds to a channel number. Valid 3000 Micro GC module addresses are **1** through **4**.

Figure 8-26 Commission a standard GC module - select module



8 After selecting the module address, click **Restart** to incorporate the changes. See Figure 8-27.

Figure 8-27 Commission a standard GC module - restart



CAUTION

Do not turn off the power without waiting at least three minutes. 3000 Micro GC must update configuration files before power is turned off. If power is turned off too soon, the files could be corrupted, making 3000 Micro GC inoperable.

9 Wait at least three minutes before shutting down the instrument. See Figure 8-28.

Figure 8-28 Commission a standard GC Module - restart instrument countdown

10 Set the 3000 Micro GC front panel power switch to the off position.

8.2.8 Enable the Instrument in EZ IQ

Update EZ IQ with updated 3000 Micro GC hardware configuration after:

- installing the replacement Standard or Performance Enhanced GC module
- updating the GC firmware

For instruction on how to update 3000 Micro GC instrument configuration in EZ IQ, refer to section 7.2 on page 7-1.

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8.3 Sample Conditioners

8.3.1 Sample Conditioner Connections

There are multiple types of optional sample conditioners. A sample conditioner connects directly to the 3000 Micro GC without a basic filter (G2801-60900).

Make sure the proper fittings are available.

8.3.1.1 Connections for Sample Inlet Filter (PN G2801-60900), Pressure Reducer (PN G2815A), Pressure Reducer and Genie Filter Assembly (PN G2816A), and Genie Filter Assembly (PN G2817A)

Table 8-2 Input fitting for the sample inlet filter and sample conditioners

3000 Micro GC or Accessory	User Fitting
GC Input Fitting or Sample Inlet Filter Assembly	1/16 in. Swagelok
G2815A Pressure Reducer	1/8 in. Swagelok
G2816A Pressure Reducer and Genie Filter Assembly	1/8 in. NTP (male)
G2817A Genie Filter Assembly	1/16 in. stainless steel tubing

8.3.1.2 Connections for the Heated Regulator (PN G2818A-X/G2845A-X/G2857A-X)

The Heated Regulator requires a Swagelok quick disconnect fitting. Use the quick disconnect fitting provided with the accessory. This quick disconnect fitting accepts a 7/16 in. threaded male connector.

8.3.1.3 Connections for the Heated Vaporizer (PN G2819A-X/G2846A-X/G2858A-X)

The Heated Vaporizer requires the Swagelok quick disconnect fitting (included with the Heated Vaporizer). This quick disconnect fitting accepts a 7/16 in. threaded male connector.

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8.3.2 Running a Low Pressure, Clean Gas Sample

To obtain a low pressure, clean gas sample, use the standard 10 micron sample inlet filter assembly for filtration (PN G2801-60900, included in the ship kit).

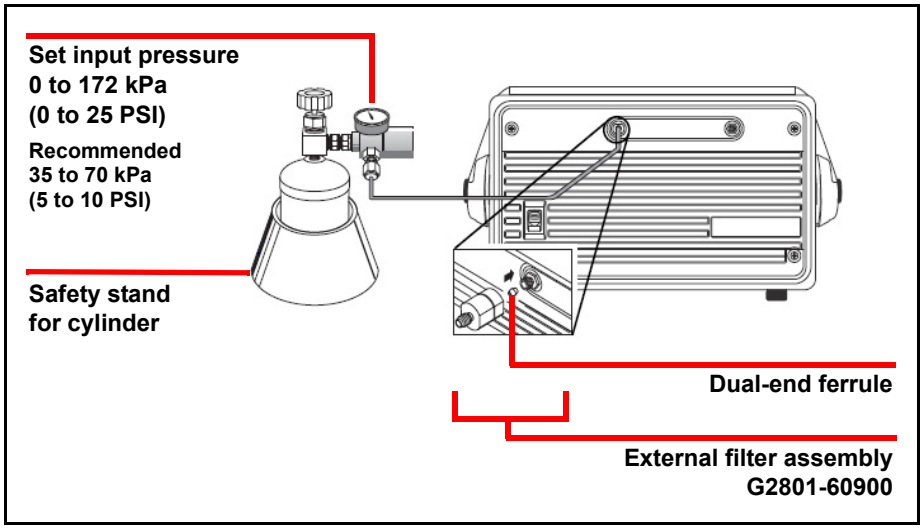
1. Turn 3000 Micro GC on.
2. Make sure the carrier gas supply is sufficient to run all of the samples.
3. If using a sample vessel, prepare the sample.

NOTE: If not installed, install the sample inlet filter assembly. Refer to section 4.2.5.3 on page 4-13.

4. Connect the sample container or gas source to the 3000 Micro GC sample inlet.

NOTE: For sample source pressures above 172 kPa (25 PSI), install a pressure regulator as shown in Figure 8-29.

Figure 8-29 Example sample connection for a clean, low pressure sample



5. Open the sample vessel valve, and adjust the pressure to <172 kPa (<25 PSI).
6. Use EZ IQ software to load the desired method and perform the analysis.
7. When the analysis is complete, close the sample vessel valve and disconnect the vessel from the instrument.
8. Repeat steps 3 to 7 to run the next sample.

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8.3.3 Running a Low Pressure, Liquid/Particulate Containing Gas Sample

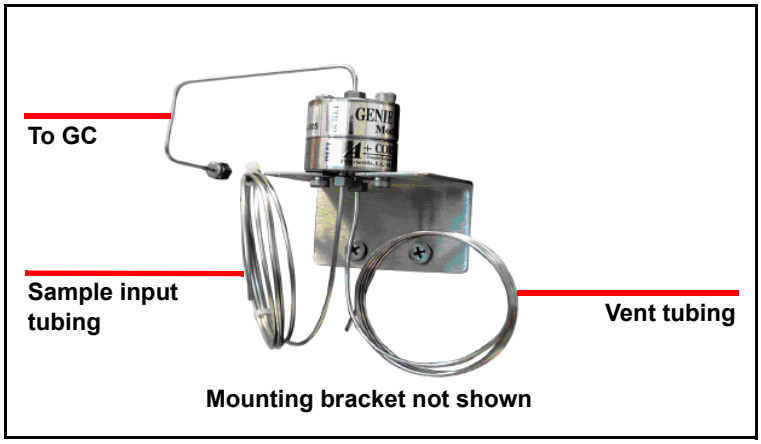
For gas samples containing liquids or particulates, use the Genie Filter Assembly (PN G2817A). See Figure 8-30.

CAUTION

The Genie Filter Assembly sample conditioner is designed to remove small amounts of liquids or particulates. It is not suitable for samples containing large amounts of liquids or particulates.

1. If the Genie Filter Assembly is not installed, refer to section 5.1.3, Installing the Genie Filter Assembly, on page 5-3.

Figure 8-30 Genie filter sample conditioner (PN G2817A)



2. Turn 3000 Micro GC on.
3. Check that the carrier gas supply is sufficient to run all of the samples.
4. If using a sample vessel, prepare the sample.
5. Connect the sample conditioner or gas source to 3000 Micro GC.

CAUTION

For sample source pressures above 172 kPa (25 PSI), install a pressure regulator between the sample source and Genie filter.

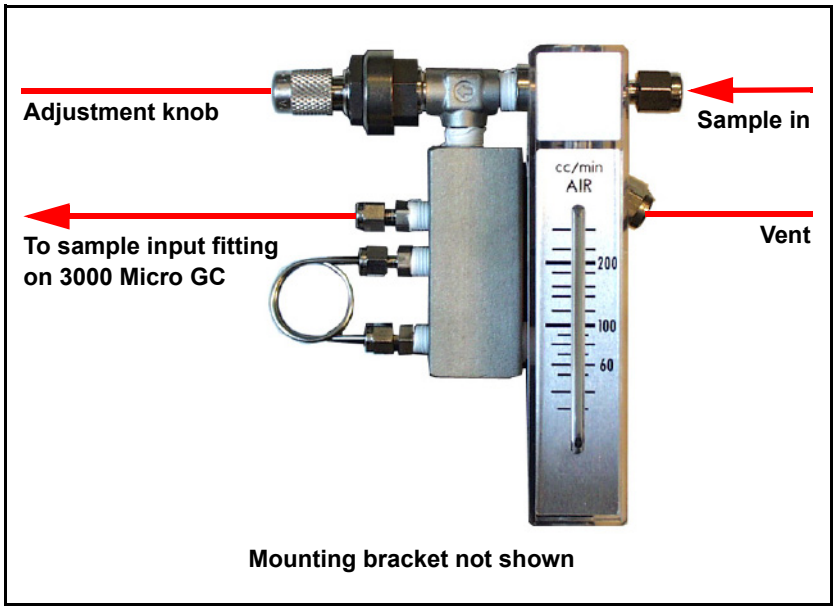
6. Open the sample vessel valve and adjust the pressure to between 70 to 172 kPa (10 to 25 PSI).
7. Use EZ IQ software to load the desired method and perform the analysis.
8. When the analysis is complete, close the sample vessel valve and disconnect the vessel from the instrument.
9. Repeat steps 4 to 8 to run the next sample.

8.3.4 Running a High Pressure Gas Sample without Liquids/Particulates

1 If the Pressure Reducer (PN G2815A) is not installed, install one as instructed in section 5.1.4, Installing the Pressure Reducer, on page 5-8. See Figure 8-31.

NOTE: The Pressure Reducer can connect directly to the 3000 Micro GC or to the sample inlet filter (PN G2801-60900).

Figure 8-31 Pressure reducer sample conditioner (PN G2815A)



2 Turn 3000 Micro GC on.

3 Check that the carrier gas supply is sufficient to run all of the samples.

4 If using a sample vessel, prepare the sample.

5 Connect the sample conditioner or gas source to the sample input fitting on the Pressure Reducer accessory.

6 Open the sample vessel valve.

7 Use EZ IQ software to load the desired method and perform the analysis.

8 When the analysis is complete, close the sample vessel valve and disconnect the vessel from the instrument.

9 Repeat steps 4 to 8 to run the next sample.

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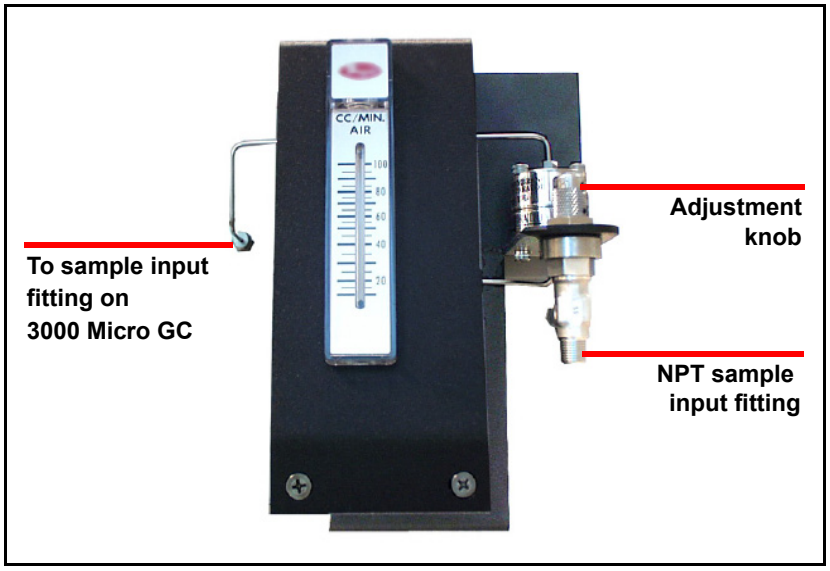
8.3.5 Running a High Pressure Gas Sample with Liquids/Particulates

1. If the Pressure Reducer and Genie Filter Assembly (PN G2816A) are not installed, install them as instructed in section 5.1.5, Installing the Pressure Reducer and Genie Filter Assembly, on page 5-12. See Figure 8-32.

   NOTE: The Pressure Reducer and Genie Filter Assembly can connect directly to 3000 Micro GC or to the sample inlet filter (PN G2801-60900).

   NOTE: There is no set range for the flow meter. Verify some flow is present.

   Figure 8-32 Pressure reducer and Genie filter assembly sample conditioner (PN G2816A)



2. Turn 3000 Micro GC.
3. Check that the carrier gas supply is sufficient to run all of the samples.
4. If using a sample vessel, prepare the sample.
5. Connect the sample vessel or gas source to the NPT sample input fitting on the Genie Filter Assembly.
6. Open the sample vessel valve.
7. Use EZ IQ to load the desired method and perform the analysis.
8. When the analysis is complete, close the sample vessel valve and disconnect the vessel from the instrument.
9. Repeat steps 4 to 8 to run the next sample.

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8.3.6 Running a High Pressure Gas Sample Containing C6+ Components

This procedure is used for samples from heated transfer lines, or from high pressure sample vessels using an INFICON Heated Regulator accessory.

Table 8-3 List of heated regulator IPNs

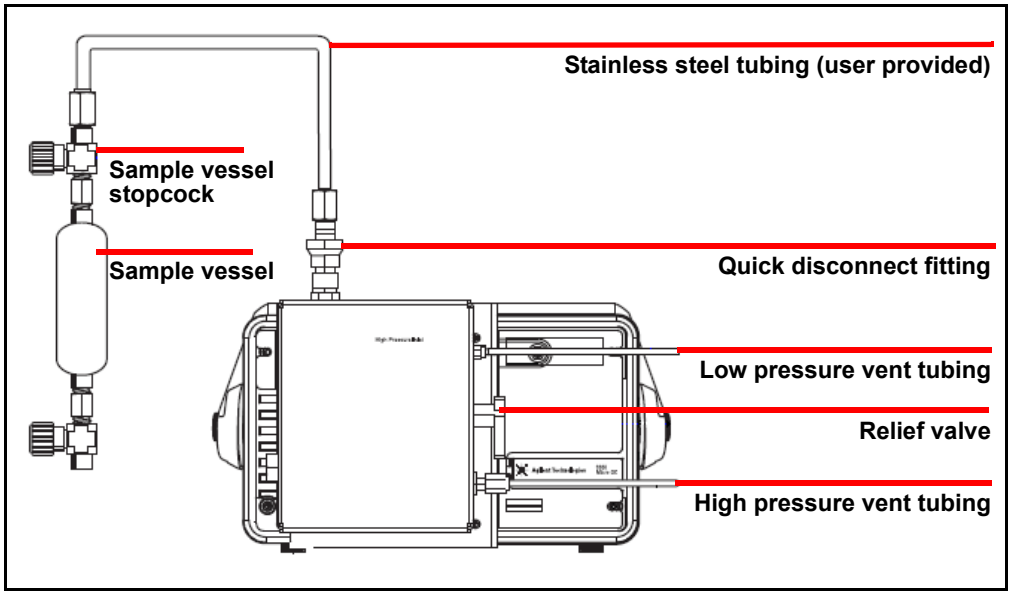
3000 Micro GC Type	Accessory
1,2-Channel 3000 Micro GC	G2818A-X
3,4-Channel 3000 Micro GC	G2845A-X
Portable 3000 Micro GC	G2857A-X

NOTE: The accessories for all 3000 Micro GC types are the same except for their mounting brackets.

8.3.6.1 Using a Sample Vessel

1. If the Heated Regulator accessory is not installed, install it as instructed in section 5.1.6, Installing Heated Sample Introduction Accessories, on page 5-17. See Figure 8-33.

Figure 8-33 Sample vessel connected to heated regulator via quick disconnect fitting (2-Channel instrument shown)



2. Turn 3000 Micro GC on
3. Turn on the Heated Regulator accessory.
4. Allow approximately thirty minutes for the Heated Regulator accessory to stabilize at operating temperature.
5. Check that the carrier gas supply is sufficient to run all of the samples.

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6 Prepare the sample vessel.

7 Connect the sample vessel to the quick disconnect fitting. Moderate pressure may be required for this connection.

8 Open the stopcock on the sample vessel.

9 Slowly turn the relief valve toward **Vent** until a small but steady flow is vented, and allow the sample to purge the line for approximately thirty seconds.

10 Turn the relief valve to **Sample** and allow the system to purge for several minutes.

11 Use EZ IQ software to load the desired method and perform the analysis.

12 When the analysis is complete, close the stopcock on the sample vessel.

13 Turn the relief valve to **Vent** to release the pressure in the system, then close the valve.

14 Remove the sample vessel from the quick disconnect fitting.

15 Repeat steps 4 to 12 to run the next sample.

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8.3.6.2 Using a Transfer Line or Other Continuous Sample Source

1 The Heated Regulator accessory must be installed as instructed in section 5.1.6, Installing Heated Sample Introduction Accessories, on page 5-17.

CAUTION

Liquids and particulates can damage 3000 Micro GC. A user-provided heated separator and an inline filter, between the sample source and 3000 Micro GC, should be installed. These devices will eliminate liquids and most particulates from the gas stream.

CAUTION

To prevent sample condensation, the transfer line should be heated, from the sample source to the Heated Regulator, to a temperature determined by sample composition and pressure.

CAUTION

Shut off the sample stream through the transfer line before connecting the transfer line to 3000 Micro GC. This will prevent high temperatures and pressures from damaging 3000 Micro GC.

WARNING

Vent the high and low pressure exhausts to a safe environment, such as a fume hood or dedicated exhaust. When 3000 Micro GC used in a vehicle, vent the high and low pressure exhausts outside of the vehicle and away from any sources of ignition.

2 Shut off any gas flow through the sample transfer line, if it is not connected to the Heated Regulator.

3 If necessary, purge the transfer line.

4 Turn 3000 Micro GC on.

5 Wait three minutes for 3000 Micro GC to fully power up.

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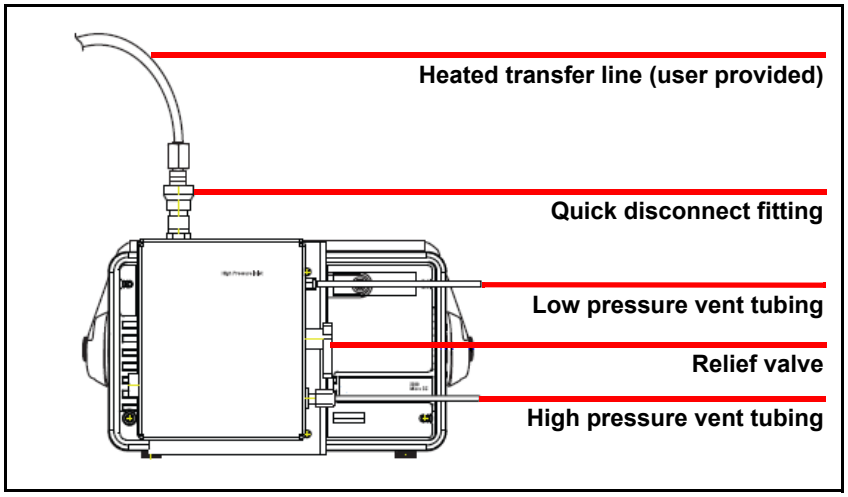
6 Use EZ IQ software to load the desired method.

7 Turn on the Heated Regulator.

8 Wait approximately five minutes for the Heated Regulator to stabilize at operating temperatures.

9 If not already connected, connect the transfer line to the quick disconnect on the Heated Regulator. See Figure 8-34.

Figure 8-34 Typical setup using a transfer line (2-channel instrument shown)



10 Start sample flow through the transfer line to 3000 Micro GC.

8.3.7 Running a High Pressure Liquid Petroleum Gas Sample

This procedure applies to high pressure LPG samples using an INFICON Heated Vaporizer accessory:

Table 8-4 List of heated vaporizer IPNs

3000 Micro GC Type	Accessory
1,2-Channel 3000 Micro GC	G2819A-X
3,4-Channel 3000 Micro GC	G2846A-X
Portable 3000 Micro GC	G2858A-X

NOTE: The accessories for all 3000 Micro GC types are the same except for their mounting brackets.

1 If the Heated Vaporizer for LPG sampling is not installed, install it as instructed in section 5.1.6, Installing Heated Sample Introduction Accessories, on page 5-17.

WARNING

The LPG sample is stored at high pressure. Do not expose the sample vessel to excessive heat or flame.

WARNING

Vent the high and low pressure exhausts to a safe environment, such as a fume hood or dedicated exhaust. When 3000 Micro GC used in a vehicle, vent the high and low pressure exhausts outside of the vehicle and away from any sources of ignition.

CAUTION

The sample to 3000 Micro GC must be relatively clean and dry. While the 2 micron filter will remove many particulate contaminants, samples containing aerosols, excessive amounts of particulate matter, high concentrations of water, and other contaminants can damage 3000 Micro GC.

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2 Turn 3000 Micro GC on.

3 Wait three minutes until 3000 Micro GC has fully powered up.

4 Use EZ IQ software to load the desired method.

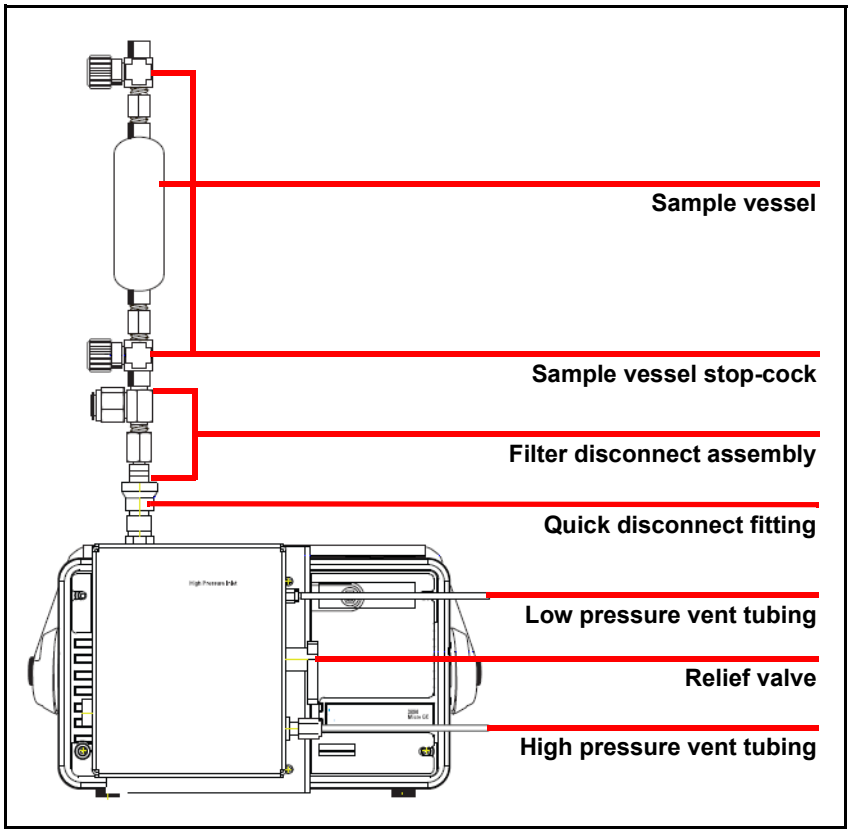
5 Power on the Heated Vaporizer.

6 Wait approximately five minutes for the Heated Vaporizer Assembly to stabilize at operating temperature.

7 Make sure the sample vessel stopcock is closed and the relief valve is turned fully to **Sample**.

8 Connect the sample vessel to the filter disconnect assembly on the Heated Vaporizer. See Figure 8-35.

Figure 8-35 Sample vessel installed on a heated vaporizer (2-channel instrument shown)



9 Open the stopcock on the sample vessel.

10 Slowly turn the relief valve toward **Vent** until a small but steady flow is vented and allow the sample to purge the line for approximately thirty seconds.

11 Turn the relief valve to **Sample**.

12 Use EZ IQ software to load the desired method and perform the analysis.

13 When the analysis is complete, close the stopcock on the sample vessel.

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14 Turn the relief valve toward **Vent** to release the back pressure in the system, then close the valve.

15 Remove the sample vessel from the filter disconnect assembly.

16 Repeat steps 5 to 12 to run the next sample vessel.

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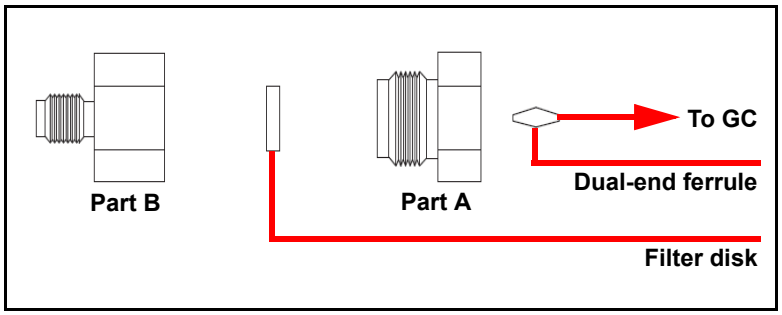
8.4 Consumable Replacement Procedures

8.4.1 Replacing the External 10 Micron Sample Inlet Filter Disk

1. Shut off any sample flow to the GC.
2. Wait for the 3000 Micro GC inlet to cool.
3. Disconnect any sample line or conditioner to the sample inlet filter.
4. Using a 5/16 in. wrench, remove **Part B**. See Figure 8-36.

Figure 8-36 Replacing the sample inlet filter disk



5. Remove the used filter disk from **Part A**.
6. Replace the used filter disk with a new one (PN 5183-4652).
7. Reassemble the sample inlet filter. Turn **Part B** clockwise until finger-tight, then use a wrench to tighten an additional 1/4 turn.

CAUTION

Do not overtighten the sample inlet filter assembly to 3000 Micro GC. This will damage the dual-ended ferrule.

8. Attach sample line or conditioner to sample inlet filter.
9. Resume sample flow as needed.

8.4.2 Replacing the 2 Micron Filter in the Heated Vaporizer (PN G2819A-X/G2846A-X/G2858A-X)

The 2 micron filter assembly uses a replaceable cartridge filter (PN 0100-2034). See Figure 8-37.

Figure 8-37 2 micron filter assembly

If the sample vessel is installed on the sample line, remove it as follows:

1. Close the stopcock on the sample vessel.
2. Turn the relief valve to **Vent** on the Heated Vaporizer and purge all residual pressure remaining in the sample line.
3. Turn the relief valve to **Sample**.
4. Disconnect the sample vessel from the sample line at the quick disconnect.
5. Disassemble the trap halves and replace the filter assembly.

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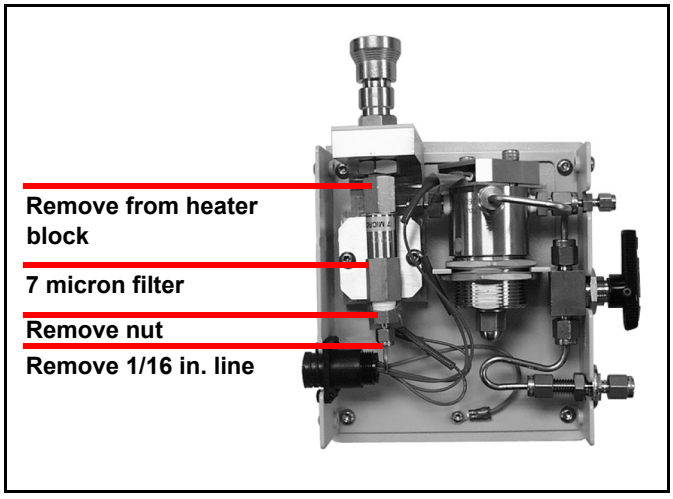
8.4.3 Replacing the 7 Micron Filter in the Heated Regulator (PN G2818A-X/G2845A/G2857A)

The 7 micron filter assembly uses a replaceable cartridge filter (PN 3150-0786). See Figure 8-38.

Figure 8-38 7 Micron filter assembly

1. Turn off any sample flow to 3000 Micro GC.
2. Turn the relief valve to **Vent** on the Heated Regulator and purge all residual pressure remaining in the sample line.
3. Unplug the heated sample conditioner and allow it to cool.
4. Loosen the screws that secure the Heated Regulator cover in place and remove the cover.
5. Remove the 1/16 in. line at the bottom of the filter assembly See Figure 8-39.
6. Remove the nut at the bottom of the filter.

Figure 8-39 Replacing the 7 micron filter



7 Remove the filter from the heater block.

8 Disassemble the trap halves.

9 To prevent potential leaks, wrap pipe thread tape around the filter connector on the Heated Regulator.

10 Replace the 7 micron filter assembly.

8.5 Portable 3000 Micro GC Operation

Due to its internal carrier gas cylinder and battery, Portable 3000 Micro GC requires special precautions and handling procedures.

8.5.1 General Information and Cautions of the Portable 3000 Micro GC

WARNING

Never fill Portable 3000 Micro GC internal gas cylinder with hydrogen. A hydrogen leak inside the Portable 3000 Micro GC can present an explosion hazard.

CAUTION

Portable 3000 Micro GC must not be operated in a vertical position (on the feet that surround the back panel). Portable 3000 Micro GC pneumatic valves need to be positioned horizontally to function properly.

8.5.2 Battery Usage Information

The LED in the front panel switch begins to flash when the battery is about 70% discharged. This indicates that the battery should be recharged as soon as possible.

For optimal performance:

- Whenever possible, operate Portable 3000 Micro GC with the 15 V (dc) power supply connected to the power line. This prolongs the life of the internal battery and minimizes the frequency of recharging.
- Portable 3000 Micro GC is powered from either the internal battery or the charger. The internal battery will operate the instrument up to two hours, depending on the application.
- When operating at high temperatures, as when running a bake out or column conditioning, run 3000 Micro GC from the charger.
- Portable 3000 Micro GC will shut down before the battery is completely drained.

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8.5.2.1 To View the Battery Status

Connect to the Portable 3000 Micro GC embedded web page by entering the IP address in the Internet Explorer address bar (**10.1.1.101** default) and select the **Status** view. Refer to section 6.2 on page 6-6.

NOTE: When recharging the battery, the displayed battery voltage and percent of charge do not apply.

In EZ IQ software, to display the current battery status, click **Control >> Instrument Status**.

8.5.2.2 Charging the Battery

To charge the battery, plug the battery charger into an electrical outlet and then into the Portable 3000 Micro GC back panel at the location marked 15 V (dc). The battery will continue to charge while Portable 3000 Micro GC is operating.

When operating Portable 3000 Micro GC from the Vehicle Power Charger (PN G2751-60530), the internal battery will charge only if the input from the vehicle's power adapter is >13.5 V (dc). Due to variation in vehicle manufacturing, consult the vehicle owner's manual to ensure the vehicle can safely supply the maximum power required by Portable 3000 Micro GC.

A new Portable 3000 Micro GC must be charged sixteen hours before use.

Portable 3000 Micro GC can be left on the charger indefinitely.

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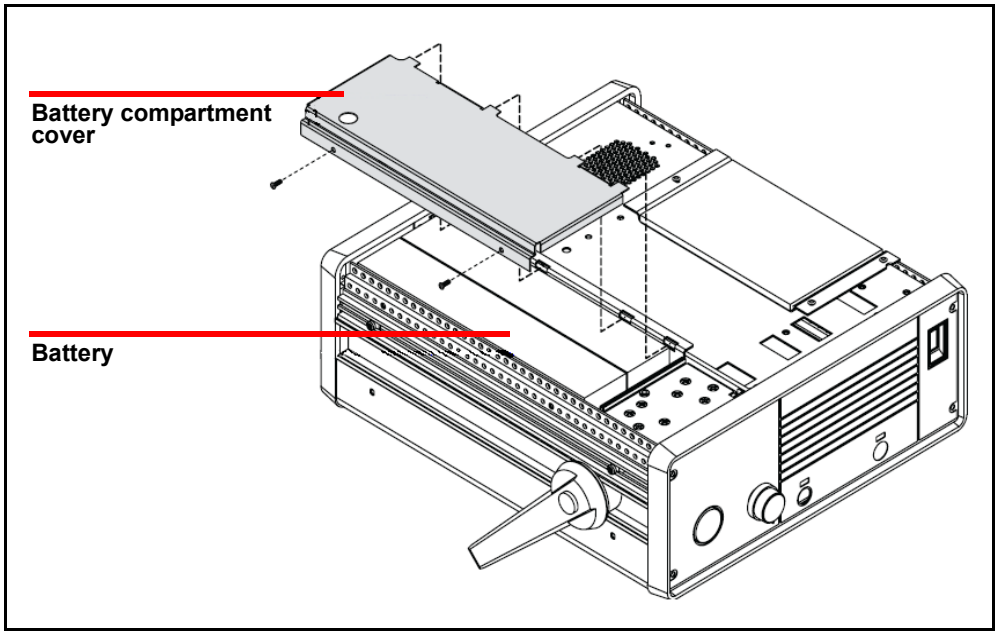
8.5.2.3 Replace the Battery

To replace the battery:

1. Shutdown the 3000 Micro GC, refer to section 6.3.3, Shutdown, on page 6-8.
2. Turn off the carrier gas.
3. Turn off the power.
4. Disconnect the power cord.
5. Remove the screws from the Portable 3000 Micro GC top cover.
6. Remove the top cover.
7. Turn Portable 3000 Micro GC over and remove the screws from the bottom cover.
8. Remove the bottom cover.
9. Facing the front panel of Portable 3000 Micro GC, the battery compartment is located on the top left side. See Figure 8-40. The panel covering the compartment is held by two Torx screws on the outer edge of the panel. Remove these screws and remove the panel.

Figure 8-40 Portable 3000 Micro GC battery compartment



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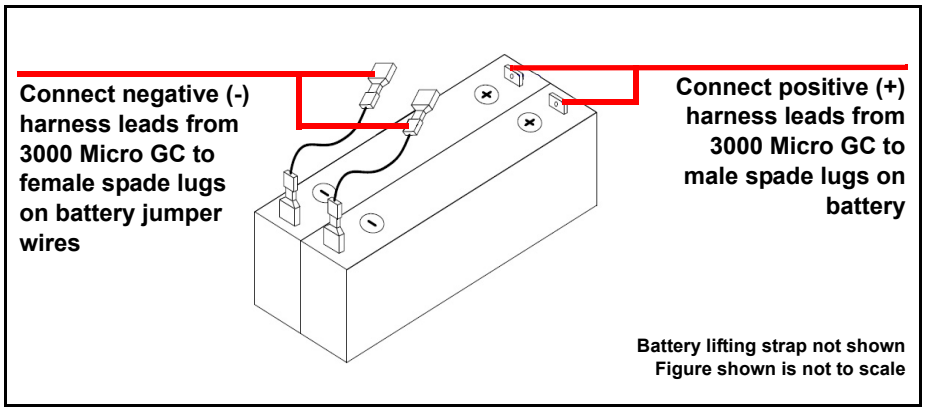
10 Lift the battery pack to expose the wiring connections.

10a Disconnect the positive (**+**) wires from the battery's male spade lugs.

10b Disconnect the battery's negative (**-**) jumper wires from the Portable 3000 Micro GC power harness. The battery comes with negative jumper wires installed. See Figure 8-41.

Figure 8-41 Battery and connections



11 Connect the wires to the new battery as shown in Figure 8-41.

12 As the new battery is lowered into place, guide the wires through the chassis holes and pull any remaining wire slack through the other side of the chassis to avoid crimping or pinching the wires.

13 The positive battery terminals should be nearest the Portable 3000 Micro GC back panel when the battery is properly installed.

14 Replace the battery compartment cover

15 Replace the bottom cover.

16 Replace the top cover.

NOTE: Dispose of the battery in accordance with local laws.

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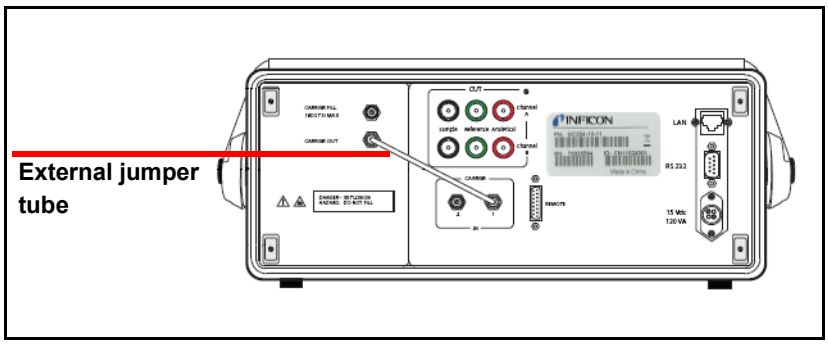
8.5.3 Onboard Carrier Gas Supply

The onboard carrier gas cylinder connects to the Portable 3000 Micro GC carrier input fitting through the external jumper tube. See Figure 8-42.

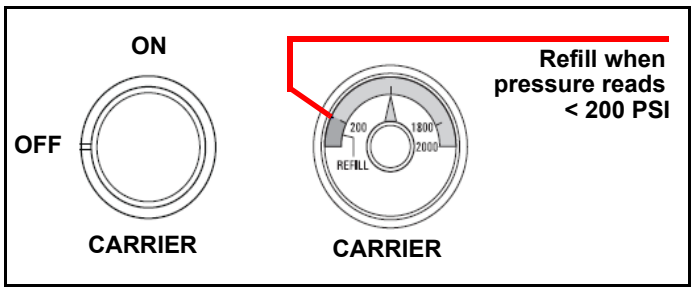
Figure 8-42 External jumper tube



Internal pressure regulators and a check valve ensure a steady 550 kPa (80 PSI) carrier gas supply to Portable 3000 Micro GC when the **CARRIER** knob is turned **ON**. See Figure 8-43.

The onboard carrier gas cylinder requires periodic refilling. Refill the cylinder when the pressure gauge on the front panel reads <200 PSI.

Figure 8-43 Portable 3000 Micro GC pressure controls



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8.5.3.1 Refill Onboard Carrier Gas Cylinder

Portable 3000 Micro GC contains a refillable, high pressure carrier gas supply cylinder. The cylinder volume is 300 mL and will last 35 to 40 hours under normal operating pressure. This cylinder has been certified by the U.S. Department of Transportation (DOT) to a pressure of 1800 PSI (12,405 kPa). The pressure in the onboard carrier gas cylinder is indicated on the front panel pressure meter. When the pressure becomes low, follow the procedure below to refill the cylinder.

WARNING

Never fill the Portable 3000 Micro GC internal gas cylinder with hydrogen. A hydrogen leak inside the instrument can present an explosion hazard.

WARNING

High pressure gas is very dangerous. Refill the tank safely using the INFICON Carrier Gas Cylinder Recharge Kit.

Components Required:

- Portable 3000 Micro GC Carrier Gas Cylinder Recharge Kit (PN PNU-2058)
- Portable 3000 Micro GC
- Bulk carrier gas cylinder, 1800 PSI (12,405 kPa) or less, with CGA-580 fittings

WARNING

INFICON is not responsible for any personal injury or damage to equipment as a result of filling gas cylinders using the Portable 3000 Micro GC Carrier Gas Cylinder Recharge Kit.

WARNING

Read the entire procedure before making any connections.

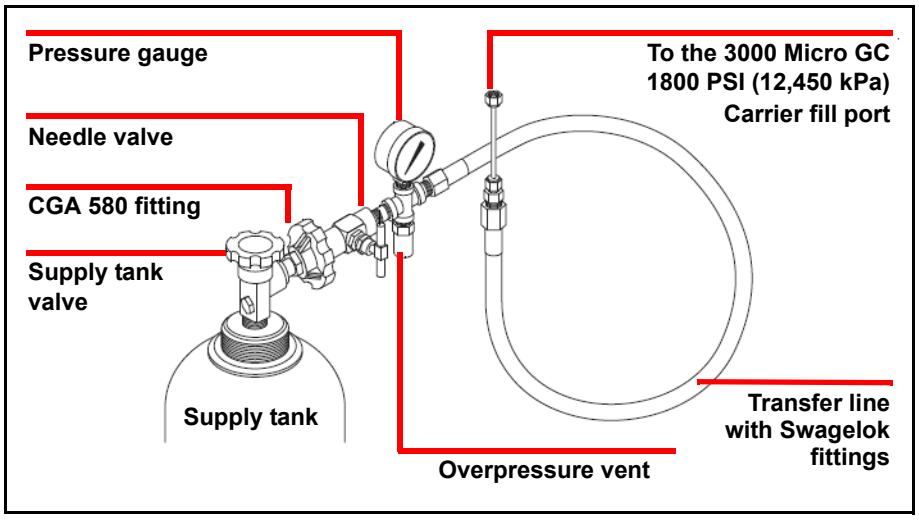
WARNING

Wear eye protection when using compressed gas.

Proceed as follows:

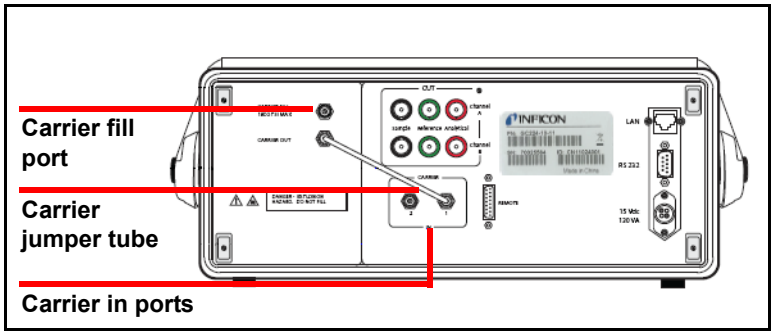
1. Connect the Carrier Gas Cylinder Recharge Kit (PN PNU-2058) to the supply tank via the CGA-580 fitting. See Figure 8-44. To avoid leaks, tighten the connections securely.
2. Make sure the needle valve of the Carrier Gas Cylinder Recharge Kit is fully closed by turning the needle valve clockwise until it is firmly seated. See Figure 8-44.

Figure 8-44 Cylinder recharging kit setup



3. Partially open the valve on the supply tank. No gas should flow.
4. Loosely connect the 1/8 in. tube from the Carrier Gas Cylinder Recharge Kit to the **CARRIER FILL** (Swagelok) port on the Portable 3000 Micro GC back panel. See Figure 8-45.

Figure 8-45 Back of Portable 3000 Micro GC



5. Partially open the needle valve on the Carrier Gas Cylinder Recharge Kit and listen for gas leaking through the loose 1/8 in. fitting on the back panel. This purges the Carrier Gas Cylinder Recharge Kit transfer lines so that no air enters Portable 3000 Micro GC.
6. After the transfer lines have been sufficiently purged (about fifteen seconds), tighten the 1/8 in. fitting on the back panel of Portable 3000 Micro GC.

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7 Turn the needle valve on the Carrier Gas Cylinder Recharge Kit clockwise until closed.

8 If the carrier gas cylinder has not been completely emptied, loosen the Swagelok fitting that secures the carrier jumper cable (refer to Figure 8-45) to the **CARRIER IN** port on the back panel.

9 Empty the remaining carrier gas in the internal cylinder by slowly turning the Carrier ON/OFF control valve on the front panel to the **ON** position. When no more gas is heard escaping, turn the Carrier ON/OFF control valve to the **OFF** position.

10 Slowly open the needle valve on the Carrier Gas Cylinder Recharge Kit until there is an increase in pressure on the Carrier Gas Cylinder Recharge Kit pressure gauge.

11 When the pressure gauge reads approximately 500 PSI, turn the Carrier ON/OFF control valve to the **ON** position. There will be a rush of gas escaping from the end of the carrier jumper tube. When the gauge needle returns to zero, turn the Carrier ON/OFF control valve to the **OFF** position. The pressure gauge needle will begin to rise again. When the pressure gauge reaches 500 PSI, repeat the process. For best results, the Portable 3000 Micro GC carrier gas cylinder should be purged, as described above, a minimum of three times.

12 Close the needle valve on the Carrier Gas Cylinder Recharge Kit.

13 Tighten the Swagelok connection between the Carrier Jumper Tube (Figure 8-45) and the **CARRIER IN** port on the Portable 3000 Micro GC back panel.

14 Observe the pressure gauge in the Carrier Gas Cylinder Recharge Kit. Partially open the needle valve on the Carrier Gas Cylinder Recharge Kit. When the pressure on the gauge reads 1500 to 1800 PSI, close the needle valve on the Carrier Gas Cylinder Recharge Kit. *Do not exceed 1800 PSI (12,405 kPa).*

WARNING

If the pressure in the Portable 3000 Micro GC tank exceeds 1800 PSI (12,405 kPa) during filling, a relief valve on the Carrier Gas Cylinder Recharge Kit will open with a loud startling noise. The relief valve will remain open, and the noise will continue, until the tank pressure drops to 1800 PSI (12,405 kPa).

15 Completely close the valve on the supply tank and disconnect the 1/8 in. connector on the Carrier Gas Cylinder Recharge Kit from the back panel of the Portable 3000 Micro GC.

16 Replace the Swagelok 1/8 in. cover fitting over the carrier fill inlet.

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17 Set gas delivery pressure and check for leaks. See Table 8-5.

Table 8-5 Carrier gas delivery pressure

Carrier Gas	Required Delivery Pressure
helium*	552 +/- 14 kPa (80 +/- 2 PSI)
argon	552 +/- 14 kPa (80 +/- 2 PSI)
nitrogen	552 +/- 14 kPa (80 +/- 2 PSI)

* Required for checkout

8.5.3.2 Before Turning Off the Carrier Gas

The internal carrier gas cylinder carries sufficient gas for 35 to 40 hours, under typical operating conditions. Leave the carrier gas **ON** between analyses to protect the column(s) and detector(s).

If it is necessary to turn off the carrier gas between analyses, refer to section 8.1.2 on page 8-3 for instructions on shutting down 3000 Micro GC.

CAUTION

Abruptly stopping the carrier gas flow to a hot column and filament may result in damage to Portable 3000 Micro GC.

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Chapter 9
Troubleshooting

9.1 Symptom, Cause, and Remedy Tables

The following tables identify common symptoms, causes and remedies. For additional information, or if the symptom does not appear in the tables, see section 9.2 on page 9-10.

9.1.1 Common Chromatographic Problems

Table 9-1 Common chromatographic problems

Symptom	Possible Cause	Remedy
Poor sensitivity	Insufficient **Sample Pump** time	In EZ IQ, increase the **Sample Pump** time to at least 15 seconds. If sufficient sample is available, increase to between 30 to 60 seconds.
	Insufficient **Inject Time**	In EZ IQ, increase the **Inject Time**.
	Backflush Time set too early (if applicable)	Increase the **Backflush Time** until all peaks of interest appear on the chromatogram.
	Contamination	Run a bakeout to clean the columns. Refer to section 9.2.2.1 on page 9-18.
	Instrument not sufficiently warmed up	Allow at least 3 minutes for 3000 Micro GC to warm up. Conduct 10 runs and calibrate on the last run.
	External leak	Check carrier gas lines using a leak detector. Tighten all fittings.
	Broken or damaged O-ring	Contact INFICON.
	Loose fitting	Tighten all fittings and connections.
	Low carrier gas pressure	Ensure the carrier gas is supplying at least 78 PSI, and no more that 82 PSI. **CAUTION** **Exceeding 82 PSI for the carrier gas pressure may damage 3000 Micro GC.**

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Table 9-1 Common chromatographic problems (continued)

Symptom	Possible Cause	Remedy
Poor sensitivity (continued)	Impure carrier gas	Ensure the carrier gas purity is between 99.995% and 99.9995%. Add hydrocarbon/moisture/oxygen traps or particulate filters to the carrier gas line to improve purity.
	Internal leak	Contact INFICON.
	Malfunctioning column or injector	Check the flow out of the analytical and reference vents on the back of 3000 Micro GC. If there is no flow from either or both vents, contact INFICON.
	Malfunctioning TCD	Contact INFICON.
Flat line chromatogram	**Inject Time** set to 0 ms.	In EZ IQ, change the **Inject Time** to a value other than 0 ms.
	Sample Pump turned off	In EZ IQ, ensure that the **Sample Pump** checkbox is selected and set for at least 15 seconds.
	Malfunctioning column or injector	Check the flow coming out of the 3000 Micro GC analytical and reference vents. If there is no flow from either or both vents, contact INFICON.
	Malfunctioning sample pump	Listen for the noise from the pump when taking a sample. If there is no noise, contact INFICON.
	Malfunctioning TCD	Contact INFICON.
Missing peak	**Backflush Time** set too early (if applicable)	Increase the **Backflush Time** until all peaks of interest appear on the chromatogram.
Saturated peak	**Inject Time** too long	In EZ IQ, shorten the **Inject Time**.
	Injector Temperature too high	In EZ IQ, lower the **Injector Temperature**.
	Detector Sensitivity set to **High**	In EZ IQ, set the **Detector Sensitivity** to **Standard**.

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Table 9-1 Common chromatographic problems (continued)

Symptom	Possible Cause	Remedy
Chromatograms not separating/no data is showing	3000 Micro GC requires power cycle	Restart 3000 Micro GC as instructed in section 6.3.2, Restart, on page 6-8.
	View is set to **Overlay**	In EZ IQ, click **View >>Tile All Data** to generate separate chromatograms.
	EZ IQ requires restart	Close EZ IQ and re-open. Restart the computer if necessary.
Chromatograms not separating/no data is showing (continued)	Drivers are corrupt	Re-configure the drivers through EZ IQ **Config**.
Calibration is poor	Contamination in calibration or carrier gas	Ensure the carrier gas purity is between 99.995% and 99.9995%. Add hydrocarbon/moisture/oxygen traps or particulate filters to the carrier gas line to improve purity.
		Ensure there are no contaminants in the calibration gas.
	Instrument requires power cycle	Restart 3000 Micro GC as instructed in section 6.3.2, Restart, on page 6-8.
	External leak	Check carrier gas lines using a leak detector. Tighten all fittings.
	Poor integration	Ensure all of the peaks of interest are identified and fully integrated.
	Backflush Time set too early (if applicable)	Increase the **Backflush Time** until all peaks of interest appear on the chromatogram.

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Table 9-1 Common chromatographic problems (continued)

Symptom	Possible Cause	Remedy
Inverted peaks; large, broad humps in chromatogram	Incorrect carrier gas	Check the carrier gases and ensure that each carrier gas is connected to the correct 3000 Micro GC inlet. See the 3000 Micro GC webpage and verify proper gas setup. Refer to section 6.4, Change Carrier Gas Configuration, on page 6-9.
	Impure carrier gas	Ensure the carrier gas purity is between 99.995% and 99.9995%. Add hydrocarbon/moisture/oxygen traps or particulate filters to the carrier gas line to improve purity.
	Carryover peaks	If broad and sporadic peaks appear, it could indicate carryover from a late-eluting compound. Extend **Run Time** or increase **Column Temperature**. **NOTE:** An increase in column temperature will change component retention times.
Air peak on blank injection	Column head pressure low	Verify there is sufficient carrier gas pressure. Insufficient carrier gas pressure may prevent the inject valve from sealing fully, creating an air leak.
	Internal leak	Contact INFICON.
Significant negative baseline, but peaks still appear	Broken reference column	Contact INFICON.
Poor separation	Contamination	Run a bakeout to clean the columns. See section 9.2.2.1, Column and Detector Bakeout, on page 9-18.
	Column Temperature and **Column Head Pressure** not optimized	Reduce the **Column Temperature** and/or **Column Head Pressure** to achieve better separation.
	Malfunctioning TCD	Contact INFICON.
	Malfunctioning column	Check the flow coming out of the 3000 Micro GC analytical and reference vents. If there is no flow from either or both vents, contact INFICON.

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9.1.2 Common Software Problems

Table 9-2 Common software problems

Symptom	Cause	Remedy
Method grayed out	Instrument not properly configured	Re-configure the drivers through **EZ IQ Config**.
	Incorrect carrier gas	Check the carrier gases and ensure each carrier gas is connected to the correct 3000 Micro GC inlet. See the 3000 Micro GC webpage to verify proper gas setup. Refer to section 6.4, Change Carrier Gas Configuration, on page 6-9.
	EZ IQ is installed incorrectly	Re-install EZ IQ. Refer to the *074-537 EZ IQ Installation Guide*.
Peaks are present, but not identified	Integration settings not optimized	Ensure all of the peaks of interest are identified and fully integrated.
	Peak is outside RT window	In EZ IQ, verify that the peak window contains the desired peak.
TCD and columns turn off	Low carrier gas pressure	Ensure the carrier gas is supplying at least 78 PSI and no more that 82 PSI. **CAUTION** **Exceeding 82 PSI for the carrier gas pressure may damage 3000 Micro GC.**

Table 9-2 Common software problems (continued)

Symptom	Cause	Remedy
TCD and columns turn off (continued)	High carrier gas pressure	Ensure the carrier gas is supplying at least 78 PSI, and no more that 82 PSI. **CAUTION** **Exceeding 82 PSI for the carrier gas pressure may result in damage to 3000 Micro GC.**
	Malfunctioning column or injector	Check the flow coming out of the analytical and reference vents on the back of the instrument. If there is no flow on either/both vents, contact INFICON.
	Malfunctioning TCD	Contact INFICON.
	Malfunctioning EPC valve	Contact INFICON.
Inlet/column temperature not stabilizing	Instrument requires power cycle	Restart 3000 Micro GC as instructed in section 6.3.2, Restart, on page 6-8.
	Hardware problem	Contact INFICON.
Unable to download method/error message	Instrument requires power cycle	Restart 3000 Micro GC as instructed in section 6.3.2, Restart, on page 6-8.
	Incorrect configuration	See section 7.2, Connecting EZ IQ with 3000 Micro GC, on page 7-1.
	EZ IQ requires restart	Close EZ IQ and re-open. Restart the computer if necessary.
	Method is corrupt	Create a new method and reprogram parameters.
	Drivers are corrupt	Configure the instrument through **EZ IQ Config**.
	D-Board error	Contact INFICON.
TCD detector 'fault'	Instrument requires power cycle	Restart 3000 Micro GC as instructed in section 6.3.2, Restart, on page 6-8.
	EZ IQ requires restart	Close EZ IQ and re-open. Restart the computer if necessary.
	Drivers are corrupt	Configure the instrument through **EZ IQ Config**.

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Table 9-2 Common software problems (continued)

Symptom	Cause	Remedy
TCD detector 'fault' (continued)	Malfunctioning column or injector	Check the flow coming out of the 3000 Micro GC analytical and reference vents. If there is no flow from either or both vents, contact INFICON.
	Malfunctioning TCD	Contact INFICON.
Method fields do not appear	Instrument not properly configurated	Re-configure the instrument through **EZ IQ Config**.
	Conflicting module addresses	Ensure the DIP switch is set to the correct address for enhanced modules.
	Corrupted software file	Re-install EZ IQ. Refer to the *074-537 EZ IQ Installation Guide*.

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9.1.3 Common Connection Problems

Table 9-3 Common connection problems

Symptom	Cause	Remedy
3000 Micro GCnot communicating with computer, ping fails and instrument cannot be configured	Instrument requires power cycle	Restart 3000 Micro GC as instructed in section 6.3.2, Restart, on page 6-8.
	EZ IQ requires restart	Exit EZ IQ and re-open. Restart the computer if necessary.
	Loose communication connections	Ensure the LAN cable connection between the controlling computer and 3000 Micro GC is connected and the connectors are properly plugged in.
	Computer IP address set incorrectly	Verify the computer IP address and LAN settings. Refer to section 6.5.1 on page 6-13.
	Conflicting 3000 Micro GC IP address	Verify there are no 3000 Micro GC with the same IP address on the LAN network.
	Power supply voltage too low	Check power supply voltage. ◆ 1-2 channel or 3-4 channel 3000 Micro GC will have communication problems at less than 24 V ◆ Portable 3000 Micro GC will have communication problems at less than 15 V.
	Flash card is unseated	Power off 3000 Micro GC. Open the chassis and locate the flash card on the onboard computer. Remove the flash card and then reseat it. Restart 3000 Micro GC and ping.
	Drivers are corrupt	Re-configure the drivers through EZ IQ **Config**.
3000 Micro GC not communicating with computer, ping fails and instrument cannot be configured (continued)	Malfunctioning OBC	Contact INFICON.
Embedded webpage cannot be accessed, but ping is successful.	Web browser proxy servers are ON	Turn off proxy servers on web browser.
	Instrument IP Address typed incorrectly	Verify that the correct 3000 Micro GC IP address is typed in the address bar of the web browser.

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9.1.4 Common Hardware Problems

Table 9-4 Common hardware problems

Symptom	Cause	Remedy
One carrier runs out faster than another	External leak	Check carrier gas lines using a leak detector. Tighten all fittings.
	Internal leak	Remove the chassis cover and listen for a hissing noise. If the noise is present, the module is not fully seated. Use a Torx 20 screwdriver to tighten the screw connecting the module to the baseplate. If hissing persists, contact INFICON.
Power switch is blinking	Power problem	Contact INFICON.
3000 Micro GC will not turn on	3000 Micro GC not plugged in	Verify that all plugs are in (seated) correctly.
	Power supply is not supplying sufficient voltage	Test the power supply using a voltmeter.
	Hardware problem	Contact INFICON.
Hissing sound within instrument	Internal leak	Remove the chassis cover and listen for a hissing noise. If the noise is present, the module is not fully seated. Use a Torx 20 screwdriver to tighten the screw connecting the module to the baseplate. If hissing persists, contact INFICON.
Pump does not run or runs intermittently	**Sample Pump** turned off	In EZ IQ, ensure the **Sample Pump** checkbox is selected and set for at least 15 seconds.
	Malfunctioning sample pump	Listen for the noise from the pump when taking a sample. If there is no noise, contact INFICON.
Standard module isn't shown on embedded web page	Module not configured	Commission a module through the embedded webpage. Refer to section 8.2.7, Commission a New Standard GC Module, on page 8-20.
	Module had a firmware update	If the module had a firmware upgrade, it must be re-commissioned. Refer to section 6.3.6, Change GC Module Address, on page 6-8.
Module cannot be commissioned	C-Board Configuration Problem	Contact INFICON.
	DIP switch set incorrectly (Enhanced Modules)	Ensure the DIP switch is set to the correct address for Enhanced Modules.

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9.2 Common Chromatographic and Method Problems

This section will provide some guidance to help diagnose common operational problems. If a diagnosis cannot be made, consult:

- *074-538 EZ IQ Operating Manual*
- EZ IQ Online Help
- Chapter 10, Service and Technical Support

This section is divided into two main topics:

1. Chromatographic Problems
2. Method Problems

For communication and hardware problems, consult Table 9-3 on page 9-8 and Table 9-4 on page 9-9. If problems still occur, contact INFICON.

9.2.1 Chromatographic Problems

This section will overview unexpected chromatographic behavior and provide a possible cause and remedy. Problems may arise from:

- Electronic or mechanical failure
- Contaminants in gas lines, injectors, columns and detectors
- Incorrect or inappropriate set points
- Leaks, bleed, or other chromatographic difficulties

These conditions often interact. For example, baseline problems may arise from any combination of the conditions. Accordingly, this section is organized by symptoms with reference to most possible causes.

9.2.1.1 Baseline Symptoms

9.2.1.1.1 Baseline Position

Baseline position changes suddenly during a run. This can result from:

- Detector filament failure
- Valve failure
- EPC failure

Inspect EZ IQ screens for highlighted warnings, or changed run settings. Make any necessary changes. Re-run sample.

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9.2.1.1.2 Baseline Wander and Drift

Baseline wander or drift is to be expected when a flow or temperature setting is changed. With sufficient time, the problem should subside. The following cases assume that sufficient stabilization time has elapsed.

Baseline is erratic; moves up and down (wander)

- Potential column leak; check column connections
- Change the sample conditioner filter
- If there is a leak at the detector end of the column, the retention times will be stable from run to run, but sensitivity will be reduced
- If there is a leak at the inlet end, there will be reduced flow (lower linear velocity) through the column, but there will be an increase in retention time and the sensitivity will be reduced

Baseline moves steadily (drift) upscale or downscale during the run

This problem can be minimized by:

- Conditioning the column
- Operating at a lower temperature, but this prolongs the analysis
- Substituting a chromatographically equivalent module

Wander and drift are often accompanied by noise. See section 9.2.1.1.3.

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9.2.1.1.3 Baseline Noise

Noise is a continuous rapid baseline fluctuation, broadening the baseline and giving it a grasslike appearance. Noise is different than spiking. Spikes are isolated rather than continuous events.

Some noise is inevitable with any detector. At low sensitivity it may not be noticeable, but noise may appear when the sensitivity is increased.

Noise appears suddenly on a previously clean baseline

This may be due to:

- Recent changes made to the system
- Loose connections in the detector or its signal path
- Detector contamination
- Contaminated carrier gas

If a tank was recently replaced, re-connect the previous tank to see if the noise decreases. If the new carrier gas is contaminated such that it saturates a trap, changing to the old one may show little improvement until the traps are replaced or regenerated. This problem is most common with nitrogen carrier gas.

It is a common practice for empty carrier gas cylinders to be refilled by the gas dealer after a thorough purging procedure. Deal with a reliable gas supplier.

Noise gradually increases to an unacceptable level

This symptom indicates gradual buildup of the noise source, rather than an abrupt change as discussed above.

9.2.1.1.4 Baseline Spiking

Spikes are isolated baseline disturbances and usually appear as sudden large upscale movements. If these spikes are accompanied by noise, address the noise problem first, since spiking may disappear at the same time.

If spikes appear whenever a run is in progress, the cause is almost always electronic in origin.

Loose connections are most likely the cause of spikes. Check all accessible cable connections.

Make sure there is no external interference from local radio transmission equipment.

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9.2.1.2 Retention Time Symptoms

9.2.1.2.1 Retention Time Drift

Retention time drift is a steady increase or decrease of retention times in a series of successive runs. Erratic times (both directions) are discussed later as retention time wander.

Retention times suddenly increase significantly

- Decreased carrier flow or reduced column temperature; check the pressure and temperature set points
- The carrier gas tank may be nearly empty

Retention times suddenly decrease significantly

- Increased carrier flow or increased column temperature; check the pressure and temperature set points

9.2.1.2.2 Retention Time Wander (Reproducibility)

Reproducibility is erratic for successive runs of similar composition

- Temperature or pressure variations within the runs. May indicate possible detector or control failure
- Radical differences in sample component concentrations alter retention time

Reproducibility is acceptable later in the run but not for early eluting peaks

When the earliest peaks elute very rapidly, they may not achieve chromatographic equilibrium with the stationary phase. They act as solvent peaks and are carried straight through the column.

Lower the column temperature.

NOTE: A 30°C drop approximately doubles the retention time.

Retention time changes with large sample concentrations

When there is more sample than the column can handle, peaks will be deformed and will shift to earlier retention times. Dilute the sample or shorten **Inject Time**.

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9.2.1.3 Peak Symptoms

9.2.1.3.1 No Peaks

Possibilities include operator error, insufficient **Sample Pump** time, low **Detector Sensitivity** setting (peaks are present but not visible) or insufficient **Inject Time**.

Check the 3000 Micro GC analytical and reference vent flow. No flow could indicate a broken column. The presence of flow could indicate an injector or TCD malfunction. Contact INFICON.

9.2.1.3.2 Inverted Peaks

Inverted peaks are usually caused by poor quality carrier gas. The carrier gas must be 99.995% to 99.9995% pure. Inverted peaks may indicate that the carrier gas is contaminated, or that the incorrect carrier gas is being used, or it is configured improperly.

Carrier gas configuration can be checked on the 3000 Micro GC embedded web page. Refer to section 6.1.1 on page 6-1. If the carrier gas is configured incorrectly, correct it by following the procedure outlined in section 6.4 on page 6-9. Refer to section 4.1.5 on page 4-3 for carrier gas requirements.

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9.2.1.3.3 Extra Peaks

Extra (ghost) peaks are peaks that appear during a blank run, and peaks that appear during a sample run. Ghost peaks appear even when no sample is injected (and are also found among the genuine peaks during a sample run).

Ghost peaks appear during a blank run

- The column has been heated and idle for an extended period of time
- Carrier gas and plumbing impurities such as oils, greases and other materials.
- Reaction of the stationary phase with trace levels of oxygen, water and other materials in the carrier gas.
- Contaminated inlet. Residues in the inlet are volatilized or pyrolyzed and swept onto the head of the column. If reducing the **Inlet Temperature** eliminates or reduces ghost peaks, the inlet requires cleaning.
- Contaminated sample conditioner. If the sample conditioner contains a filter, replace the filter.

Additional peaks appear when pure sample is injected

- Sample is not pure, causing ghost peaks. Run a blank (carrier gas only). If the peaks persist, they are not sample-related.
- Thermal degradation of one or more components by an overheated inlet. Reduce the **Inlet Temperature**.
- Sample carryover, causing ghjost peaks. Run time is not adequate for all the sample compounds to elute. Compounds carried over appear as broad peaks during the second run. This can be eliminated by increasing **Column Temperature** or increasing sample **Run Time**. If applicable, adjust **Backflush Time** until all sample components appear during a run.

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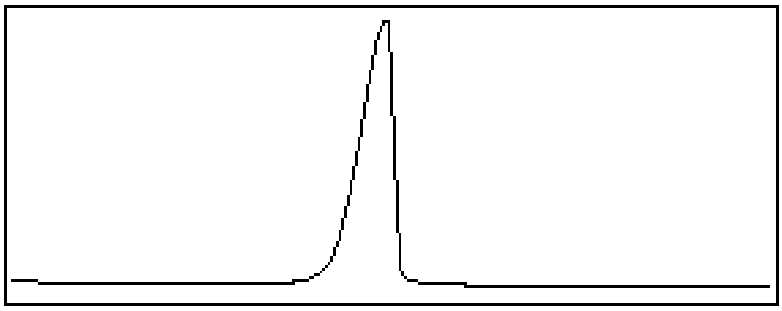
9.2.1.4 Deformed peaks

The ideal chromatography peak is a pure Gaussian shape. In reality, some asymmetry is always present, particularly near the baseline. Some common types of deformed peaks are described.

9.2.1.4.1 Peak Fronting

The peak rises normally, then drops sharply to baseline

Figure 9-1 Fronting



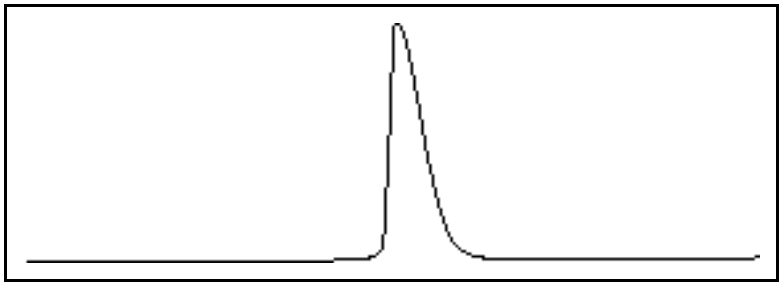
Fronting is usually caused by column overloading. Try diluting the sample by a factor of ten or, if the channel has a variable volume injector, reduce the sample **Inject Time** by a factor of ten.

Fronting could also be two (or more) closely merged (unresolved) peaks. Decrease the **Column Temperature** by 30°C and repeat the analysis. If peaks separate at the lower temperature, the fronting was caused by merged peaks.

9.2.1.4.2 Peak Tailing

The peak rises sharply and then falls normally to baseline.

Figure 9-2 Tailing



Tailing is usually caused by column overloading. Try diluting the sample by a factor of ten or, if the channel has a variable volume injector, reduce the sample **Inject Time** by a factor of ten.

This could also be two (or more) closely merged (unresolved) peaks. Decrease the **Column Temperature** by 30°C and repeat the analysis. If peaks separate at the lower temperature, the tailing was caused by merged peaks.

Tailing can also be caused by a low **Inlet Temperature**. Increase the **Inlet Temperature** and repeat the analysis.

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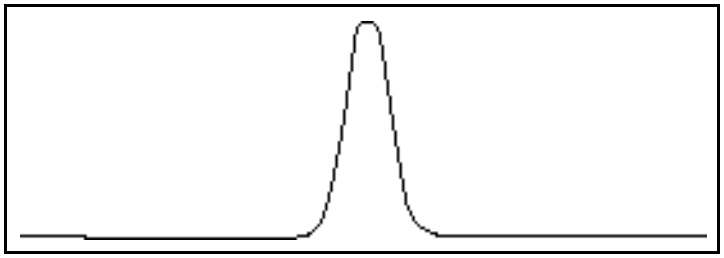
9.2.1.4.3 Deformed Peak Apex

Top (apex) of the peak is deformed.

Figure 9-3 Deformed apex

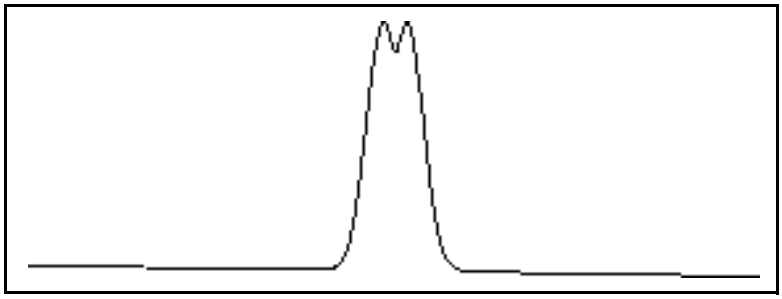


A deformed peak apex is usually caused by column overloading. In severe cases, doubling the amount injected may cause little or no increase in peak size. Decrease the sample volume. Since the detector is at the upper limit of its response, a substantial reduction in sample volume is needed to return to normal operating range.

9.2.1.4.4 Split Peak Apex

Top (apex) of the peak is split.

Figure 9-4 : Apex split



Make sure that this is not a merged peak by conducting a run at a lower temperature.

Decrease volume of sample injected by a factor of ten and repeat the run. If the split disappears, detector overload was the problem. This usually improves linearity as well.

Hydrogen peaks, analyzed with a thermal conductivity detector and helium carrier, often show a split peak apex. Reduce sample size until the split is resolved.

9.2.2 Method Problems

This section describes how to troubleshoot a method and solve problems that arise from incorrect instrument parameter settings, wrong peak identification windows, and inappropriate peak detection parameters. These conditions cause an erroneous calculation of the mole percent composition of samples.

Troubleshoot the method if the following symptoms are observed in the reports and chromatograms when running a calibration standard:

- Zero mole percent composition for components known to be present
- Peaks are not being integrated, or are being integrated incorrectly
- Unusually high or low mole percent composition
- Samples with unnormalized totals outside the 95 to 105% range

First, clean the system as instructed in section 9.2.2.1, Column and Detector Bakeout.

9.2.2.1 Column and Detector Bakeout

This procedure cleans the column and detector of carryover residue (i.e., high molecular weight components) from previous samples that may interfere in subsequent analyses. Over time, small amounts of contaminants accumulate, especially in the column, and cause peak tailing and retention time shifts.

Perform a bakeout as instructed in section 8.1.1, System Bakeout, on page 8-1.

9.2.2.2 Correcting Instrument Parameter Settings

9.2.2.2.1 Adjusting Column Head Pressure

Column head pressure controls flow through the column, and directly affects the retention time of all peaks in the run.

1. Determine the retention time for the start of the unretained peak (first peak) for all channels in the calibration standard.
2. Adjust column head pressure so that all peaks elute within method defined peak windows.
3. Save the method in EZ IQ (click **File >> Method >> Save**).

9.2.2.2.2 Recalibrating

Changes to column head pressure and/or column temperature may cause peak retention times to shift requiring adjustment to peak retention times and peak windows. Recalibrate as instructed in section 7.12, Calibration, on page 7-36.

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Chapter 10
Service and Technical Support

10.1 How to Contact Customer Support

Worldwide support is available by contacting:

- Technical Support, to correspond with an applications engineer with questions regarding INFICON products and applications
- Sales and Customer Service, to contact an INFICON Sales office,
- Repair Service, to contact an INFICON Service Center

If you are experiencing a problem with your 3000 Micro GC, please have the following information readily available:

- The 3000 Micro GC part number and serial number. Refer to section 3.7, Product Identification, on page 3-23.
- A description of the problem
- An explanation of any corrective action that may have been attempted
- The exact wording of any error messages observed

To contact Customer Support, see the Support page at www.inficon.com.

10.2 Returning 3000 Micro GC to INFICON

Do not return a 3000 Micro GC or a GC module to INFICON without first speaking with a Customer Support Representative. A Return Material Authorization (RMA) number must be obtained from the Customer Support Representative.

If a 3000 Micro GC or a GC module is delivered to INFICON without an RMA number, it will be held until the sender is contacted. This may result in delays in servicing the component.

Prior to being given an RMA number, a Declaration Of Contamination (DOC) form must be filled out and submitted. DOC forms must be approved by INFICON before an RMA number is issued. INFICON may require that the 3000 Micro GC or GC module be sent to a designated decontamination facility, rather than to the factory.

10.3 Warranty Extension

INFICON offers a multiple year warranty extension option upon 3000 Micro GC purchase. Contact INFICON for details.

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10.4 Service Contract

INFICON offers service contracts for an out-of-warranty 3000 Micro GC. INFICON will conduct an evaluation to verify the condition of an out-of-warranty 3000 Micro GC before agreeing to offer a service contract. Contact INFICON.

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Chapter 11
Replacement Parts and Gases

This chapter lists the replacement part numbers (PN) for 3000 Micro GC.

Before attempting to perform an on-site replacement, contact an INFICON service representative to discuss possible solutions.

11.1 Power Cables and Converters

Each 3000 Micro GC requires one converter and one power cable.

Figure 11-1 160 VA power cable and converter

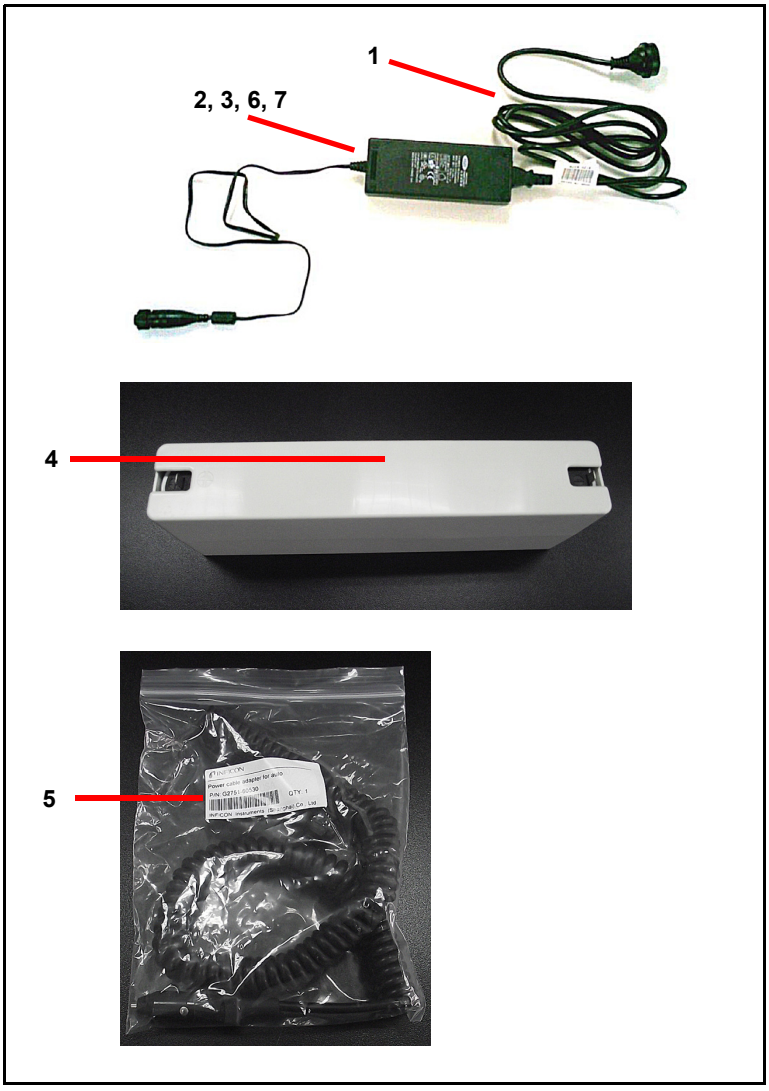

Table 11-1 Power cord descriptions and PNs

	Description	Part Number
1	Power Cord for PN G2801-60746/60747/60748/60749 Power Converter	
	◆ United States	8120-1378
	◆ Europe	8120-1689
	◆ Australia/New Zealand	8120-1369
	◆ UK/Hong Kong/Singapore/Malaysia	8120-8705
	◆ China	8120-0723
	◆ Japan	8120-4753
	◆ Korea	8121-1226
2	24 V (dc) Power Converter, 160 VA, for 1 to 4-channel standard 3000 Micro GC	G2801-60747
3	15 V (ac) AC Power Converter for Portable 3000 Micro GC	G2801-60748
4	Vehicle Power Charger for Portable 3000 Micro GC	G2751-60530
5	Replacement Dual Battery Pack for Portable 3000 Micro GC	G2801-80180
6	15 V (dc) AC2DC Power Supply (Heated Regulator)	G2801-60746
7	15 V (dc) AC2DC Power Supply (Heated Vaporizer LPG)	G2801-60749

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11.2 GC Modules

The GC module assembly contains the injector, column, column heater, detector, and connecting tubing.

11.2.1 Description of GC Module Numbers

GC module numbers are referenced in this section. A short description of each GC module number is provided.

11.2.1.1 Reference Number on Top of GC Module

This is not an orderable part number. It is used for INFICON internal reference only.

11.2.1.2 New Module Part Number

Use this part number when ordering a new module from INFICON. A new module may be stored as a spare, or swapped with an existing module in a 3000 Micro GC.

11.2.1.3 Refurbished Module Part Number

INFICON offers fast service turn-around with an Exchange Module Program. Used modules can be refurbished in an INFICON repair center to meet the urgent needs of the customer. To leverage the fast turn around of a refurbished or exchange module, customers can order a refurbished module using the **Refurbished Module Part Number**. *Once the refurbished module is received, the corresponding defective module must be returned to INFICON.*

In addition, the refurbished module will have the Refurbished Module Part Number label adhered on top of it for proper identification.

11.2.1.4 New Module Replacement Part Number:

Direct replacement modules are available for discontinued modules. The new part numbers for these replacement modules can be found in section 11.2.6, Discontinued Module Replacement IPNs, on page 11-14.

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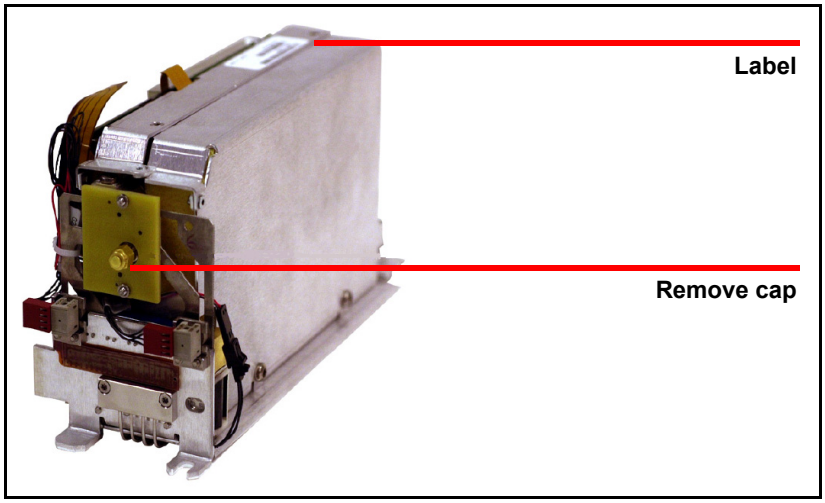
11.2.2 Standard Modules

Standard modules have a two digit numerical ending based on column parameters.

An example of a standard module is shown in Figure 11-2.

Figure 11-2 GCMOD-23 standard module



NOTE: Modbox design is used for MolSieve columns. An example of a Modbox design is shown in Figure 11-3.

Figure 11-3 GCMOD-30 standard module with Modbox design

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11.2.3 Standard Modules Table

To order a replacement Standard GC module, contact INFICON with the **New** or **Refurbished Module Part Number** specified in Table 11-2.

NOTE: If the reference number is not listed in the table, see section 11.2.6, Discontinued Module Replacement IPNs, on page 11-14.

Table 11-2 Standard modules table

Reference Number on Top of GC Module	New Module Part Number	Refurbished Module Part Number	Injector Type	Analytical Column	Analytical Column Length	Pre-Column	Pre-Column Length
G2801-60100	GCMOD-01	G2801-69100	1.0 µL BackFlush	PLOT-U	8 m	PLOT-U	1 m
G2801-60502	GCMOD-03	G2801-69047	1.0 µL BackFlush	PLOT-U	8 m	PLOT-Q	1 m
G2801-60503	GCMOD-04	G2801-69048	0.4 µL BackFlush	Alumina 0.32 mm	10 m	Alumina 0.32 mm	1 m
G2801-60506	GCMOD-05	G2801-69001	1.6 Fixed Vol.	PLOT-U	8 m		
G2801-60507	GCMOD-06	G2801-69002	1.6 Fixed Vol.	OV-1, 1.2 µm	4 m		
G2801-60508	GCMOD-07	G2801-69003	1.6 Fixed Vol.	OV-1, 1.2 µm	8 m		
G2801-60509	GCMOD-08	G2801-69004	1.6 Fixed Vol.	OV-1, 2.0 µm	6 m		
G2801-60511	GCMOD-10	G2801-69006	1.6 Fixed Vol.	Alumina	10 m		
G2801-60512	GCMOD-11	G2801-69007	1.6 Fixed Vol.	PLOT-Q	8 m		
G2801-60513	GCMOD-12	G2801-69008	1.6 Fixed Vol.	PLOT-U	4 m		
G2801-60514	GCMOD-13	G2801-69009	1.6 Fixed Vol.	PLOT-U	6 m		
G2801-60516	GCMOD-14	G2801-69011	1.6 Fixed Vol.	Stabilwax	10 m		
G2801-60520	GCMOD-15	G2801-69520	1.0 µL BackFlush	MolSieve	30 m	PLOT-U	3 m
G2801-60535	GCMOD-16	G2801-69012	Variable Vol.	OV-1, 2.0 µm	8 m		
G2801-60536	GCMOD-17	G2801-69013	Variable Vol.	PLOT-U	8 m		
G2801-60537	GCMOD-18	G2801-69014	Variable Vol.	OV-1, 1.2 µm	4 m		

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Table 11-2 Standard modules table (continued)

Reference Number on Top of GC Module	New Module Part Number	Refurbished Module Part Number	Injector Type	Analytical Column	Analytical Column Length	Pre-Column	Pre-Column Length
G2801-60538	GCMOD-19	G2801-69015	Variable Vol.	OV-1, 1.2 µm	8 m		
G2801-60539	GCMOD-20	G2801-69016	Variable Vol.	OV-1, 2.0 µm	6 m		
G2801-60541	GCMOD-22	G2801-69018	Variable Vol.	Alumina 0.32 mm	10 m		
G2801-60542	GCMOD-23	G2801-69019	Variable Vol.	PLOT-Q	8 m		
G2801-60543	GCMOD-24	G2801-69020	Variable Vol.	PLOT-U	4 m		
G2801-60544	GCMOD-25	G2801-69021	Variable Vol.	PLOT-U	6 m		
G2801-60545	GCMOD-26	G2801-69022	Variable Vol.	OV-1701	8 m		
G2801-60546	GCMOD-27	G2801-69023	Variable Vol.	Stabilwax	10 m		
G2801-60572	GCMOD-28	G2801-69572	Large Vol.	OV-1701	8 m		
G2801-60578	GCMOD-29	G2801-69578	Large Vol.	OV-1701	4 m		
G2801-60584	GCMOD-30	G2801-69584	1.0 µL BackFlush	MolSieve	10 m	PLOT-U	3 m
G2801-60585	GCMOD-31	G2801-69585	Variable Vol.	MolSieve	10 m		
G2801-60586	GCMOD-32	G2801-69586	1.6 Fixed Vol.	MolSieve	10 m		
G2801-60587	GCMOD-33	G2801-69587	Variable Vol.	MolSieve	14 m		
G2801-60588	GCMOD-34	G2801-69588	Large Vol.	MolSieve	14 m		
G2801-60592	GCMOD-35	G2801-69592	1.0 µL BackFlush	MolSieve	14 m	PLOT-U	2 m
G2801-60617	GCMOD-36	G2801-69617	Large Vol.	MolSieve	10 m		
G2801-60620	GCMOD-37	G2801-69620	Large Vol.	MolSieve	30 m		
G2801-60628	GCMOD-38	G2801-69628	Large Vol.	Stabilwax	10 m		
G2801-60642	GCMOD-39	G2801-69642	Variable Vol.	Innowax	10 m		
G2801-60643	GCMOD-40	G2801-69643	Variable Vol.	MolSieve	4 m		

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Table 11-2 Standard modules table (continued)

Reference Number on Top of GC Module	New Module Part Number	Refurbished Module Part Number	Injector Type	Analytical Column	Analytical Column Length	Pre-Column	Pre-Column Length
G2801-60644	GCMOD-41	G2801-69644	Variable Vol.	PLOT-Q	8 m		
G2801-60649	GCMOD-42	G2801-69649	Variable Vol.	HPFFAP	25 m		
G2801-60660	GCMOD-43	G2801-69660	1.0 µL BackFlush	OV-1, 0.15 mm	4 m	OV-1	1 m
G2801-60663	GCMOD-44	G2801-69663	Large Vol.	PLOT-Q	10 m		
G2801-60664	GCMOD-45	G2801-69664	1.0 µL BackFlush	OV-1701	8 m	OV-1701	1 m
G2801-60680	GCMOD-47	G2801-69680	1.6 Fixed Vol.	PLOT-Q	8 m		
G2801-60692	GCMOD-49	G2801-69692	Variable Vol.	Alumina KCl 0.32mm	10 m		
G2801-60694	GCMOD-50	G2801-69694	1.0 µL BackFlush	OV-1, 2.0 µm	8 m	Stabilwax	1.2 m
G2801-60696	GCMOD-51	G2801-69696	Variable Vol.	OV-1701	4 m		
G2801-60698	GCMOD-52	G2801-69698	1.0 µL BackFlush	OV-1, 0.15 mm	6 m	Stabilwax	1.2 m
G2801-60701	GCMOD-53	G2801-69701	1.0 µL BackFlush	PLOT-U	8 m	Stabilwax	1.2 m
G2801-60703	GCMOD-54	G2801-69703	1.0 µL BackFlush	OV-1, 0.15 mm	14 m	OV-1	2.2 m
G2801-60594	GCMOD-55		Large Vol.	OV-1, 2.0 µm	14 m		
G2801-60801	GCMOD-56	G2801-69801	1.0 µL BackFlush	PLOT-Q	12 m	PLOT-Q	1 m
G2801-60802	GCMOD-57	G2801-69802	Large Vol.	PLOT-U	14 m		
G2801-60838	GCMOD-58	G2801-69838	0.4 µL BackFlush	Alumina 0.32mm	14 m	Stabilwax	1.2 m
G2801-60850	GCMOD-59	G2801-69000	1.6 Fixed Vol.	OV-1, 2.0 µm	8 m		
G2801-60857	GCMOD-61	G2801-69857	1.0 µL BackFlush	PLOT-Q	8 m	PLOT-Q	1 m
G2801-60858	GCMOD-62	G2801-69858	1.0 µL BackFlush	Stabilwax	10 m	Stabilwax	1.2 m

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Table 11-2 Standard modules table (continued)

Reference Number on Top of GC Module	New Module Part Number	Refurbished Module Part Number	Injector Type	Analytical Column	Analytical Column Length	Pre-Column	Pre-Column Length
G2801-60859	GCMOD-63	G2801-69859	1.0 µL BackFlush	Stabilwax	14 m	Stabilwax	1.2 m
G2801-60860	GCMOD-64	G2801-69010	1.6 Fixed Vol.	OV-1701	8 m		
G2801-60864	GCMOD-66	G2801-69864	Large Vol.	PLOT-Q	8 m		
G2801-60865	GCMOD-67	G2801-69165	Large Vol.	PLOT-U	4 m		
G2801-60867	GCMOD-68	G2801-69867	Large Vol.	PLOT-U	8 m		
G2801-60871	GCMOD-70	G2801-69871	Large Vol.	PLOT-Q	8 m		
G2801-61080	GCMOD-71	G2801-69697	Variable Vol.	PLOT-Q	10 m		
G2801-61106	GCMOD-72	G2801-69065	Variable Vol.	Alumina 0.25 mm	14 m		
G2801-61107	GCMOD-73	G2801-69042	1.6 Fixed Vol.	OV-1, 2.0 µm	10 m		
G2801-61108	GCMOD-74	G2801-69043	1.0 µL BackFlush	OV-1, 2.0 µm	10 m	Stabilwax	1.2 m
G2801-61109	GCMOD-75	G2801-69044	0.4 µL BackFlush	Alumina 0.25 mm	14 m	Alumina 0.25 mm	1 m
G2801-61110	GCMOD-76	G2801-69045	0.4 µL BackFlush	Alumina 0.32 mm	14 m	Alumina 0.32 mm	1 m
G2801-61114	GCMOD-77	G2801-69061	1.6 Fixed Vol.	OV-1, 2.0 µm	14 m		
G2801-61115	GCMOD-78	G2801-69062	Variable Vol.	OV-1, 2.0 µm	14 m		
G2801-61150	GCMOD-79	G2801-69160	1.6 Fixed Vol.	OV-73, 0.5 µm	6 m		
G2801-61151	GCMOD-80	G2801-69161	Variable Vol.	OV-73, 0.5 µm	6 m		
G2801-61153	GCMOD-81	G2801-69163	1.0 µL BackFlush	PLOT-U	10 m	PLOT-Q	1 m
G2801-60593	GCMOD-82		Large Vol.	OV-1, 1.2 µm	4 m		
G2801-70650	GCMOD-83	G2801-79650	Variable Vol.	MolSieve	30 m		
G2801-60518	GCMOD-87		1.6 Fixed Vol.	PLOT-Q (Varian)	10 m		

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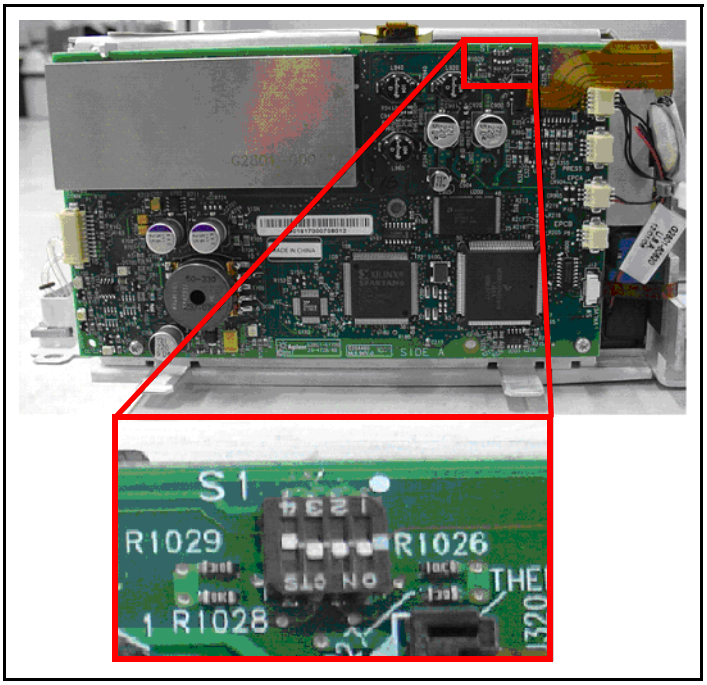
11.2.4 Performance Enhanced Modules

Performance Enhanced modules have a two digit alphabetic ending based on column parameters.

An example of a performance enhanced module is shown in Figure 11-4.

NOTE: The performance enhanced module contains a DIP switch for easy module commissioning.

Figure 11-4 GCMOD-FW performance-enhanced module with DIP switch



NOTE: Modbox design is used for Molsieve columns. An example of a Modbox design is shown in Figure 11-3.

11.2.5 Performance Enhanced Modules Table

To order a replacement GC module, contact INFICON with the **New** or **Refurbished Part Number** specified in Table 11-3.

NOTE: If the reference number is not listed in the table, see section 11.2.6, Discontinued Module Replacement IPNs, on page 11-14.

Table 11-3 Performance enhanced GC module PNs

Reference Number on Top of GC Module	New Module Part Number	Refurbished Module Part Number	Injector Type	Analytical Column	Analytical Column Length	Pre-Column	Pre-Column Length
G2807-60100	GCMOD-FA	G2807-69100	1.0 µL BackFlush	PLOT-U	8 m	PLOT-U	1 m
G2807-60502	GCMOD-FC	G2807-69047	1.0 µL BackFlush	PLOT-U	8 m	PLOT-Q	1 m
G2807-60503	GCMOD-FD	G2807-69048	0.4 µL BackFlush	Alumina 0.32 mm	10 m	Alumina 0.32 mm	1 m
G2807-60506	GCMOD-FE	G2807-69001	1.6 Fixed Vol.	PLOT-U	8 m		
G2807-60507	GCMOD-FF	G2807-69002	1.6 Fixed Vol.	OV-1, 1.2 µm	4 m		
G2807-60508	GCMOD-FG	G2807-69003	1.6 Fixed Vol.	OV-1, 1.2 µm	8 m		
G2807-60509	GCMOD-FH	G2807-69004	1.6 Fixed Vol.	OV-1, 2.0 µm	6 m		
G2807-60511	GCMOD-FJ	G2807-69006	1.6 Fixed Vol.	Alumina	10 m		
G2807-60512	GCMOD-FK	G2807-69007	1.6 Fixed Vol.	PLOT-Q	8 m		
G2807-60513	GCMOD-FL	G2807-69008	1.6 Fixed Vol.	PLOT-U	4 m		
G2807-60514	GCMOD-FM	G2807-69009	1.6 Fixed Vol.	PLOT-U	6 m		
G2807-60516	GCMOD-FN	G2807-69011	1.6 Fixed Vol.	Stabilwax	10 m		
G2807-60520	GCMOD-FO	G2807-69520	1.0 µL BackFlush	MolSieve	30 m	PLOT-U	3 m
G2807-60535	GCMOD-FP	G2807-69012	Variable Vol.	OV-1, 2.0 µm	8 m		
G2807-60536	GCMOD-FQ	G2807-69013	Variable Vol.	PLOT-U	8 m		
G2807-60537	GCMOD-FR	G2807-69014	Variable Vol.	OV-1, 1.2 µm	4 m		
G2807-60538	GCMOD-FS	G2807-69015	Variable Vol.	OV-1, 1.2 µm	8 m		
G2807-60539	GCMOD-FT	G2807-69016	Variable Vol.	OV-1, 2.0 µm	6 m		

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Table 11-3 Performance enhanced GC module PNs (continued)

Reference Number on Top of GC Module	New Module Part Number	Refurbished Module Part Number	Injector Type	Analytical Column	Analytical Column Length	Pre-Column	Pre-Column Length
G2807-60541	GCMOD-FV	G2807-69018	Variable Vol.	Alumina 0.32 mm	10 m		
G2807-60542	GCMOD-FW	G2807-69019	Variable Vol.	PLOT-Q	8 m		
G2807-60543	GCMOD-FX	G2807-69020	Variable Vol.	PLOT-U	4 m		
G2807-60544	GCMOD-FY	G2807-69021	Variable Vol.	PLOT-U	6 m		
G2807-60545	GCMOD-FZ	G2807-69022	Variable Vol.	OV-1701	8 m		
G2807-60546	GCMOD-GA	G2807-69023	Variable Vol.	Stabilwax	10 m		
G2807-60572	GCMOD-GB	G2807-69572	Large Vol.	OV-1701	8 m		
G2807-60578	GCMOD-GC	G2807-69578	Large Vol.	OV-1701	4 m		
G2807-60584	GCMOD-GD	G2807-69584	1.0 µL BackFlush	MolSieve	10 m	PLOT-U	3 m
G2807-60585	GCMOD-GE	G2807-69585	Variable Vol.	MolSieve	10 m		
G2807-60586	GCMOD-GF	G2807-69586	1.6 Fixed Vol.	MolSieve	10 m		
G2807-60587	GCMOD-GG	G2807-69587	Variable Vol.	MolSieve	14 m		
G2807-60588	GCMOD-GH	G2807-69588	Large Vol.	MolSieve	14 m		
G2807-60592	GCMOD-GI	G2807-69592	1.0 µL BackFlush	MolSieve	14 m	PLOT-U	2 m
G2807-60617	GCMOD-GJ	G2807-69617	Large Vol.	MolSieve	10 m		
G2807-60620	GCMOD-GK	G2807-69620	Large Vol.	MolSieve	30 m		
G2807-60628	GCMOD-GL	G2807-69628	Large Vol.	Stabilwax	10 m		
G2807-60642	GCMOD-GM	G2807-69642	Variable Vol.	Innowax	10 m		
G2807-60643	GCMOD-GN	G2807-69643	Variable Vol.	MolSieve	4 m		
G2807-60644	GCMOD-GO	G2807-69644	Variable Vol.	PLOT-Q	8 m		
G2807-60649	GCMOD-GP	G2807-69649	Variable Vol.	HPFFAP	25 m		
G2807-60660	GCMOD-GQ	G2807-69660	1.0 µL BackFlush	OV-1, 0.15 mm	4 m	OV-1	1 m
G2807-60663	GCMOD-GR	G2807-69663	Large Vol.	PLOT-Q	10 m		
G2807-60664	GCMOD-GS	G2807-69664	1.0 µL BackFlush	OV-1701	8 m	OV-1701	1 m
G2807-60692	GCMOD-GV	G2807-69692	Variable Vol.	Alumina KCl 0.32 mm	10 m		

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Table 11-3 Performance enhanced GC module PNs (continued)

Reference Number on Top of GC Module	New Module Part Number	Refurbished Module Part Number	Injector Type	Analytical Column	Analytical Column Length	Pre-Column	Pre-Column Length
G2807-60694	GCMOD-GW	G2807-69694	1.0 µL BackFlush	OV-1, 2.0 µm	8 m	Stabilwax	1.2 m
G2807-60696	GCMOD-GX	G2807-69696	Variable Vol.	OV-1701	4 m		
G2807-60698	GCMOD-GY	G2807-69698	1.0 µL BackFlush	OV-1, 0.15 mm	6 m	Stabilwax	1.2 m
G2807-60701	GCMOD-GZ	G2807-69701	1.0 µL BackFlush	PLOT-U	8 m	Stabilwax	1.2 m
G2807-60703	GCMOD-HA	G2807-69703	1.0 µL BackFlush	OV-1, 0.15 mm	14 m	OV-1	2.2 m
G2807-60594	GCMOD-HB		Large Vol.	OV-1, 2.0 µm	14 m		
G2807-60801	GCMOD-HC	G2807-69801	1.0 µL BackFlush	PLOT-Q	12 m	PLOT-Q (Varian)	1 m
G2807-60802	GCMOD-HD	G2807-69802	Large Vol.	PLOT-U	14 m		
G2807-60838	GCMOD-HE	G2807-69838	0.4 µL BackFlush	Alumina 0.32 mm	14 m	Stabilwax	1.2 m
G2807-60850	GCMOD-HF	G2807-69000	1.6 Fixed Vol.	OV-1, 2.0 µm	8 m		
G2807-60857	GCMOD-HI	G2807-69857	1.0 µL BackFlush	PLOT-Q	8 m	PLOT-Q (Varian)	1 m
G2807-60858	GCMOD-HJ	G2807-69858	1.0 µL BackFlush	Stabilwax	10 m	Stabilwax	1.2 m
G2807-60859	GCMOD-HK	G2807-69859	1.0 µL BackFlush	Stabilwax	14 m	Stabilwax	1.2 m
G2807-60860	GCMOD-HL	G2807-69010	1.6 Fixed Vol.	OV-1701	8 m		
G2807-60864	GCMOD-HN	G2807-69864	Large Vol.	PLOT-Q	8 m		
G2807-60865	GCMOD-HO	G2807-69165	Large Vol.	PLOT-U	4 m		
G2807-60867	GCMOD-HP	G2807-69867	Large Vol.	PLOT-U	8 m		
G2807-60871	GCMOD-HR	G2807-69871	Large Vol.	PLOT-Q	8 m		
G2807-61080	GCMOD-HS	G2807-69697	Variable Vol.	PLOT-Q	10 m		
G2807-61106	GCMOD-HT	G2807-69065	Variable Vol.	Alumina 0.25 mm	14 m		
G2807-61107	GCMOD-HU	G2807-69042	1.6 Fixed Vol.	OV-1, 2.0 µm	10 m		
G2807-61108	GCMOD-HV	G2807-69043	1.0 µL BackFlush	OV-1, 2.0 um	10 m	Stabilwax	1.2 m

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Table 11-3 Performance enhanced GC module PNs (continued)

Reference Number on Top of GC Module	New Module Part Number	Refurbished Module Part Number	Injector Type	Analytical Column	Analytical Column Length	Pre-Column	Pre-Column Length
G2807-61109	GCMOD-HW	G2807-69044	0.4 µL BackFlush	Alumina 0.25 mm	14 m	Alumina 0.25 mm	1 m
G2807-61110	GCMOD-HX	G2807-69045	0.4 µL BackFlush	Alumina 0.32 mm	14 m	Alumina 0.32 mm	1 m
G2807-61114	GCMOD-HY	G2807-69061	1.6 Fixed Vol.	OV-1, 2.0 µm	14 m		
G2807-61115	GCMOD-HZ	G2807-69062	Variable Vol.	OV-1, 2.0 µm	14 m		
G2807-61150	GCMOD-IA	G2807-69160	1.6 Fixed Vol.	OV-73, 0.5 µm	6 m		
G2807-61151	GCMOD-IB	G2807-69161	Variable Vol.	OV-73, 0.5 µm	6 m		
G2807-61152	GCMOD-IC	G2807-69162	Large Vol.	14% Phenyl	12.5 m		
G2807-61153	GCMOD-ID	G2807-69163	1.0 µL BackFlush	PLOT-U	10 m	PLOT-Q (Varian)	1 m
G2807-60593	GCMOD-IE		Large Vol.	OV-1, 1.2 µm	4 m		
G2807-70650	GCMOD-IF	G2807-79650	Variable Vol.	MolSieve	30 m		
G2807-60518	GCMOD-II		1.6 Fixed Vol.	PLOT-Q (Varian)	10 m		
G2807-60731	GCMOD-IJ		Large Vol.	OV-1, 2.0 um	20 m		
G2807-60732	GCMOD-IK		Variable Vol.	OV-1, 2.0 um	20 m		
G2807-60733	GCMOD-IL		Large Vol.	GASPRO	10 m		
G2807-60553	GCMOD-IM		Large Vol.	PLOT-U	6 m		
G2807-60547	GCMOD-IN		Large Vol.	OV-1, 2.0 um	6 m		
G2807-60734	GCMOD-IO		1.6 Fixed Vol.	OV-1, 2.0 um	20 m		
G2807-60889	GCMOD-IP		Large Vol.	CPSil 19CB	12 m		

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11.2.6 Discontinued Module Replacement IPNs

Discontinued GC modules are listed for service support and are not for sale. Corresponding to each discontinued GC module, a New Module Replacement Part Number is specified as a replacement for the discontinued GC module. See Table 11-4.

Table 11-4 Discontinued module replacement IPNs

Reference Number Top of GC module	New Module Replacement Part Number	Injector Type	Analytical Column	Analytical Column Length	Pre-Column	Pre-Column Length
G2801-60501	GCMOD-30	1.0 µL BackFlush	MolSieve	10 m	PLOT-U	3 m
G2801-60540	GCMOD-31	Variable Vol.	MolSieve	10 m		
G2801-60510	GCMOD-32	1.6 Fixed Vol.	MolSieve	10 m		
G2801-60687	GCMOD-33	Variable Vol.	MolSieve	14 m		
G2801-60868	GCMOD-34	Large Vol.	MolSieve	14 m		
G2801-60852	GCMOD-35	1.0 µL BackFlush	MolSieve	14 m	PLOT-U	2 m
G2801-60862	GCMOD-36	Large Vol.	MolSieve	10 m		
G2801-61171	GCMOD-78	Variable Vol.	OV-1, 2.0 µm	14 m		
G2801-60669	GCMOD-57	Large Vol.	PLOT-U	14 m		
G2807-60501	GCMOD-GD	1.0 µL BackFlush	MolSieve	10 m	PLOT-U	3 m
G2807-60540	GCMOD-GE	Variable Vol.	MolSieve	10 m		
G2807-60510	GCMOD-GF	1.6 Fixed Vol.	MolSieve	10 m		
G2807-60687	GCMOD-GG	Variable Vol.	MolSieve	14 m		
G2807-60868	GCMOD-GH	Large Vol.	MolSieve	14 m		
G2807-60852	GCMOD-GI	1.0 µL BackFlush	MolSieve	14 m	PLOT-U	2 m
G2807-60862	GCMOD-GJ	Large Vol.	MolSieve	10 m		
G2807-61171	GCMOD-HZ	Variable Vol.	OV-1, 2.0 µm	14 m		
G2807-60669	GCMOD-HD	Large Vol.	PLOT-U	14 m		

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11.3 Sample Accessories and Filters

11.3.1 Sample Conditioners

Table 11-5 Sample conditioners

Description	Part Number
Genie Filter Assembly	G2817A
Pressure Reducer	G2815A
Pressure Reducer and Genie Filter Assembly	G2816A
*Heated Regulator for Gas Sampling	
◆ For 1 or 2-channel instruments	G2818A-X
◆ For 3 or 4-channel instruments	G2845A-X
◆ For Portable instruments	G2857A-X
*Heated Vaporizer for LPG Sampling	
◆ For 1 or 2-channel instruments	G2819A-X
◆ For 3 or 4-channel instruments	G2846A-X
◆ For Portable instruments	G2858A-X

* The Heated Regulator and Heated Vaporizer require external power supply.
X represents one of the following to specify the type of power cable.
0 - NONE
1 - China
2 - Europe
3 - US
4 - Japan
5 - UK/HK/SG/MY
6 - Australia/NZ
7 - Korea

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11.3.2 Filters

Table 11-6 Filters

Description	Part Number
7 Micron Particle Filter for G2818A-A/G2845A-X/G2857A-X	3150-0786
2 Micron Particle Filter Element for G2819A-X/G2846A-X/G2858A-X (4/pk)	0100-2034
Replacement Genie Membrane filters (5/pk)	HDW-2170
External 10 Micron Particle Filter	G2801-60900
External 10 Micron Particle Filter Body (5/pk)	5183-4652
Carrier Gas Particulate Filter	3150-0602

11.3.3 Other Support Parts

Table 11-7 Other support parts

Description	Part Number
Gas Sample Tubing, 1/16 in., stainless steel with fittings	5185-5817
Dual Ended Ferrule for use with sample inlet filter	FRL-1269
Hydrocarbon/Moisture Trap for carrier gas	G2870A-01
Remote Start Cable	G2801-60618
Digital I/O Module Kit	G2847A
5 amp 12 V Replacement Dual Battery Pack (Portable 3000 Micro GC only)	G2801-80180
Vehicle Power Charger	G2751-60530
Onboard Carrier Gas Cylinder Recharge Kit (Portable 3000 Micro GC only)	PNU-2058

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11.4 Checkout Gases

Table 11-8 Checkout gases

Description	Part Number
Universal Checkout Gas Cylinder	5183-4810
NGA Checkout Gas Cylinder	5184-3556
RGA Checkout Gas Cylinder	5184-3558
Regulator for Checkout Gas Cylinders	5184-3559

11.4.1 Universal Checkout Gas

Universal Checkout Gas may be used during installation to verify the chemical performance of 3000 Micro GC or GC module. See Table 11-9 for the component concentrations.

Table 11-9 The universal checkout gas

Components	Concentration (Mole %)
helium	**0.10%**
neon	**0.05%**
hydrogen	**0.10%**
oxygen	**0.05%**
nitrogen	**0.10%**
methane	**balance**
ethane	**0.05%**
ethylene	**0.05%**
carbon dioxide	**0.05%**
carbon monoxide	**0.10%**
acetylene	**0.05%**
propane	**0.05%**
methyl acetylene	**0.05%**
n-butane	**0.05%**
n-hexane	**0.05%**
n-heptane	**0.05%**

NOTE: Do not use the Universal Checkout Gas as a calibration standard for specific applications. Different applications have different calibration requirements and must be calibrated by an application-specific calibration standard gas.

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11.5 NGA Checkout Gas

The Natural Gas Analyzer (NGA) Checkout Gas may be used during installation of a 3000 Micro GC configured for natural gas composition/BTU analysis to verify chemical performance. Table 11-10 lists the component concentrations.

Table 11-10 NGA checkout gas calibration standard

Components	Concentration (Mole %)
nitrogen	5.2%
methane	balance
ethane	9.0%
carbon dioxide	1.5%
propane	6.0%
isobutane	3.0%
n-butane	2.0%
isopentane	0.50%
n-pentane	0.50%
n-hexane	0.10%

NOTE: Do not use NGA Checkout Gas as a calibration standard for specific natural gas applications. Since natural gas composition differs from region to region, acquire a calibration standard that meets specific requirements.

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11.5.1 RGA Checkout Gas

Refinery Gas Analyzer (RGA) Checkout Gas may be used during installation of a 3000 Micro GC configured for refinery gas composition analysis to verify chemical performance. Table 11-11 lists the component concentrations.

Table 11-11 RGA checkout gas

Components	Concentration (Mole %)
hydrogen	12.0%
oxygen	0.2%
nitrogen	balance
carbon monoxide	1.0%
carbon dioxide	3.0%
methane	5.0%
ethane	4.0%
ethylene	2.0%
acetylene	1.0%
propane	2.0%
propylene	1.0%
1,2-propadiene	1.0%
methyl acetylene	1.00%
isobutane	0.3%
n-butane	0.3%
1-butene	0.3%
isobutylene	0.3%
trans-2-butene	0.3%
cis-2-butene	0.3%
1,3 butadiene	0.3%
isopentane	0.1%
n-pentane	0.1%
1-pentene	0.1%
cis-2-pentene	0.1%
trans-2-pentene	0.1%
2-methyl-2-butene	0.05%
n-hexane	0.05%

NOTE: Do not use RGA Checkout Gas as a calibration standard for specific refinery gas applications. Since refinery gas composition varies greatly among various petrochemical processes, acquire a calibration standard that meets specific requirements.

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