

Agilent G3971 QuickProbe

User Manual



Notices

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CAUTION

A CAUTION notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a CAUTION notice until the indicated conditions are fully understood and met.

WARNING

A WARNING notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in personal injury or death. Do not proceed beyond a WARNING notice until the indicated conditions are fully understood and met.

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This chapter describes general information about the QuickProbe, including a hardware description, general safety warnings, fuse replacement, and QuickProbe specifications.

QuickProbe Hardware Description

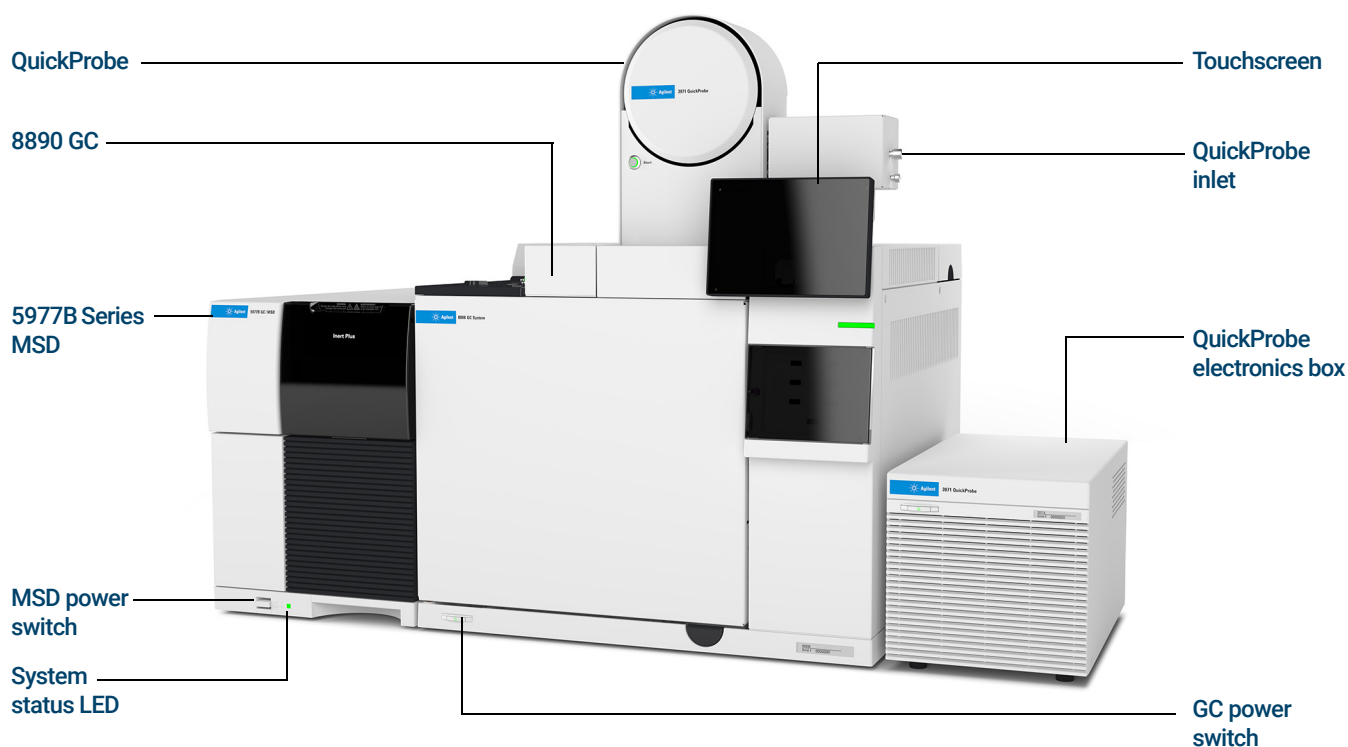


Figure 1. 5977B Series GC/MSD QuickProbe system, shown with an Agilent 8890 GC

The Agilent QuickProbe instrument enables real time analysis with separation. This guide covers operation, familiarization, and maintenance of this instrument.

QuickProbe is compatible with the Agilent 8890 GC, 7890 series GC, and the 5975 and 5977 series MSD. QuickProbe does not support an MS with a diffusion pump or an HES ion source. Your MS must have an extractor, inert, or SS source installed to use QuickProbe.

Important Safety Warnings

There are several important safety notices to always keep in mind when using the QuickProbe as part of a GCMS system configuration. Please read and understand all safety aspects of operation and maintenance found in your Agilent supplied GC and MSD documentation before attempting to use these instruments with the QuickProbe inlet and oven.

Many internal parts of the QuickProbe carry dangerous voltages

If the QuickProbe is connected to a power source, even if the power switch is off, potentially dangerous voltages exist on:

- The wiring between the QuickProbe power cord and the AC power supply
- The AC power supply itself
- The wiring from the AC power supply to the power switch

With the power switch on, potentially dangerous voltages also exist on:

- All electronics boards in the instrument
- The internal wires and cables connected to these boards
- The wires for any heater (oven and inlet heater)

WARNING

All these parts are shielded by covers. With the covers in place, it should be difficult to accidentally make contact with dangerous voltages. Unless specifically instructed to, never remove a cover unless the power cord is unplugged.

WARNING

If the power cord insulation is frayed or worn, the cord must be replaced. Contact your Agilent service representative. Replace only with power cord of same ratings.

If the primary fuse has failed, the QuickProbe will already be off, but for safety, switch off the QuickProbe and unplug the power cord to the electronics box. It is not necessary to allow air into the analyzer chamber.

WARNING

Never replace the primary fuse while the QuickProbe is connected to a power source.

Electrostatic discharge is a threat to QuickProbe electronics

The printed circuit boards in the QuickProbe can be damaged by electrostatic discharge. Do not touch any of the boards unless it is absolutely necessary. If you must handle them, wear a grounded wrist strap, and take other anti-static precautions.

Many parts are dangerously hot

Many parts of the GC/MSD operate at temperatures high enough to cause serious burns. These parts include but are not limited to:

- QuickProbe column
- QuickProbe inlet
- GC inlets
- GC oven and its contents including the column nuts attaching the column to a GC inlet, GC/MSD interface, or GC detector
- GC detector
- GC valve box
- Foreline pump
- Heated MSD ion source, GC/MSD interface, and quadrupole

Always cool these areas of the system to room temperature before working on them. They will cool faster if you first set the temperature of the heated zone to room temperature. Turn the zone off after it has reached the setpoint. If you must perform maintenance on hot parts, use a wrench and wear gloves. Whenever possible, cool the part of the instrument that you will be maintaining before you begin working on it.

WARNING

Be careful when working behind the instrument. During cool-down cycles, the GC emits hot exhaust which can cause burns.

WARNING

The insulation around the QuickProbe oven outlet, GC inlets, detectors, valve box, and the insulation cups is made of refractory ceramic fibers. To avoid inhaling fiber particles, we recommend the following safety procedures:

- Ventilate your work area
- Wear long sleeves, gloves, safety glasses, and a disposable dust/mist respirator
- Dispose of the insulation in a sealed plastic bag
- Wash your hands with mild soap and cold water after handling the insulation

The oil pan under the foreline pump can be a fire hazard

Oily rags, paper towels, and similar absorbents in the oil pan could ignite and damage the pump and other parts of the MSD.

WARNING

Combustible materials (or flammable/nonflammable wicking material) placed under, over, or around the foreline (roughing) pump constitutes a fire hazard. Keep the pan clean, and do not leave absorbent material such as paper towels in it.

Safety and Regulatory Certifications

The QuickProbe conforms to the following safety standards:

- Canadian Standards Association (CSA): CAN/CSA-C222 No. 61010-1
- CSA/Nationally Recognized Test Laboratory (NRTL): UL 61010-1
- International Electrotechnical Commission (IEC): 61010-1
- EuroNorm (EN): 61010-1

The QuickProbe conforms to the following regulations on Electromagnetic Compatibility (EMC) and Radio Frequency Interference (RFI):

- CISPR 11/EN 55011: Group 1, Class A
- IEC/EN 61326
- AUS/NZ

This ISM device complies with Canadian ICES-001. Cet appareil ISM est conforme à la norme NMB-001 du Canada.

EMC declaration for South Korea

This equipment has been evaluated for its suitability for use in a commercial environment. When used in a domestic environment, there is a risk of radio interference.

사용자안내문

이 기기는 업무용 환경에서 사용할 목적으로 적합성평가를 받은 기기로서 가정용 환경에서 사용하는 경우 전파간섭의 우려가 있습니다.

※ 사용자 안내문은 “업무용 방송통신기자재”에만 적용한다.

The QuickProbe is designed and manufactured under a quality system registered to ISO 9001.

The QuickProbe is RoHS compliant.

Information

The Agilent Technologies QuickProbe meets the following IEC classifications: Equipment Class I, Laboratory Equipment, Installation Category II, Pollution Degree 2.

Operating environmental conditions:

- Indoor use only;
- Altitude: 4000 m;
- Temperature: 15 to 35 °C;
- Humidity: 40 to 80% RH;
- Mains supply voltage fluctuations: +/- 10%;

This unit has been designed and tested in accordance with recognized safety standards. It is designed for use indoors. If the instrument is used in a manner not specified by the manufacturer, the protection provided by the instrument may be impaired. Whenever the safety protection of the QuickProbe has been compromised, disconnect the unit from all power sources, and secure the unit against unintended operation.

Refer servicing to qualified service personnel. Substituting parts or performing any unauthorized modification to the instrument may result in a safety hazard.

The power cord set serves as the main disconnecting device for the equipment. The socket outlet must be near the equipment and be easily accessible.

Symbols

Warnings in the manual or on the instrument must be observed during all phases of operation, service, and repair of this instrument. Failure to comply with these precautions violates safety standards of design and the intended use of the instrument. Agilent Technologies assumes no liability for the customer's failure to comply with these requirements.

Indicates no Hydrogen is allowed for the Quick Probe.



See accompanying instructions for more information.



Indicates a hot surface.



Indicates hazardous voltages.



Indicates earth (ground) terminal.



Indicates potential explosion hazard.



or



Indicates radioactivity hazard.



Intended Use

Agilent products must be used only in the manner described in the Agilent product user guides. Any other use may result in damage to the product or personal injury. Agilent is not responsible for any damages caused, in whole or in part, by improper use of the products, unauthorized alterations, adjustments, or modifications to the products, failure to comply with procedures in Agilent product user guides, or use of the products in violation of applicable laws, rules, or regulations.

Cleaning/Recycling the Product

To clean the unit, disconnect the power and wipe down with a damp, lint-free cloth. For recycling, contact your local Agilent sales office.

Accidental Liquid Spillage

Do not spill liquids on the QuickProbe. If liquid is accidentally spilled on the QuickProbe, first, cut the power. Once the QuickProbe is disconnected from all power sources, dry all affected parts. If the liquid spillage affects the electronics, wait at least 24 hours, depending upon the ambient humidity. While waiting for the parts to dry, please call your local Agilent service representative.

To Replace the Primary Fuse

Materials needed

- Fuse, 5 A, 250 V (2110-0709) – 1 required
- Screwdriver, flat-blade (8730-0002)

Procedure

- 1 Cap the QuickProbe inlet, and unplug the power cord from the back of the electronics box power cord socket.

If the primary fuse fails, the QuickProbe will already be off, but for safety and access to the fuse holder, remove the power cord from the back of the electronics box.

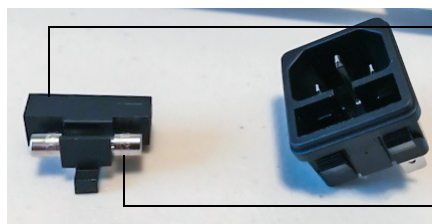
WARNING

Never replace the primary fuse while the QuickProbe is connected to a power source.

- 2 Press on the fuse holder compartment to pop it open.
- 3 Remove the old fuse from the fuse holder.



Fuse holder



Fuse holder

Fuse

- 4 Install a new fuse in the fuse holder.
- 5 Reinstall the fuse holder.
- 6 Reconnect the QuickProbe electronics box power cord to the back of the electronics box.

QuickProbe Benefits and Advantages

QuickProbe is a real time analysis method and device that provides the following advantages.

Real time analysis with separation

QuickProbe provides ultra-fast GC separation in an under one-minute full analysis cycle including separation.

Library based sample identification

The use of an EI library such as NIST or Wiley uniquely provides sample identification including at the isomer level, with sample names and structures. Agilent Library database identification can work with Agilent Quant, Qual, and deconvolution software.

Uniform compound independent response

EI mode operation provides an approximately uniform compound independent response. The analysis reports what compounds are in your sample with the exception of non-volatile and labile compounds. You can use the peak area percentage report data to obtain the relative abundance of any searched compound in its mixture.

Safe and low cost operation

The QuickProbe does not require any solvent and so is safer to use. The vaporized sample is also fully contained at the QuickProbe and fully swept forward. The QuickProbe helium requirement is 70-100 mL/min which is substantially lower than other ambient ionization techniques.

Sensitive method and device

The high sensitivity of electron ionization, full intra QuickProbe thermal desorption, effective QuickProbe self-cleaning and the fast response time of the QuickProbe result in improved sensitivity.

Operation on your available lower cost GC-MS system

One of the most important benefits of the QuickProbe is that it is operated with a standard low-cost Agilent GC-MSD. The enhanced QuickProbe separation serves as a lower cost alternative to costly high-resolution MS.

QuickProbe Specifications

Item	Specification
QuickProbe column temperature program rate	Up to 16 °C/s or 960 °C/min
QuickProbe column cooling rate 340 °C to 60 °C	Under 20 s, typically 15 s
QuickProbe oven start reproducibility	± 100 ms
QuickProbe inlet maximum temperature	300 °C
QuickProbe column upper temperature	350 °C
Column heating tube length	130 cm
Gas pump flow rate	About 20-25 mL/min at operating conditions
Column flow rate	About 2 mL/min when the system at operating conditions
QuickProbe flow rate	50-100 mL/min (adjustable)
QuickProbe mounting location	The Agilent GC front detector cutout
Electronics box location	Up to 3 m from the QuickProbe
Electronics box power requirements	120-240 Vac, 50/60 Hz, 260 W
QuickProbe electronics to PC connection	LAN
QuickProbe oven column	1.5 m long, 0.25 mm ID high temperature column with 0.1 µm film (400 °C upper service limit)
Restrictor column	About 60-70 cm long 0.18 mm ID column with 0.18 µm film

1 Introduction

QuickProbe Specifications

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The most important aspect of sample handling for QuickProbe analysis is how to prepare and introduce only nano-gram range samples. Too much sample can overload the column and result in carryover into the next analysis. Nanogram range compounds cannot be visibly observed. Experience in QuickProbe operation improves performance.

The use of QuickProbe requires the user to do manual operations, including sample handling, loading, and injection with minimal sample preparation. The samples can be varied in physical form, - solid (powders, tablets, plant material, soil) or liquid (standards in solvent, oils, gels, etc.) - and concentration. Controlling the loading for QuickProbe operation is critical given that standard GC/MS can analyze samples in the nanogram to low picogram level. Therefore, sample handling is the most important aspect for successful QuickProbe GC/MS analyses. Too much sample can overload the column and/or the inlet and could result in carryover into the next analysis. It is strongly recommended to spend some time and effort to be familiarized with the QuickProbe hardware, how to use it, sample handling, probes, probe holders, and injection techniques.

CAUTION

Always wear gloves when preparing samples for use in QuickProbe to avoid contamination of the probe and probe holder.

Probe Holders

The QuickProbe holder is the main tool used for sample handling and injection. It can hold two types of glass probes: round tip probe and pocket probe. The round tip is for general use and can work with most sample types whereas the pocket probe is specifically designed to sample powders. For more information, watch the videos on the [Agilent QuickProbe web site](#).

Another holder that could be used with QuickProbe is a modified Thermal Separation Probe (TSP) probe holder. This holder uses the TSP vials which are useful for solid samples and thermal desorption experiments.

QuickProbe holder

This probe holder is used with the glass probes (round tip and pocket probes). The holder plunger can be depressed and rotated to two locking positions for sampling (shown in figure below). Position 1 extends the glass probe about 10 mm and it is useful when loading a sample by scraping material from a solid material such as a tablet. Position 2 extends the probe to the maximum allowable (about 46 mm) and it is useful when loading a sample from vial such as liquids. Keep your thumb on the locking screw when holding and sampling with this holder to prevent sudden unlocking that push back the plunger to the extended position. When the sample has been loaded the plunger can be set back to the extended position before performing an injection. Note that the glass probe is no longer visible in this position.



To insert a new probe in the holder set the holder plunger to position 2 and keep it in a vertical position. With tweezers or clean gloved hand, pick a glass probe and slide through the tip until it bottoms out. Firmly press the glass probe into the plunger (you may feel some resistance).

Performing an injection

To inject the sample into the QuickProbe inlet, start a run in MassHunter data acquisition software and wait for the system to become ready. Ensure the probe holder plunger is in its fully extended position after sample loading. Place the tip of the holder at the entrance of the inlet at a slight angle. In a smooth movement straighten the probe horizontally and insert the holder tip to a stop. Depress the holder plunger completely and press the QuickProbe start button. Keep the holder depressed a few seconds (typically 5 seconds) for sample vaporization. Release the plunger slowly and retract the holder from the inlet. Set the holder to position 2, remove the used probe and install a new one.



QuickProbe holder tip

On occasions the holder tip can get contaminated with sample and needs to be cleaned. Remove any probe installed in the holder and unscrew the holder tip to remove it. Rinse it a small amount of solvent (such as methanol) and let it air dry. If too much solvent is used, the tip can be dried in an oven at 80 C for 15-20 minutes.

Probes

Round Tip probe

To load this glass round tip probe, depress the plunger to the desired QuickProbe holder lock position. Touch, dip, or scrape the sample keeping in mind that you only want to load the tip of the probe.

For liquids, dip the probe 1-3 mm (usually < 5 mm is needed) into the liquid and retract it from the sample. Alternatively, a syringe or micro-pipette can be used to measure a small volume (1 μ L) to load at the probe tip. Wait for the solvent to evaporate before returning the holder to the extended position. Make sure that probe is pointing down after the liquid has been loaded to avoid the liquid contaminating the length of the probe and potentially the probe holder tip. For viscous liquids such as oils or gels, follow the same procedure but clean the extra residue from the probe with a suitable wipe to make sure the loading is controlled.

Similar extra residue cleaning step can and should be apply for other sample types as needed. For example, scraping plant material can get into the length of the exposed glass probe which should be cleaned before proceeding with an analysis.

For tablet analysis scrape the tablet surface with the round tip probe to load the sample. One to three scraping strokes should provide enough loading on the probe. In many cases is better to sample the inside of the tablets (and necessary for capsules) by cutting it open and scraping the exposed material.

Pocket probe

This glass probe is specifically designed for powders (e.g., particulate samples) by providing a small concave area (pocket) at the tip of the probe to hold the sample. The pocket size is designed to control the maximum loading of powder particles and in most instances, it does not have to be fully loaded to have adequate loading.

To load this glass pocket probe, depress the plunger to the QuickProbe holder lock position 2. Place the powder sample on a weigh boat (preferably) or in a vial. Keeping the probe vertically gently tap once the probe tip into the powder, taking care to avoid powder from getting up the sides of the probe. Then, tap the probe on the side of the weight boat to remove loosely held powder; the goal is to avoid carryover or contamination of the probe holder and inlet. Be careful not to touch the walls when sampling from a vial or another container. Clean the excess material with a suitable wipe along the exposed portion of the probe. Keep in mind that this probe can be thoroughly wiped clean without the concern that the sample is going to be completely removed. The sample will stay in the pocket.

TSP holder and vial

A modified TSP holder is used with QuickProbe (see figure below). It holds vials for introduction into the QuickProbe inlet. These are the same vials as the Agilent TSP (3 mm O.D. x 2.4 mm I.D x 15 mm long vials). Place the smallest sample amount possible inside the vial. For example, use a 0.5 mm piece of Cannabis flower for the analysis of THC and other components (CBD and CBN). Insert the TSP holder with loaded vial into the QuickProbe inlet. Press the Start button on the front of the QuickProbe and hold the TSP holder in the inlet 3-5 seconds while thermal desorption occurs. Note that different solid sample types may require different thermal desorption time length. Remove holder from the inlet and remove the vial to discard it.



Introduce a powder sample

The best way to handle powders is using a glass pocket probe placed in a probe holder. This glass probe is specifically designed for powders (e.g., particulate samples) by providing a small concave area (pocket) at the tip of the probe to hold the sample. The pocket size is designed to control the maximum loading of powder particles and in most instances, it does not have to be fully loaded to have adequate loading.

CAUTION

Wear gloves to avoid contamination of the probe.

- 1 Load an appropriate MassHunter QuickProbe method.
- 2 Remove the QuickProbe inlet cap.
- 3 Load a powder sample into the pocket probe. See **“Load a Powder Sample into the Pocket Probe”** on page 23.
- 4 When the start button lights steady green, the QuickProbe is ready for a sample injection. Insert the probe holder containing a few nanograms of sample into the QuickProbe inlet and immediately press the **Start** button on the front of the QuickProbe. The start button LED turns off for 5 seconds (default for the glass probe) and then flashes indicating it is time to remove the probe.
- 5 Remove the probe holder from the inlet.
- 6 Replace the inlet cap to conserve helium when your are finished running samples. With the cap in place, lower the helium pressure to 5 psig to conserve helium.

Load a Powder Sample into the Pocket Probe

CAUTION

Wear gloves to avoid contamination of the probe.

- 1 Place a new pocket probe in the probe holder.
- 2 Depress the plunger to the QuickProbe holder lock position 2 so that it is fully extended.
- 3 Place the powder sample on a weigh boat (preferably) or in a vial.
- 4 Keeping the probe vertical, gently tap the probe tip once into the powder, taking care to avoid getting powder on the sides of the probe.
- 5 Tap the probe on the side of a weight boat to remove loosely held powder. The goal is to avoid carryover caused by contamination of the probe holder and inlet. Be careful not to touch the walls when sampling from a vial or another container.
- 6 Clean the excess material from the exposed portion of the probe with a suitable wipe. Keep in mind that this probe can be thoroughly wiped clean without the concern that the sample is going to be completely removed. The sample will stay in the pocket.

Monitor Sample Carryover

If the sample amount on the probe is too large, the column becomes overloaded and a fronting peak shape is observed. This overloading can result in carryover of this sample into the next analysis. Reduce the collected amount and run the analysis again. There are several techniques to reduce the loaded amount on the glass probes. These are especially useful for powder samples, but it could be applied to other sample types.

Familiarization with the sample handling techniques and hardware is critical to avoid carryover and be successful using the QuickProbe GC/MS system. See **"Reduce Carryover"** on page 24.

Suggested Work flow for Sampling

- 1 Run a system blank.
System blanks are run at the beginning of a sequence or shift, similar to running a normal GC/MS blank. This system blank can be repeated 2-5 times to verify a flat baseline. Typically, the baseline is flat by second run.
- 2 Run a probe blank. A probe is inserted into the probe holder, then inserted into the inlet. Probes are held in the inlet for about 5 seconds and then removed to clear contamination for use in the sample run.
- 3 Run the sample using the probe and holder from the previous probe blank run.
- 4 Run a system blank to verify no carryover or inlet contamination. If found, run a probe holder blank to see if the probe tip is contaminated.
- 5 If necessary, run a standard.

Reduce Carryover

Try these sample preparation techniques to reduce carryover:

- Always wear clean gloves when handling probes and probe holder.
- Use the probe holder for sample collection & injection.
- Use clean wiping paper such as a Kim wipe to clean the outside of the probe holder so contamination isn't transferred to clean gloves.
- Place powder in weight boat for sampling, touch powder gently with probe, and then tap against side of weigh boat to remove excess.
- After loading sample on the probe tip, wipe the glass probe with clean wiping paper such as a Kim wipe to remove excess sample.
- Rinse glass probe with solvent to remove excess (may not be feasible in all labs).

Run blanks between samples. See **"Suggested Work flow for Sampling"** on page 24.

When carryover occurs, there are several ways to troubleshoot it. First, find the amount and location of the carryover by running system blanks. Determine if the carryover is decreasing to acceptable levels or it is constant. Try to eliminate carryover by increasing the inlet temperature, attach the inlet plug to increase the QuickProbe column flow, inject a small amount (~5 µL) of solvent with a GC syringe. If this fails, liner or gold seal replacement is usually required to get the system back to acceptable background levels.

Sample Size

If the sample amount is too large, the column becomes overloaded and a fronting peak shape is observed. This overloading results in carryover of this sample into the next analysis. Reduce the collected amount and run the analysis again. There are three ways to reduce the collected amount of powder sample.

Collect the edge of a sample

Touch the powder at the edge of the sample surface where its particles are smaller and far away from each other. For example, if the powder is in a small glass container (vial), lightly touch the upper part of the glass container a cm above the powder.

Dilute the sample by rinsing the probe with solvent

- 1 Use a glass probe (either round-tip or pocket probe) inserted in a probe holder to touch the powder sample (See **"Load a Powder Sample into the Pocket Probe"** on page 23.) and collect a visible amount of sample. This amount is in the microgram range sample amount.
- 2 Place the probe pointing down over a beaker (used to collect waste).
- 3 Use a Pasteur pipette or wash bottle to add a few drops of solvent (such as methanol) to dissolve/dilute the sample. Add the solvent starting closer to the holder tip if sample is observed along probe length.
- 4 Let the probe air dry until the solvent is evaporated.
- 5 When the start button lights steady green, the QuickProbe is ready for a sample injection. Insert the probe containing a few nanograms of sample into the QuickProbe inlet and immediately press the **Start** button on the front of the QuickProbe. The start button LED turns off for 5 seconds (default for the glass probe) and then flashes indicating it is time to remove the probe.
- 6 Remove the probe holder from the inlet.
- 7 Replace the inlet cap to conserve helium when you are finished running samples. With the cap in place, lower the helium pressure to 5 psig to conserve helium.

Dilute the sample in solvent using the probe

- 1 Prepare several vials at the beginning of a series of powder sample analyses by adding 50-150 μ L of clean solvent (such as methanol).
- 2 Use a glass probe (round tip or pocket probe) to touch the powder sample (as detailed in Probes and Probe holders section) and collect a visible amount of sample. This amount is in the microgram range sample amount.
- 3 Place the loaded probe inside a vial with solvent.
- 4 Swirl to dissolve and dilute the sample.
- 5 Remove the probe from the vial.
- 6 Let the probe air dry until the solvent is evaporated.
- 7 When the start button lights steady green, the QuickProbe is ready for a sample injection. Insert the probe containing a few nanograms of sample into the QuickProbe inlet and immediately press the **Start** button on the front of the QuickProbe. The start button LED turns

off for 5 seconds (default for the glass probe) and then flashes indicating it is time to remove the probe.

- 8 Remove the probe holder from the inlet.
- 9 Replace the inlet cap to conserve helium when your are finished running samples. With the cap in place, lower the helium pressure to 5 psig to conserve helium.

Complete dissolution

QuickProbe analysis usually requires minimal or no sample preparation. However, prepared samples can also be used for controlling loading of more problematic samples.

- 1 Dissolve a small amount of powder sample in a known solvent volume.
- 2 Dip the probe 1-3 mm (usually < 5 mm is needed) into the liquid and retract it from the sample. Alternatively, a syringe or micro-pipette can be used to measure a small volume (1 μ L) to load at the probe tip.
- 3 Let the probe air dry until the solvent is evaporated.
- 4 When the start button lights steady green, the QuickProbe is ready for a sample injection. Insert the probe containing a few nanograms of sample into the QuickProbe inlet and immediately press the **Start** button on the front of the QuickProbe. The start button LED turns off for 5 seconds (default for the glass probe) and then flashes indicating it is time to remove the probe.
- 5 Remove the probe holder from the inlet.
- 6 Replace the inlet cap to conserve helium when your are finished running samples. With the cap in place, lower the helium pressure to 5 psig to conserve helium.

Introduce an oil or liquid compound sample

- 1 Use a round probe to collect a μ g of liquid sample.
- 2 Spread this sample on a thin porous paper.
- 3 Use another round probe to touch the wet paper area.
- 4 When the start button lights steady green, the QuickProbe is ready for a sample injection. Insert the probe containing a few nanograms of sample into the QuickProbe inlet and immediately press the **Start** button on the front of the QuickProbe. The start button LED turns off for 5 seconds (default for the glass probe) and then flashes indicating it is time to remove the probe.
- 5 Remove the probe holder from the inlet.
- 6 Replace the inlet cap to conserve helium when your are finished running samples. With the cap in place, lower the helium pressure to 5 psig to conserve helium.

Alternatively, touch the liquid with the tip of the probe and wipe it using a piece of clean paper to reduce the sample amount.

Thermal Separation Probes

Introduce gland, plant, hair or similar sample

Use a Thermal Separation Probe (TSP) for gland, plant, hair, or similar types of samples. It holds probes for introduction into the QuickProbe inlet.

- 1 Place the smallest sample amount possible inside the probe.

For example, use a 0.5 mm piece of Cannabis flower for the analysis of THC and other components (CBD and CBN) in the Cannabis.

- 2 When the start button lights steady green, the QuickProbe is ready for a sample injection. Insert the TSP into the QuickProbe inlet and immediately press the **Start** button on the front of the QuickProbe. The start button LED turns off for 5 seconds (default for the glass probe) and then flashes indicating it is time to remove the probe.
- 3 Remove the probe holder from the inlet.
- 4 Replace the inlet cap to conserve helium when you are finished running samples. With the cap in place, lower the helium pressure to 5 psig to conserve helium.

Introduce a hard object or pill sample

Pills often have hard protective coating. To analyze the active drug formulation, use one of the following methods then sample the powder as described in **"Introduce a powder sample"** on page 23.

- Place the pill inside a piece of paper and crush with a hammer. Use a clean probe to collect sample from the resulting powder.
- Hold a probe by its bottom side and immerse its open end in a solvent such as acetone. Touch the solvent on the probe to the side of the pill. The solvent dissolves the protective coating. With the coating dissolved, use a clean probe to collect sample from this area.

2 Sample Preparation and Injection Techniques

Thermal Separation Probes

QuickProbe Operating Tips

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QuickProbe Column Temperature

A default temperature program used for typical analytical work uses an initial column temperature of 40 °C and holds at this temperature for 3 seconds at the start of a run. The final temperature is set at 325 °C. A temperature increase rate of 10 °C/s requires 28.5 s to reach 325 °C from 40 °C. This is followed by a 3 s hold time. The total time for this default run is 34.5 s.

QuickProbe Inlet Temperature

Use 250 °C as the inlet operating temperature as this temperature covers the full range of compounds that can be analyzed. Above this temperature low volatility compounds can be thermally desorbed at the QuickProbe inlet and can contaminate the column or create ghost peaks.

Very Low Sample Amount

The QuickProbe has far more sensitivity than ambient ionization methods. Use sample preparation methods that minimize the sample amount such as those discussed in **“Sample Size”** on page 25. Typical GC-MS use up to a 100 ng sample which is not visible to the naked eye.

Ionization Gauge

Monitor the ionization gauge pressure during each sample run to detect developing problems. Get a benchmark ionization gauge pressure during a typical analytical method run without using a sample. Use a flow meter to measure purge flow, helium supply flow, and split vent exhaust flow at this ionization gauge pressure. Degradation of this pressure over time will signal problems caused by a leak, filter clog, Vacuum pump, or other instrument problems.

QuickProbe Inlet Cap

Secure the cap to the inlet and lower the inlet helium pressure when not using QuickProbe for an extended period of time to conserve helium. Always maintain a helium gas flow even with the cap in place if the instrument is at operating temperatures to avoid damage to the column and MSD.

Range of Compounds

The QuickProbe can analyze a greater range of compounds than standard GC-MS since:

- The column uses a thin film to elute compounds at lower temperatures.
- The inlet liner uses a high flow rate of about 16 mL/min that allows a lower QuickProbe column temperature with less sample degradation.
- The analysis is much faster so the compounds have less time to degrade in the liner (split injection) and column.

Compared to other ambient ionization techniques, the QuickProbe can also analyze non-polar compounds. As a general rule, the greater the flow rate the greater is the range of compounds that can be analyzed.

Analysis Time and Peak Width

A general relationship between run time and peak width is that for every peak width reduction factor of 2, the speed of analysis can be increased by a factor of 4 and the GC peaks become half as narrow. The QuickProbe uses a 7 times narrower GC peak width of about 0.2-0.25s resulting in a 50 times faster run time. QuickProbe uses a column that is 20 times shorter and has a flow rate 3 times higher to obtain its lower run time.

Slower Analysis Benefits Labile Compounds

While typical QuickProbe analysis is directed at 30s chromatography, 5 s column cleaning time and 15 s cooling time for a 50 s full analysis cycle time there are cases in which one may consider slower analysis. For example, having a 4 times slower 120 s run time for chromatography will result in 2.4 min full analysis cycle time but will lower the sample compounds elution temperatures by 40 °C extending the range of compounds that can be analyzed.

Standby Method

CAUTION

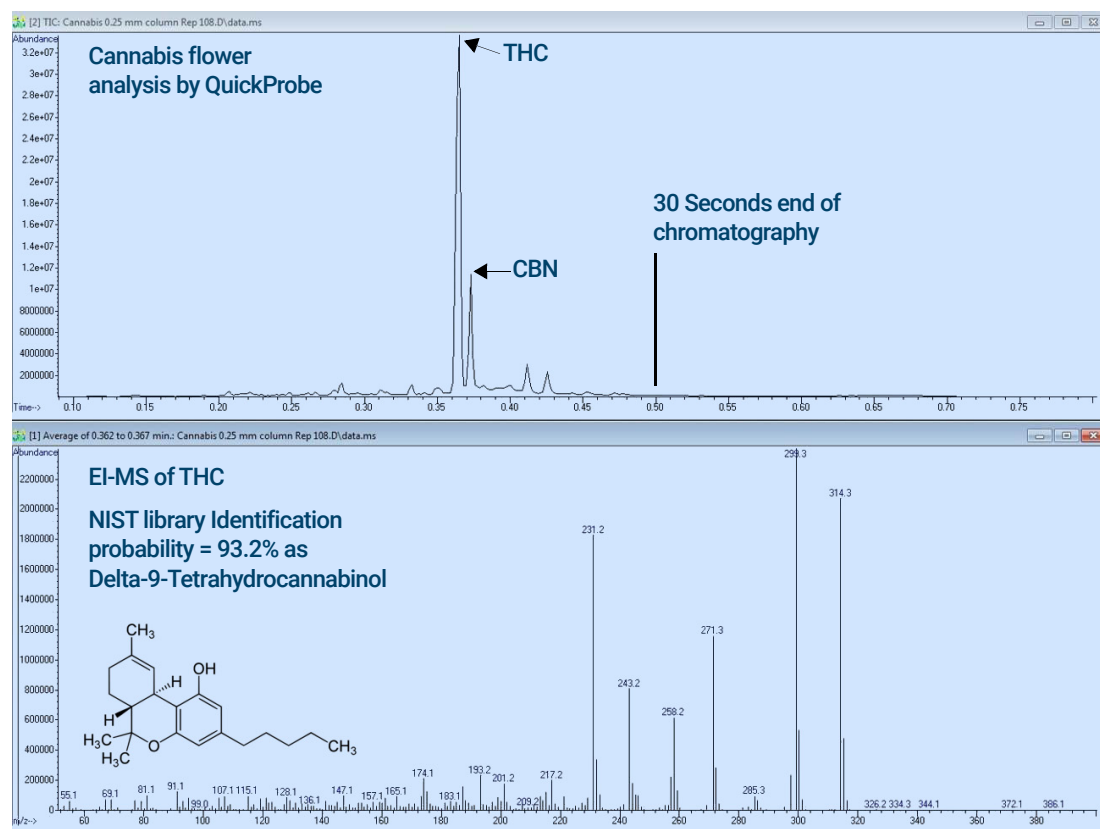
Always cap the Quickprobe inlet when not running samples. When a standby method is set to reduce the inlet pressure below 15 psig, it can allow room air to enter the inlet. This air can damage the column or introduce moist air into the MSD requiring an extensive pumpdown and water removal from the MSD or worse before the system can again be operational.

Set up a standby method in the MassHunter Acquisition software. This method can be manually loaded causing immediate activation or activated at a user defined countdown time of inactivity. When that activity timeout is reached, the standby method is loaded.

- Always cap the QuickProbe inlet when not running samples to conserve helium and protect against a helium gas supply loss. At the lower standby method pressure air can enter the inlet when the helium pressure is reduced.
- Set the QuickProbe inlet temperature to 100 °C and column temperature to 40 °C as safe temperatures to protect the flow path from damage caused by a leak.
- Turn the helium gas on to protect against leaks while the cooling fan, split pump, and its valve are off to increase their life time by setting the inlet mode to standby.
- Keep the GC oven temperature and transfer line temperature at a typical analytical temperature of 250 °C to reduce the temperature cycling effects on the GCMS interface that can likely cause a leak.
- Change the QuickProbe inlet pressure to about 5 PSIG to reduce the Helium flow into the MS.
- If the standby method is automatically loaded and you see **Standby** displayed in the MassHunter monitor, remember to Cap the inlet.

Example of Cannabis analysis

The graph below displays the fast analysis of the Cannabis flower for the presence of Tetrahydrocannabinol (THC), the psychoactive ingredient of Cannabis. A touch of the flower and sample holder insertion, followed by a 30 second chromatography analysis time and 50 second full analysis cycle time. The THC elutes at 0.37 minute (22 seconds), and its peak width is at 0.25 seconds. The chromatography ends at 0.5 min. The THC peak height is 3.3×10^7 counts while the baseline level is 10,000 counts. The baseline noise is 1600 counts resulting with S/N of 20,000. The peak of Cannabinol (CBN) is indicated with an arrow. The EI mass spectrum of THC provides positive identification by the NIST library with 93.2% identification probability. The Delta-9-Tetrahydrocannabinol isomer level, whose structure and elemental formula are provided by the library, is identified as well.



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Create a QuickProbe method 35


View the QuickProbe status 42

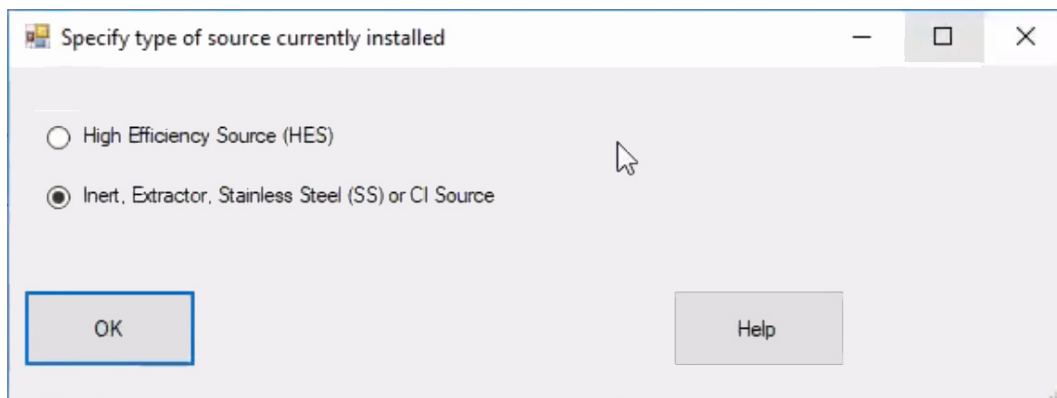
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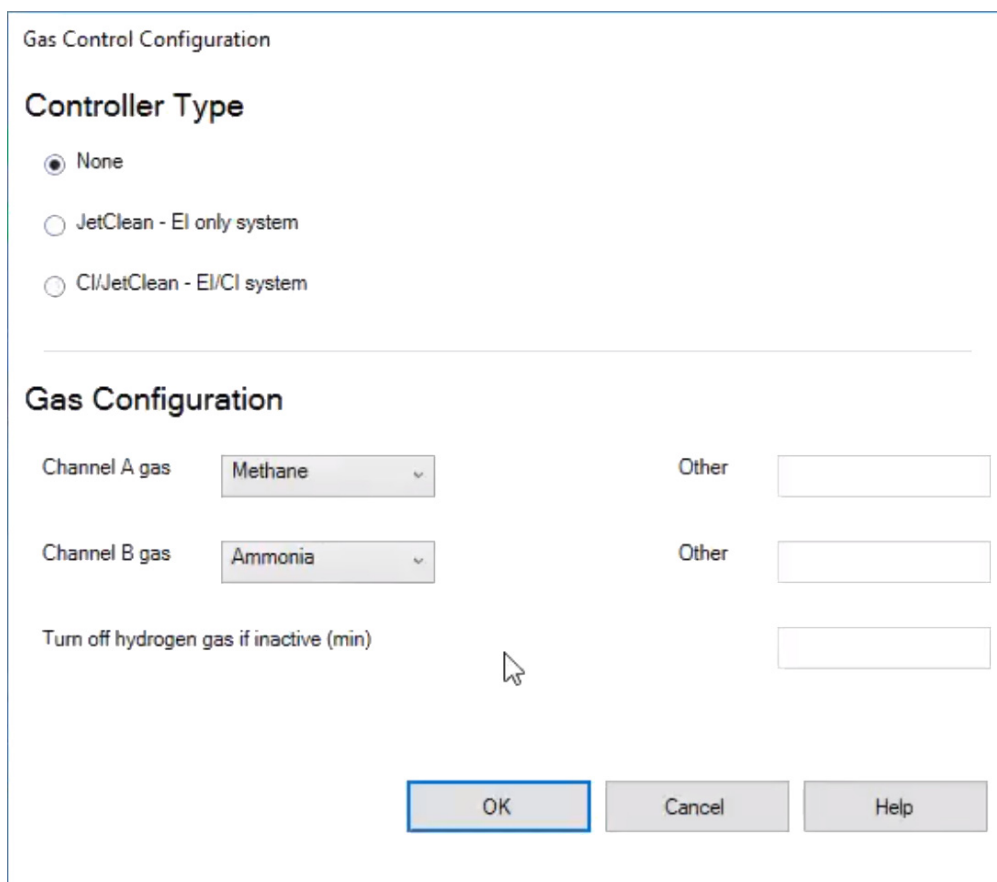
The QuickProbe is controlled by MassHunter Data Acquisition program along with the QuickProbe device driver. This software controls the instrument, at idle time and during run-time.

Open MassHunter Data Acquisition for QuickProbe Use

- 1 Double-click your instrument's desktop icon  to open MassHunter Data Acquisition. The HES is not supported when using QuickProbe. Your instrument should have an extractor, inert, or SS source installed to use QuickProbe.



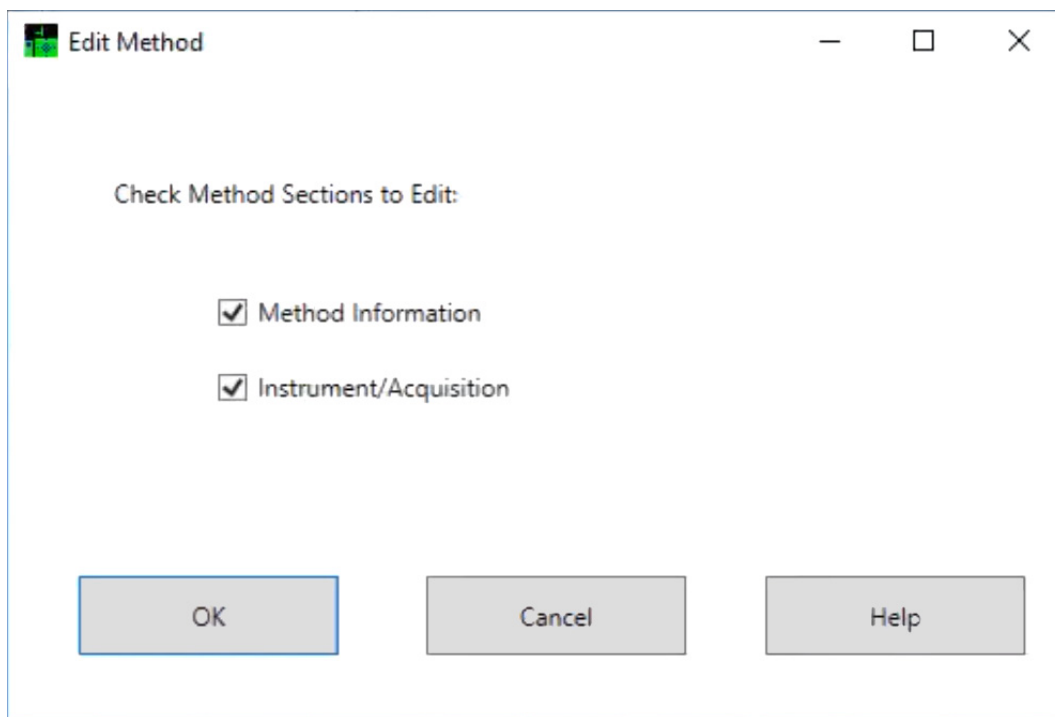
- 2 Select **Insert Extractor, Stainless Steel (SS) or CI Source**, then click **OK**. The Gas Control Configuration window displays if your MS has an ion source Gas Controller installed.



- 3 Select **None** under **Controller Type**, then select **OK**.
- 4 Load an appropriate QuickProbe method. See **"Create a QuickProbe method"** on page 35.

Create a QuickProbe method

- 1 Load an appropriate method.
- 2 From **Instrument Control** view, select **Method>Edit Entire Method**. The **Edit Method** window displays.

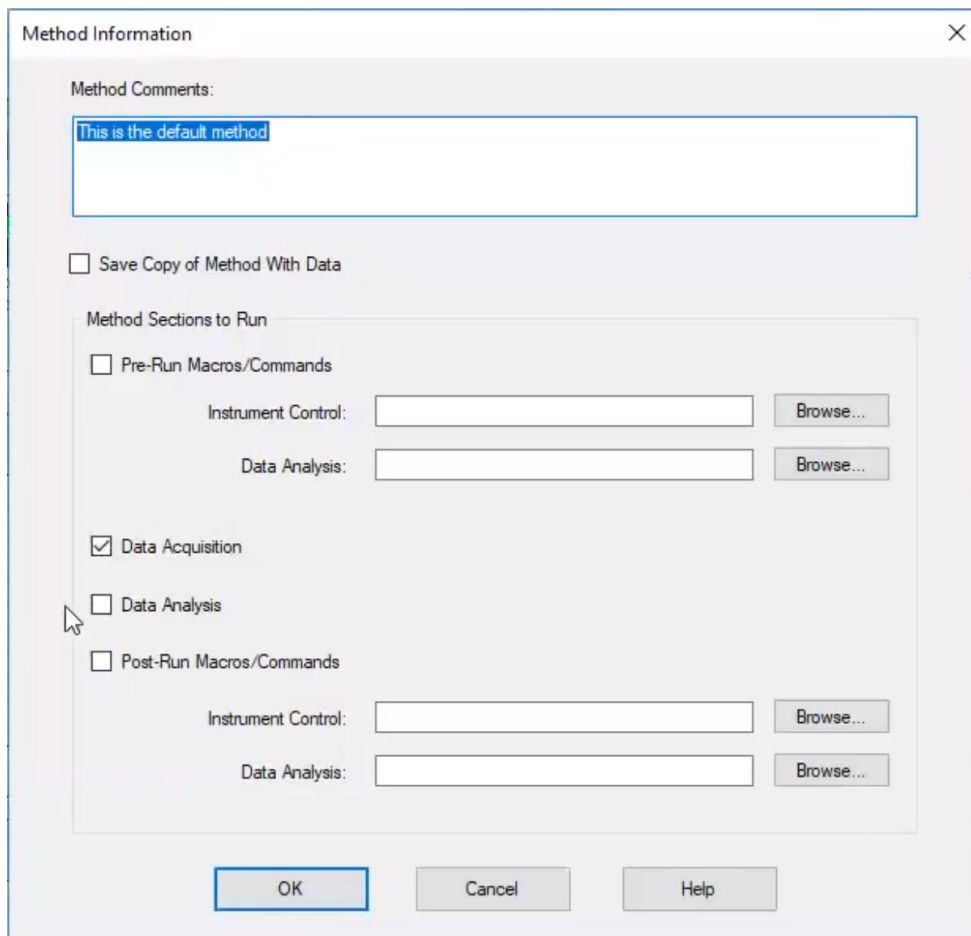


- 3 Select the **Method Information** to edit the Method Information dialog.
- 4 Select **Instrument/Acquisition** to edit these parts of the method:
 - Inlet and Injection Parameters
 - GC Edit Parameters
 - Real Time Plots for GC 7890
 - MS or MSD Method Editor
 - Select Monitors

4 Operation Using MassHunter Software

Create a QuickProbe method

- 5 Click **OK** to continue to modify all portions of the method selected above. The previously selected **Method Information** dialog displays.

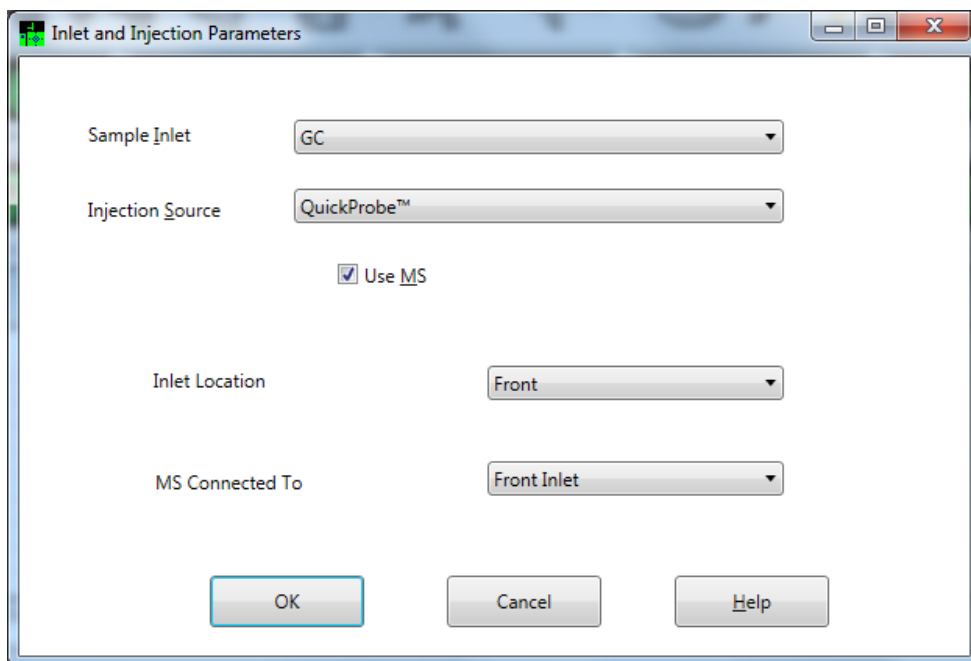


The **Method Information** dialog box is shown. It contains the following fields and options:

- Method Comments:** A text box containing "This is the default method".
- ☐ **Save Copy of Method With Data**
- Method Sections to Run** (grouped in a box):
 - ☐ **Pre-Run Macros/Commands**
 - Instrument Control:** [Text Box] **Browse...**
 - Data Analysis:** [Text Box] **Browse...**
 - ☒ **Data Acquisition**
 - ☐ **Data Analysis** (A mouse cursor is pointing at this checkbox)
 - ☐ **Post-Run Macros/Commands**
 - Instrument Control:** [Text Box] **Browse...**
 - Data Analysis:** [Text Box] **Browse...**

Buttons at the bottom: **OK**, **Cancel**, **Help**.

- 6 De-select **Data Analysis**, then click **OK**. The **Inlet and Injection Parameters** dialog displays.



The **Inlet and Injection Parameters** dialog box is shown. It contains the following fields and options:

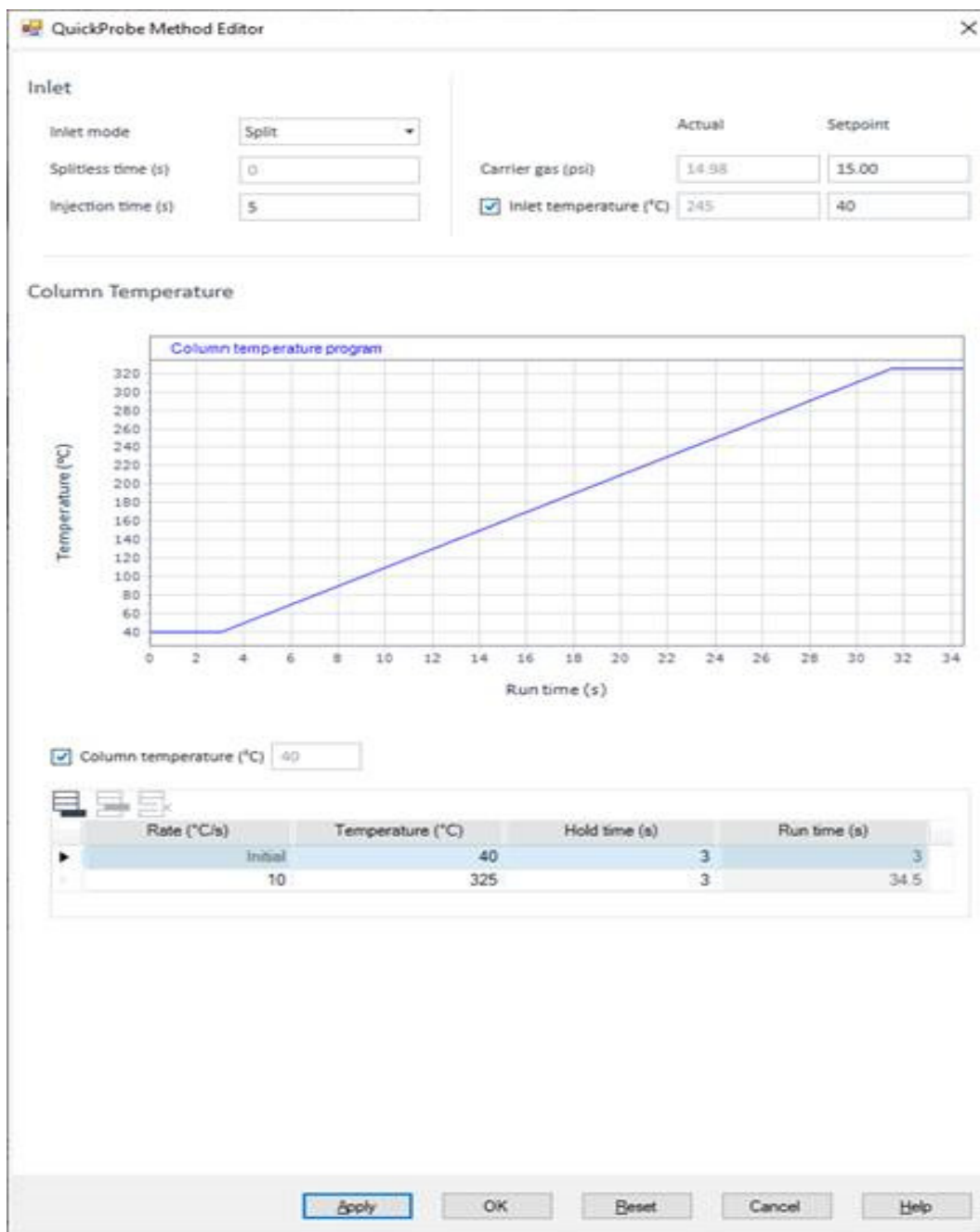
- Sample Inlet:** [Dropdown Menu] (Selected: GC)
- Injection Source:** [Dropdown Menu] (Selected: QuickProbe™)
- ☒ **Use MS**
- Inlet Location:** [Dropdown Menu] (Selected: Front)
- MS Connected To:** [Dropdown Menu] (Selected: Front Inlet)

Buttons at the bottom: **OK**, **Cancel**, **Help**.

4 Operation Using MassHunter Software

Create a QuickProbe method

- 7 Select **QuickProbe** from the **Injection Source** drop-down menu and then select **Use MS**.
- 8 Confirm that the **Sample Inlet** is GC, then click **OK**. The **QuickProbe Method Editor** opens the current QuickProbe method.

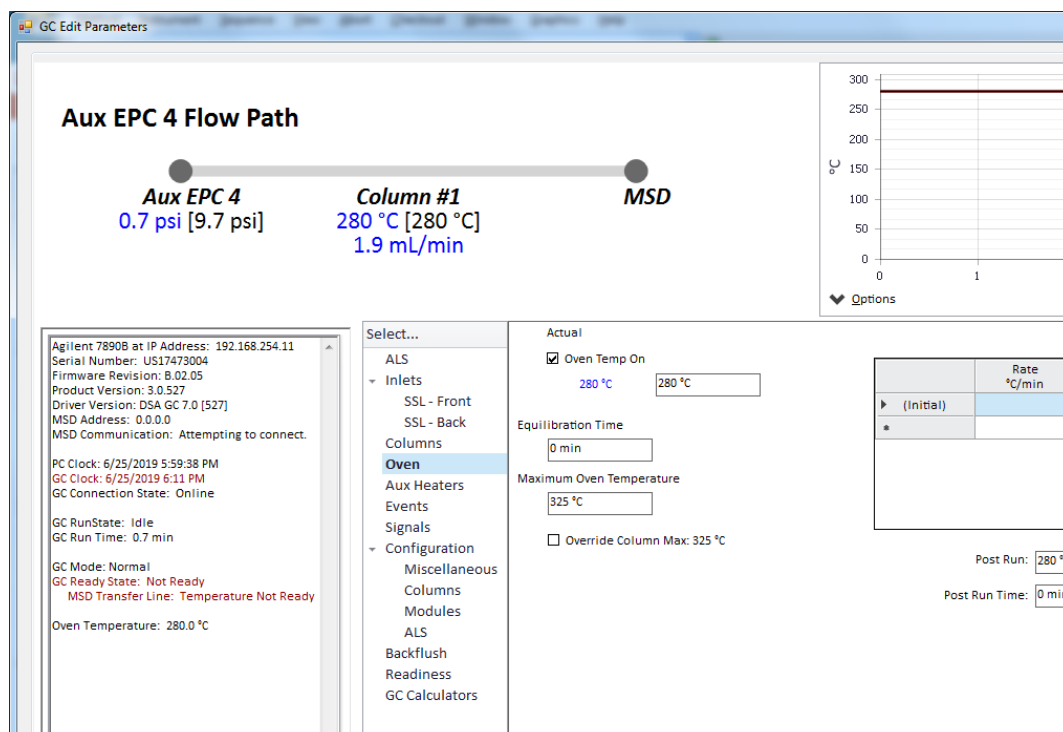


- 9 Set up the QuickProbe inlet parameters.
 - To create a Split method select **Split** from the **Inlet** area **Inlet mode** dropdown menu then enter an **Injection time (s)** in seconds.
 - To create a Splitless method select **Splitless** from the **Inlet** area **Inlet mode** dropdown menu then enter a **Splitless time (s)** and **Injection time (s)** in seconds.
- 10 Set the carrier gas pressure in the selected units.

4 Operation Using MassHunter Software

Create a QuickProbe method

- 11 Select **QuickProbe temperature (°C)** and enter the QuickProbe inlet temperature to maintain for the run.
- 12 Select **Column temperature (°C)** to turn on the column heater.
- 13 Setup the column temperature program. Here, an initial column temperature is set to 40 °C and holds at this temperature for 3 seconds at the start of a run. The final temperature is set at 325 °C. A temperature increase rate of 10 °C/s requires 28.5 s to reach 325 °C from 40 °C. This is followed by a 3 s hold time. The total time for this run is 34.5 s.
- 14 Click **OK** to close the QuickProbe method editor and display the **GC Edit Parameters** window.
- 15 In the GC Links column on the left, select **Oven**.

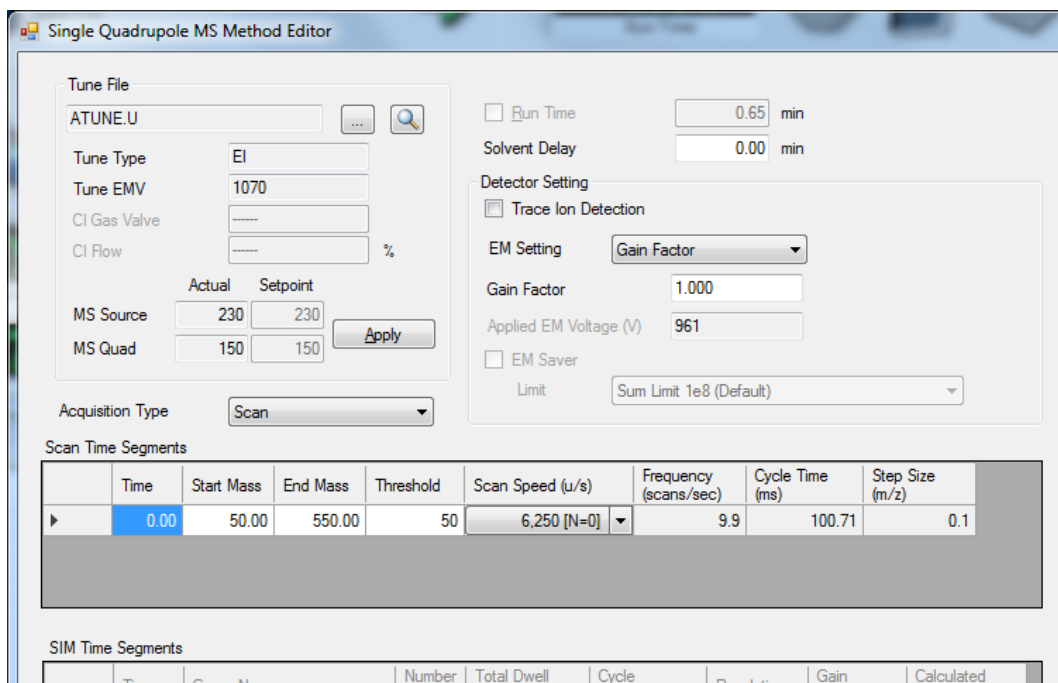


- 16 Select **Oven Temp On** and enter a GC oven temperature value (280 °C default), **Equilibration Time** (0 s), and **Maximum Oven Temperature** (325 °C). With QuickProbe, the GC oven's purpose is to maintain a constant temperature that keeps compounds vaporized and prevents degradation when traveling from the QuickProbe column to the GCMS transfer interface.
- 17 In the GC Links column on the left, select **Aux Heaters**. The Aux Heaters screen displays.
- 18 Enter a temperature value for the **MSD Transfer Line Temperature**. This is normally the same temperature set for the GC oven. To display Real Time Plots of GC data on the Control Panel, see the MassHunter online help.

4 Operation Using MassHunter Software

Create a QuickProbe method

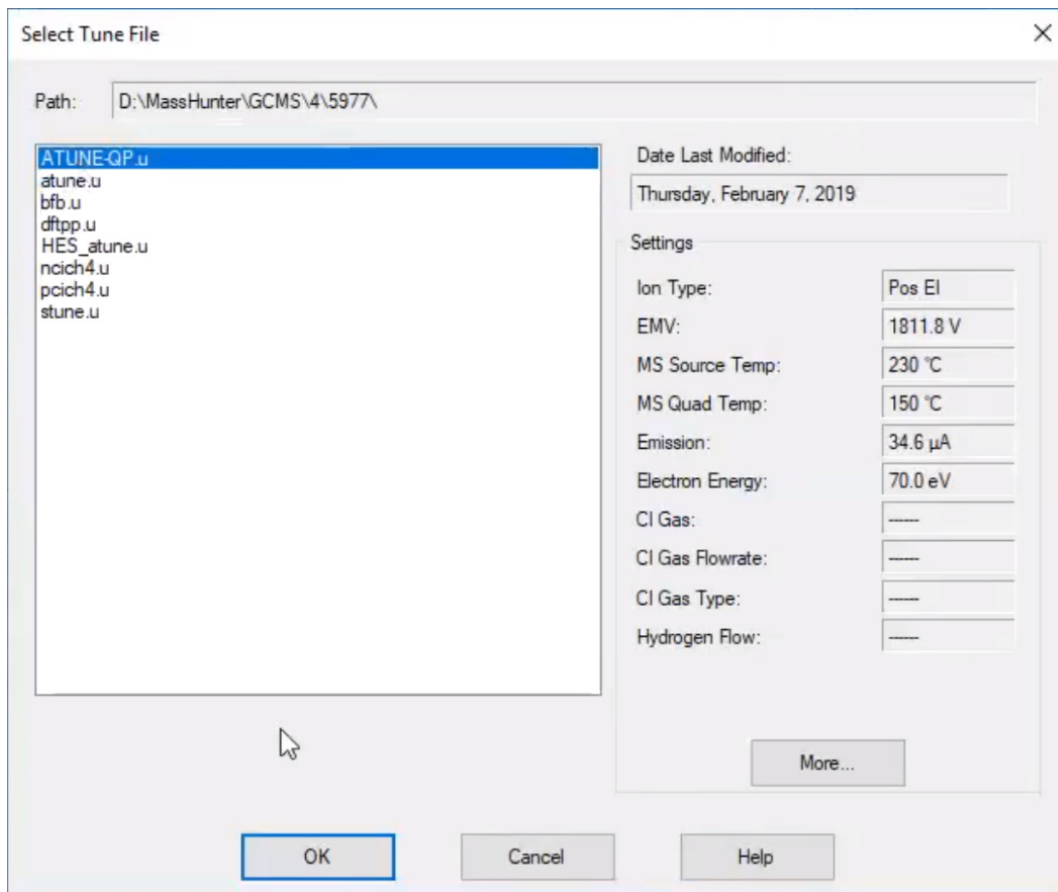
- 19 Click **OK** to exit the **GC Edit Parameters** window and display the **Single Quadrupole MS Method Editor** window.



The **Single Quadrupole MS Method Editor** window displays various parameters for method configuration. The **Tune File** section shows **ATUNE.U** as the selected file. The **Tune Type** is set to **EI**, **Tune EMV** is **1070**, and **CI Gas Valve** and **CI Flow** are set to **---**. The **MS Source** is **230** and **MS Quad** is **150**. The **Acquisition Type** is set to **Scan**. The **Detector Setting** section shows **Trace Ion Detection** is checked, **EM Setting** is **Gain Factor**, **Gain Factor** is **1.000**, and **Applied EM Voltage (V)** is **961**. The **EM Saver** is unchecked, and the **Limit** is **Sum Limit 1e8 (Default)**. The **Scan Time Segments** table shows a single segment with a start time of **0.00**, start mass of **50.00**, end mass of **550.00**, threshold of **50**, scan speed of **6,250 [N=0]**, frequency of **9.9**, cycle time of **100.71**, and step size of **0.1**. The **SIM Time Segments** table is empty.

Time	Start Mass	End Mass	Threshold	Scan Speed (u/s)	Frequency (scans/sec)	Cycle Time (ms)	Step Size (m/z)
0.00	50.00	550.00	50	6,250 [N=0]	9.9	100.71	0.1

- 20 Under **Tune File** click **...** to display the **Select Tune File** window.



The **Select Tune File** window displays a list of tune files in the **Path:** **D:\MassHunter\GCMS\4\5977** directory. The list includes **ATUNE-QP.u**, **atune.u**, **bfb.u**, **dftpp.u**, **HES_atune.u**, **ncich4.u**, **pcich4.u**, and **stune.u**. The **Date Last Modified:** is **Thursday, February 7, 2019**. The **Settings** section shows **Ion Type:** **Pos EI**, **EMV:** **1811.8 V**, **MS Source Temp:** **230 °C**, **MS Quad Temp:** **150 °C**, **Emission:** **34.6 µA**, **Electron Energy:** **70.0 eV**, **CI Gas:** **---**, **CI Gas Flowrate:** **---**, **CI Gas Type:** **---**, and **Hydrogen Flow:** **---**. The **More...** button is visible at the bottom right. The **OK**, **Cancel**, and **Help** buttons are at the bottom.

4 Operation Using MassHunter Software

Create a QuickProbe method

- 21 Select an appropriate tune file from the list, then click **OK** to return to the **Single Quadrupole MS Method Editor** window.

Single Quadrupole MS Method Editor

Tune File: ATUNE.U

Tune Type: EI

Tune EMV: 1070

CI Gas Valve: -----

CI Flow: ----- %

MS Source: Actual 230 Setpoint 230

MS Quad: Actual 150 Setpoint 150

Acquisition Type: Scan

Run Time: 0.65 min

Solvent Delay: 0.00 min

Detector Setting: Trace Ion Detection

EM Setting: Gain Factor

Gain Factor: 1.000

Applied EM Voltage (V): 961

EM Saver: Limit Sum Limit 1e8 (Default)

Time	Start Mass	End Mass	Threshold	Scan Speed (u/s)	Frequency (scans/sec)	Cycle Time (ms)	Step Size (m/z)
0.00	50.00	550.00	50	6,250 [N=0]	9.9	100.71	0.1

SIM Time Segments

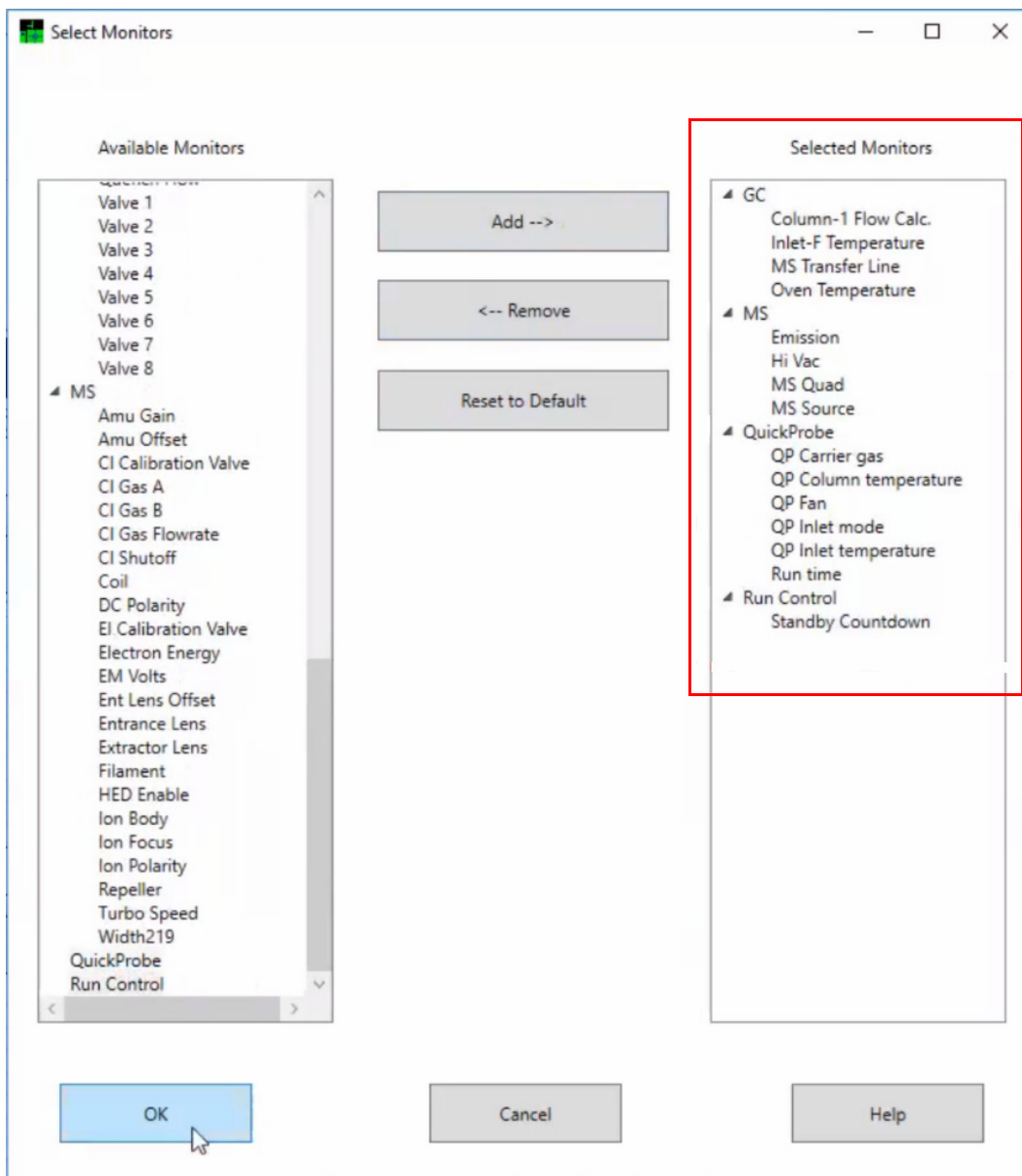
Time	Group Name	Number	Total Dwell	Cycle	Resolution	Gain	Calculated
------	------------	--------	-------------	-------	------------	------	------------

- 22 There are 3 settings here that are particular to QuickProbe use.
- In the **Single Quadrupole MS Method Editor**, enter 0.00 minutes for the **Solvent Delay**.
 - In the **Scan Time Segments** area, enter 50 for the **Threshold**.
 - In the **Scan speed** select 6250 (N=0) from the dropdown menu.
- 23 Edit other parameters required for the MS method. To display Real Time Plots of MS data on the Control Panel, see the MassHunter online help.
- 24 Click **OK** to close the **Single Quadrupole MS Method Editor** window and display the **Select Monitors** window.

4 Operation Using MassHunter Software

Create a QuickProbe method

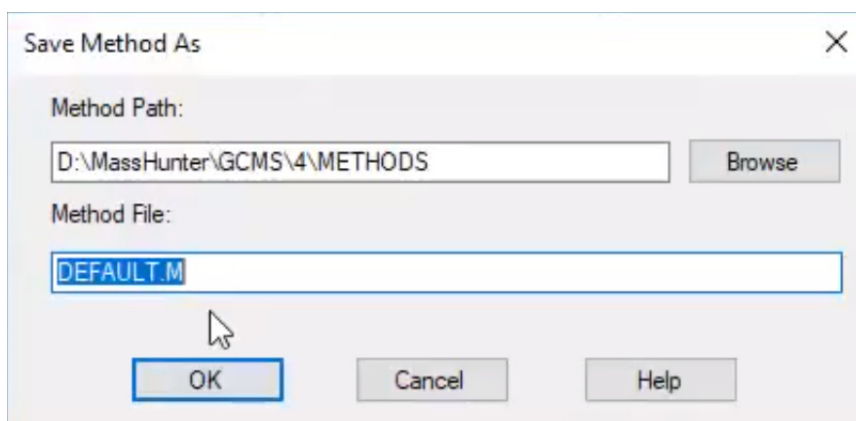
- 25 Under **Available Monitors** on the left, scroll down the list and select items particular to QuickProbe monitoring shown here already moved into **Selected Monitors**. Move an item to **Selected Monitors** by double-clicking or by selecting an item in **Available Monitors** and clicking **Add**.



4 Operation Using MassHunter Software

View the QuickProbe status

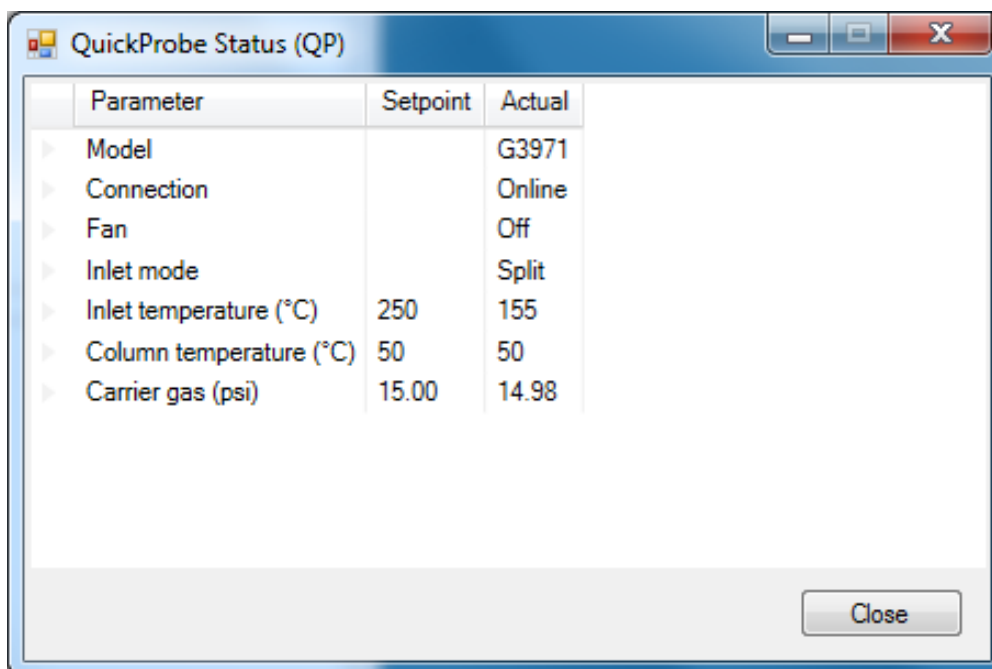
- 26 Click **OK** to return to the Instrument Control window. And display the **Save Method As** dialog.



- 27 Name the method and click **OK** to save it
- 28 Select **Window>Arrange** monitors. To evenly distribute monitors in the window.
- 29 Save the method.

View the QuickProbe status

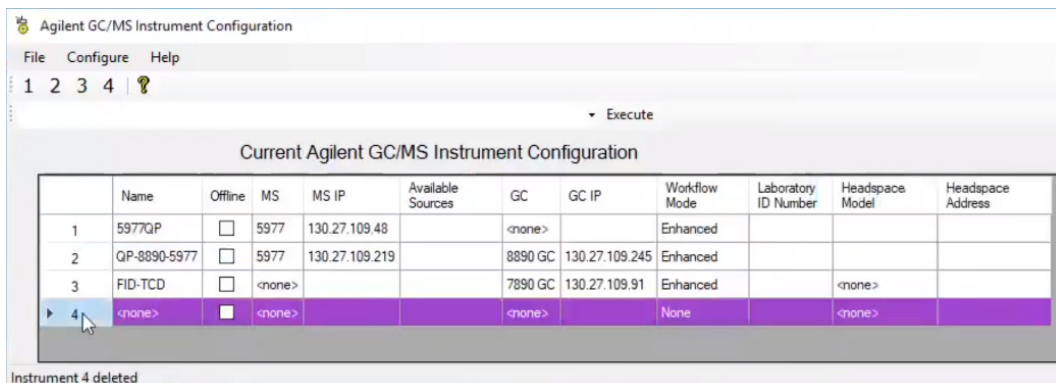
- 1 Select Window>QuickProbe status.



- 2 Click **Close** to exit.

Configure an instrument

- 1 From your windows desktop, double-click the Agilent GCMS Configuration icon. The Agilent GC/MS Instrument Configuration window opens.



- 2 From the Agilent GC/MS Instrument Configuration window, double-click in the first column of an empty row to display a blank GC/MS Instrument Configuration dialog.

Agilent GC/MS Instrument Configuration

Instrument Name: <none>

Laboratory ID Number:

☐ Offline Instrument

Mass Spectrometer

Model: None

Address:

Gas Chromatograph

Model: Other/None

☐ Use a PAL Sampler Configure PAL Sampler

☐ Use a QuickProbe™ Sampler Configure QuickProbe™

Address:

Headspace Type: <none>

Headspace Port:

Headspace Address:

Direct Communication

☐ Enable Direct Communication between instruments

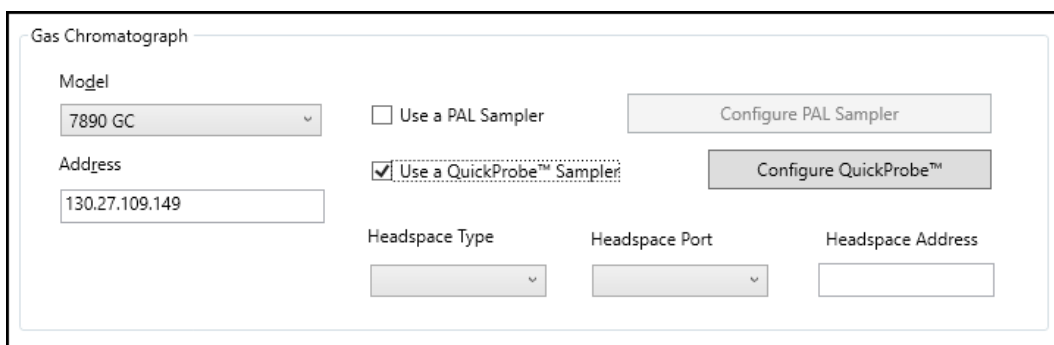
Workflow Mode: Enhanced

OK Cancel Help

4 Operation Using MassHunter Software

Configure an instrument

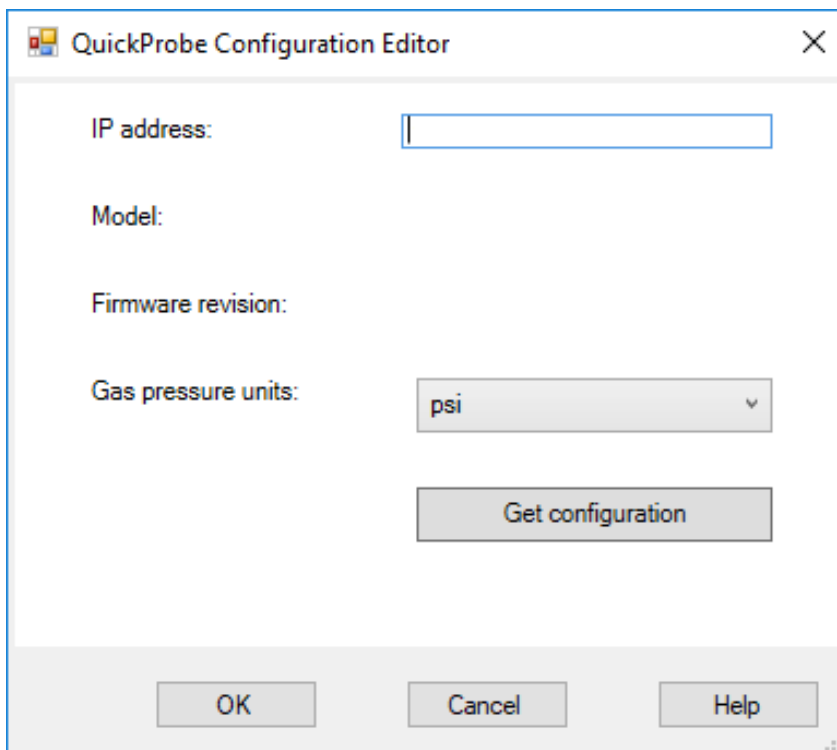
- 3 Enter an **Instrument Name**. This name is used to identify this instrument in the Windows Start menu and desktop icons.
- 4 (Optional) Enter a **Laboratory ID Number**. For example, this could be a company-specified ID or the instrument's serial number.
- 5 Clear the **Offline Instrument** check box.
- 6 Select the Mass Spectrometer model from **Mass Spectrometer\Model** dropdown menu and enter the **Mass Spectrometer\IP Address** of the instrument. Available mass spectrometer models supported include 5975 series MSD, and the 5977 Series MSD.
- 7 Select the GC model from the **Gas Chromatograph\Model** dropdown menu and enter the **Gas Chromatograph\IP Address** of the instrument. Available models include the 8890 GC, and 7890 series GC.
- 8 Select **Use a QuickProbe Sampler**. A PAL and QuickProbe may not be configured in the same instrument. The Configure QuickProbe control feature becomes active.



The screenshot shows the 'Gas Chromatograph' configuration window. It contains the following fields and controls:

- Model:** A dropdown menu with '7890 GC' selected.
- Address:** A text field containing '130.27.109.149'.
- Use a PAL Sampler:** An unchecked checkbox with a 'Configure PAL Sampler' button to its right.
- Use a QuickProbe™ Sampler:** A checked checkbox with a 'Configure QuickProbe™' button to its right.
- Headspace Type:** A dropdown menu.
- Headspace Port:** A dropdown menu.
- Headspace Address:** A text field.

- 9 Verify that the instrument is turned on and connected to the same network as your workstation and then click **Configure QuickProbe**.



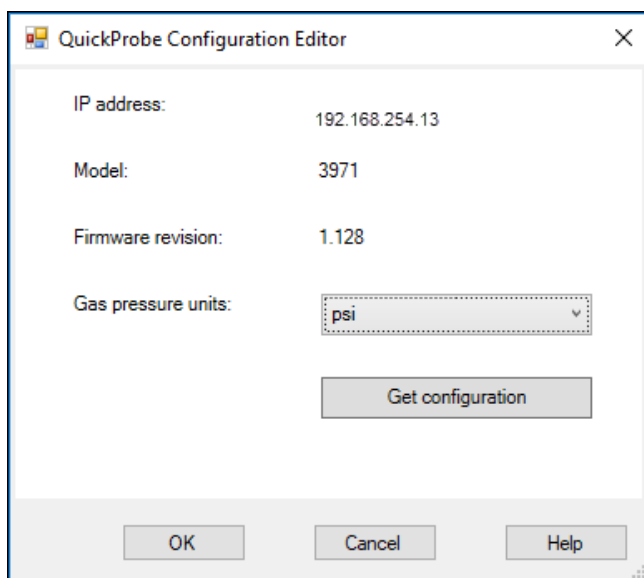
The screenshot shows the 'QuickProbe Configuration Editor' window. It contains the following fields and controls:

- IP address:** A text field.
- Model:** A text field.
- Firmware revision:** A text field.
- Gas pressure units:** A dropdown menu with 'psi' selected.
- Get configuration:** A button.
- OK, Cancel, Help:** Three buttons at the bottom of the window.

4 Operation Using MassHunter Software

Configure an instrument

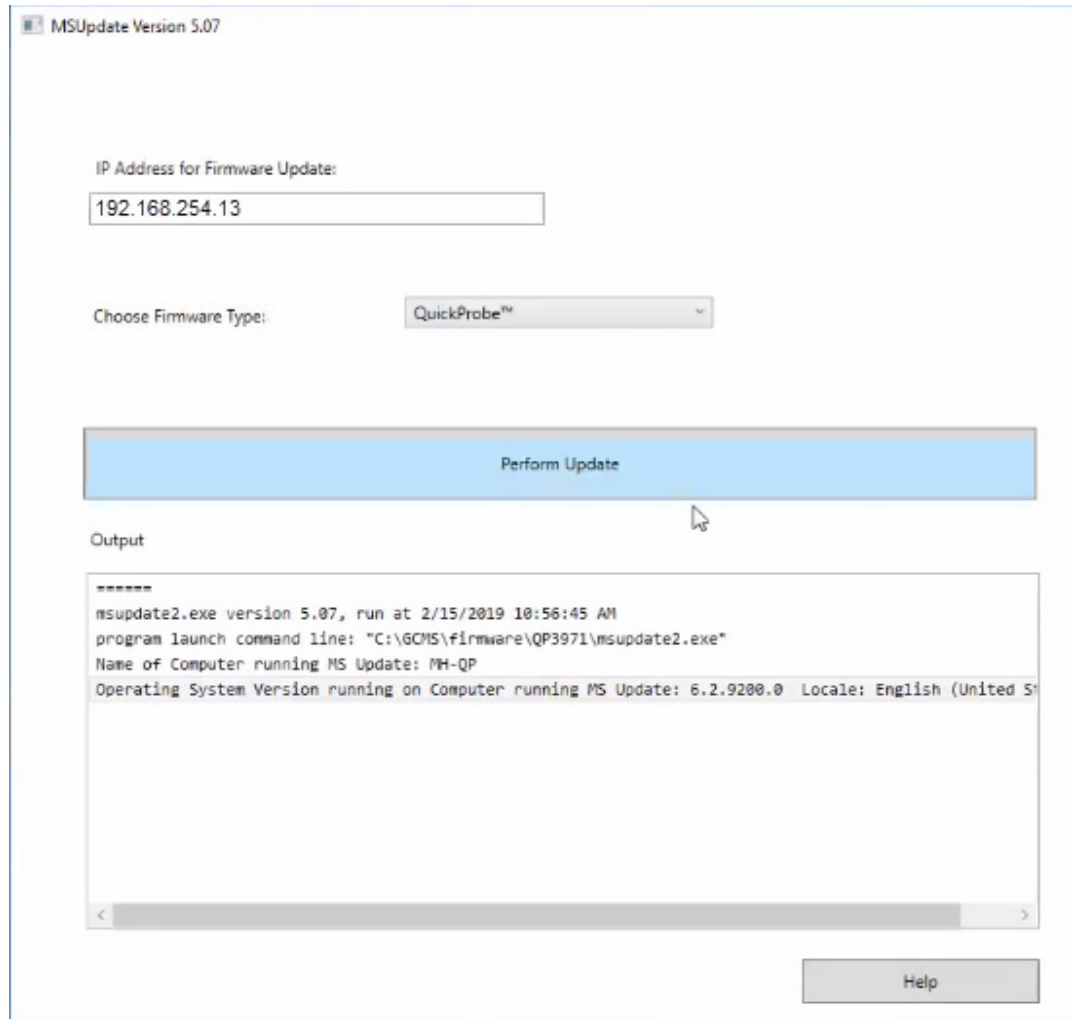
- 10 Enter the QuickProbe IP Address then click **Get Configuration** to verify the IP address, view the model number of the instrument, and the firmware revision number. Configuration will check to see if newer firmware is available. The IP Address of the instrument is set to 192.168.254.13 in the factory.



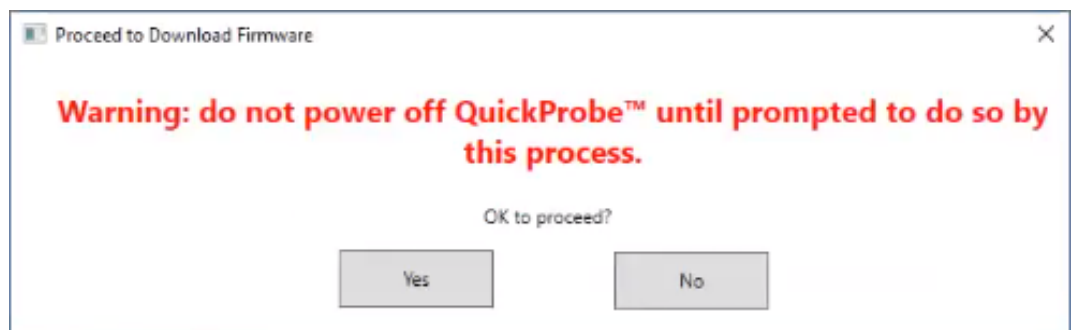
- 11 (Optional) Use the drop-down menu to select the gas pressure units of the carrier gas (psi, bar, or kPa).
- 12 Select **Get configuration** to update the configuration. The Model number and Firmware revision is read from the hardware and automatically updates.
- 13 Select **OK** to return to the Instrument Configuration screen.
- 14 On the Instrument Configuration screen, select **OK**. An update confirmation dialog box displays.
- 15 If enabling Direct Communications between a 8890 GC, 7890A+ or 7890B GC and another supported instrument, select the **Enable Direct Communication between instruments**. This checkbox is only displayed when you have selected supported instruments above and entered their IP addresses.
- 16 If you only select the currently installed source, MassHunter will not prompt you to enter the source type at startup. If you intend to use two or three of the source types and do not want to change these configuration settings in the future, select all check boxes that apply to this instrument.
- 17 In the DC Polarity area, select the factory configured polarity of this instrument. The DC Polarity is listed on a label on the MSD cover over the RF coils. This cover can be viewed by removing the upper MSD cover.
- 18 To configure the data analysis Work flow Mode, select **Enhanced**.
- 19 Click **OK** to save the configuration and close the GC/MS Instrument Configuration dialog.
- 20 When the system has saved the configuration information, the message Instrument configuration saved appears at the bottom of the **System Configuration** window.
- 21 Select **Exit** from the **File** menu to close the **System Configuration** window.
- 22 An entry for the new instrument name is created in the **Start > Programs** menu and an icon is also created on the Windows Desktop for starting the Agilent MassHunter GC/MS Data Acquisition software.

Install Firmware Updates

- 1 On your local hard drive, navigate to Local Disk (C:)\GCMS\firmware\<instrument>\msupdate2.exe.
- 2 Double-click to launch msupdate2.exe. The firmware update window displays.



- 3 Select **Perform Update**. The firmware update begins. The following warning displays.



- 4 Click **Yes** to continue.

QuickProbe Maintenance Procedures

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Replace the Gold Seal and Liner	65
Remove the Heater Block	69
Install the Heater Block	71
Replace the Liner with Inlet Installed	73
Leak Checking	76

Remove the QuickProbe Column

Materials needed

- Gloves, clean
 - Large (8650-0030)
 - Small (8650-0029)
- Wrench, open-ended, 1/4-inch and 5/16-inch (8710-0510)
- Wrench, open-ended, 9/16-inch and 5/8-inch (8720-0010)
- Wrench, adjustable
- Torx driver, T10 (5182-3466)
- Column cutter, ceramic (5181-8836) or diamond (5183-4620)
- Tweezers

Procedure

CAUTION

Always wear clean gloves while handling any parts that go inside the GC, QuickProbe, or the analyzer chambers.

WARNING

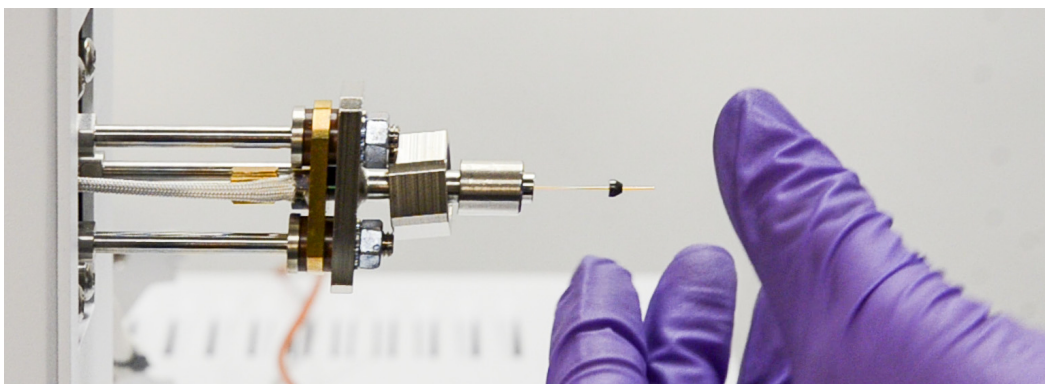
The analyzer, GC/MSD interface, and other components in the analyzer chamber operate at very high temperatures. Do not touch any part until you are sure it is cool.

- 1 Vent the MSD. See "To Vent the MS" in your Agilent 5977 or 5975 Series MSD Operating manual.

WARNING

The GC oven, the QuickProbe, and the GCMSD interface operate under high temperatures. Do not touch any parts in these areas until you are certain they are cool.

- 2 Remove the heater block assembly. See ["Remove the Heater Block"](#) on page 69.
- 3 Remove the QuickProbe Inlet. See ["Remove the QuickProbe Inlet"](#) on page 61.
- 4 Use tweezers to pull the ferrule holder insert out of the ferrule holder. To expose the ferrule attached to the column for cutting, slide the ferrule holder insert back into the ferrule holder.

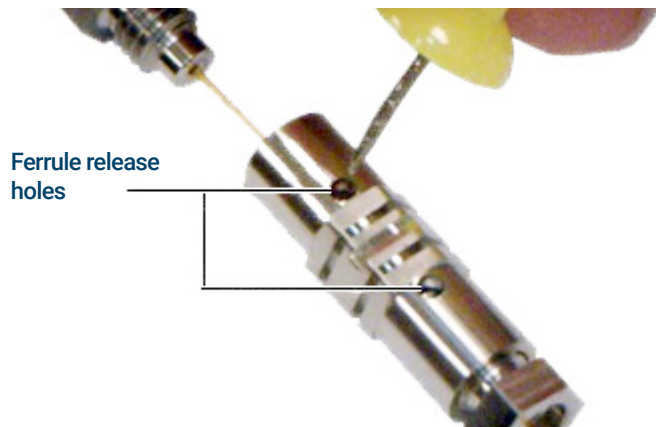


- 5 Cut the column to remove the ferrule.

5 QuickProbe Maintenance Procedures

Remove the QuickProbe Column

- 6 If reusing the ferrule holder insert, clean it and temporarily inset it back into the ferrule holder.
- 7 Use a ¼-inch open-end wrench to disconnect the QuickProbe column from the ultimate union inside the GC Oven. If the ferrule does not release from the fitting, do not try to pull the column free. Insert a pointed object (such as a thumb pin or a paper clip) into the ferrule release hole, and press firmly. You will hear a click as the ferrule releases.



- 8 Pull the column out of the QuickProbe oven into the GC oven.
- 9 To replace the QuickProbe column, see **"Install the QuickProbe Column"** on page 50.

Install the QuickProbe Column

This procedure starts with the MS Vented and cooled down, the QuickProbe inlet and column removed, and the GC cooled down. If this is not the case, see **“Remove the QuickProbe Column”** on page 48.

Agilent recommends replacing the QuickProbe gold seal and liner when you replace the column. See **“Replace the Gold Seal and Liner”** on page 65.

Materials needed

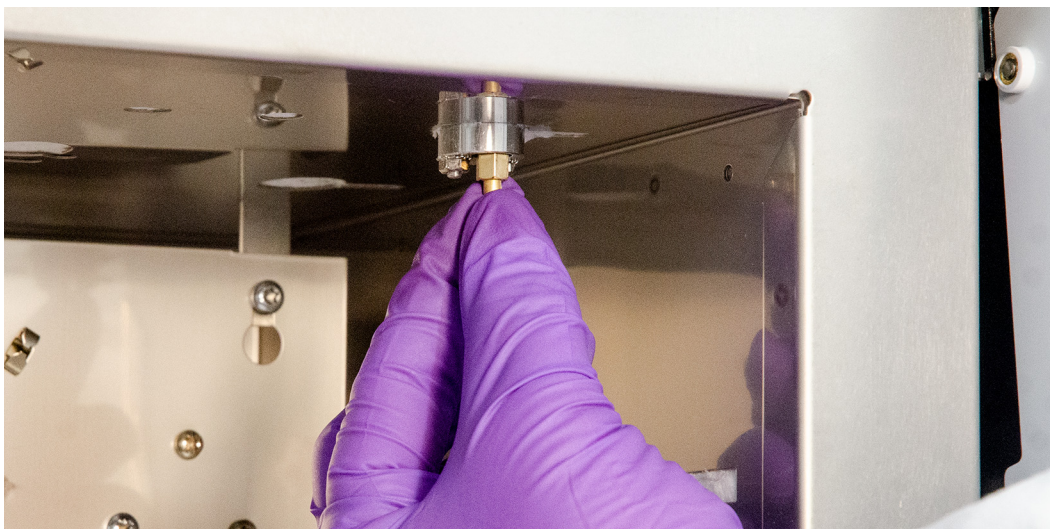
- Gloves, clean
 - Large (8650-0030)
 - Small (8650-0029)
- Wrench, open-end, 1/4-inch and 5/16-inch (8710-0510)
- Wrench, adjustable
- Column cutter, ceramic (5181-8836) or diamond (5183-4620)
- Ferrule holder insert if replacement is needed
- Ferrules for Quickprobe column inlet end
 - 0.40-mm od, for 0.25-mm id columns (5181-3323)
 - No-Hole Ferrule (5190-4054) if storing QuickProbe
- Preconditioned column
 - DB-1HT, ~2 m × 0.250 mm × 0.10 µm
- Ferrules for GCMS interface
 - 0.40-mm od, for 0.25-mm id columns (5181-3323)
- Ultimate union column fittings
 - UltiMetal Plus Flexible Metal ferrule 0.1 - 0.25 mm column id, 10/pk (G3188-27501)
 - Internal nut, CFT capillary fitting (G2855-20530)
 - Swaging tool (G3440-80227)
- Magnifying loupe
- Clean wiping paper such as Kim wipe

WARNING

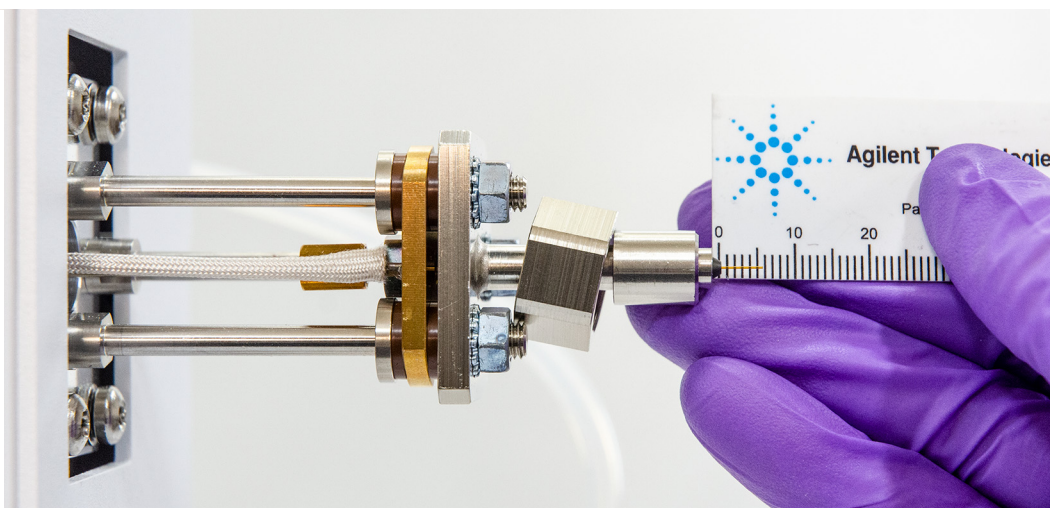
The MS, GC, and QuickProbe operate under high temperatures. Do not touch any parts unless you are certain they are cool.

Procedure

- 1 Pull the ferrule holder insert out of the ferrule holder.
- 2 From inside the GC oven, insert a pre-conditioned column (DB-1HT, ~2 m × 0.250 mm × 0.10 µm) into the QuickProbe oven outlet fitting until resistance stops insertion. It is normal to feel resistance as the column is inserted into the oven. Retract the column a small amount and continue to insert until the column exits the QuickProbe oven inlet ferrule holder.



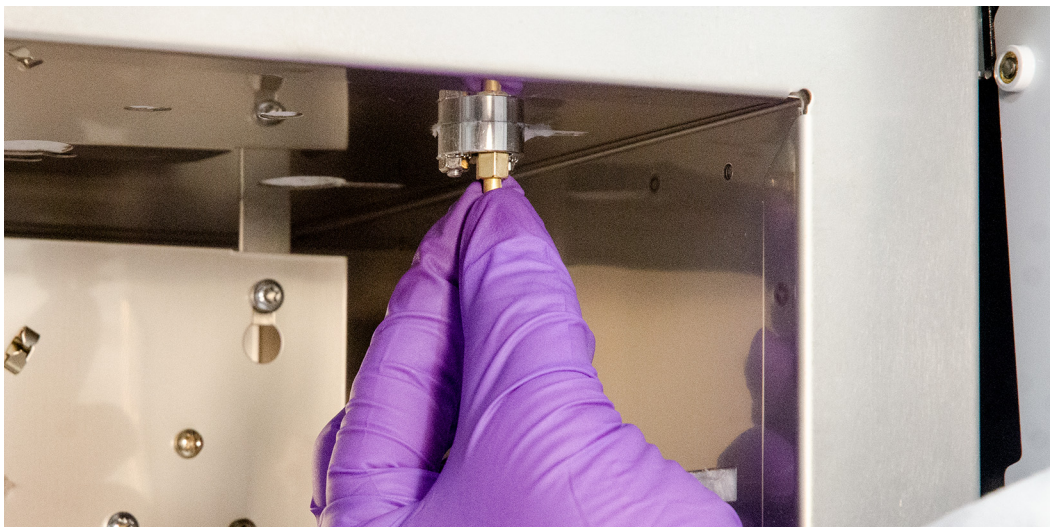
- 3 With the QuickProbe inlet removed, and the column extending a couple of inches past the ferrule holder, slide a new or clean ferrule holder insert over the column and into the ferrule holder. Then slide a Vespel/Graphite ferrule on the column with the flat side facing the QuickProbe ferrule holder.
- 4 Slide the ferrule into the ferrule holder insert with the ferrule seated flush in the insert.
- 5 Cut the column to have a square cut (repeat if needed). Clean the column with clean wiping paper such as a Kim wipe and isopropanol.
- 6 From the GC oven side, pull the column slowly until it extends 5-6 mm past the ferrule on the QuickProbe inlet side.



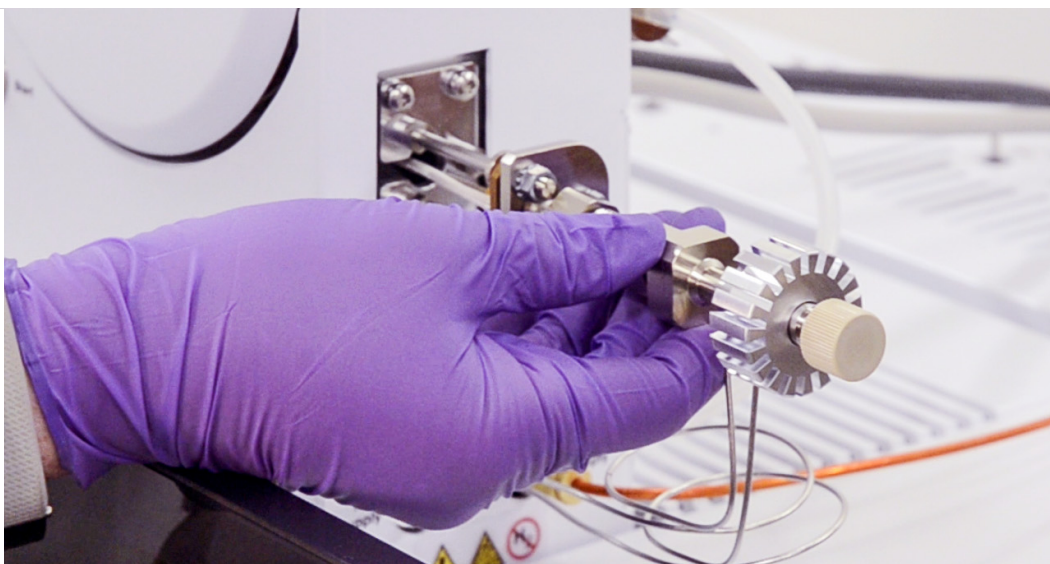
5 QuickProbe Maintenance Procedures

Install the QuickProbe Column

- 7 Using your left-hand finger, pinch the column against the QuickProbe oven tubing outlet from inside the GC oven to keep the ferrule from moving along the column during this step.



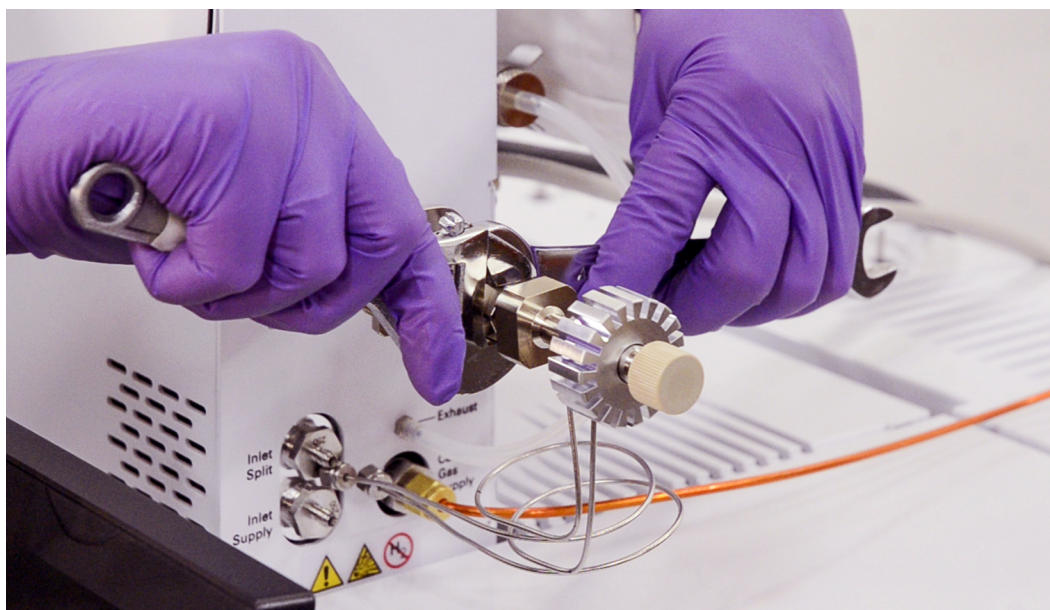
Using your right-hand, slide the QuickProbe inlet assembly over the ferrule holder and hand tighten the ferrule holder nut to the main union of the inlet body assembly.



5 QuickProbe Maintenance Procedures

Install the QuickProbe Column

- 8 Using the 5/8" and adjustable wrenches, tighten the ferrule holder to the main union by rotating the ferrule holder nut about 90 degrees. Keep the ferrule holder nut's top side edge parallel to the Main Body assembly end top side to fit the heater block's inside profile.



- 9 Install the inlet heater block. See **"Install the Heater Block"** on page 71.
- 10 Attach the other end of the column to the ultimate union using a UltiMetal Plus Flexible Metal ferrule, internal nut, and swaging tool. See the G3182B Purged Ultimate Union Kits manual (G3182-90020) for complete instructions.
 - a The length of the column from the QuickProbe oven outlet to the ultimate union should be approximately the height of GC oven.
 - b Using a magnification loupe, verify the column end is square and free of cracks. If needed, trim it.
 - c Pass the column end through the internal nut and the ferrule, as shown.

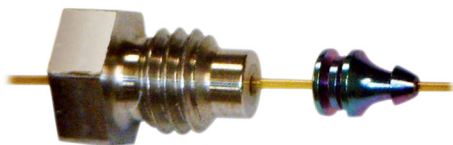


- d Thread the internal nut into the swaging tool until finger tight.
- e Use a 1/4-inch open-ended wrench to swage the ferrule to the column. Rotate the wrench clockwise 50 degrees.
- f Check if the ferrule is gripping the column. If yes, stop. If not, continue to tighten the internal nut in small 5 to 15 degree increments. Check after each increment to see if the ferrule is gripping the column. Stop as soon as gripping occurs but the wrench rotation should not exceed 100 degrees or problems may occur.
- g Rotate the internal nut clockwise an additional 15 to 20 degrees clockwise to assure the ferrule is properly swaged onto the column.

5 QuickProbe Maintenance Procedures

Install the QuickProbe Column

- h** Remove the internal nut from the swaging tool and column.



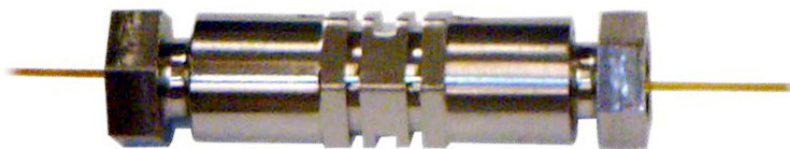
- i** Using the column cutter, trim the column at the small end of the ferrule leaving approximately 0.3 mm of the column extending from the ferrule.



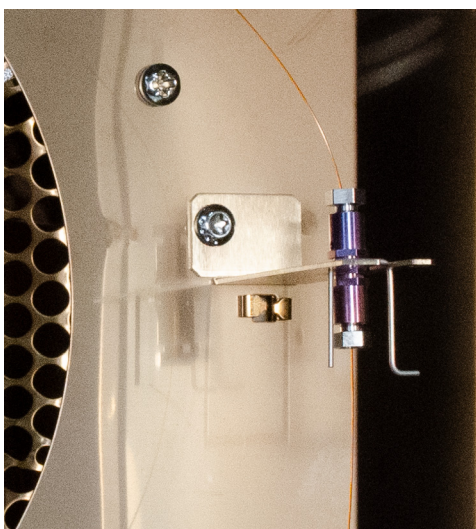
- j** The minimum size of the column head extending from the ferrule is 0.1 mm and the maximum is 0.5 mm. It is important to have 0.5 mm or less column head to prevent column conflict in the union.

- k** Finger-tighten the column to the ultimate union.

- l** Use an adjustable wrench to hold the union body and a 1/4-inch open-end wrench to tighten the internal nut another 15 to 20 degrees.



- 11** Place the ultimate union on the bracket and secure using the wire clip.



- 12** Leak check all the connections. See **“Leak Checking”** on page 76.

Remove the Restrictor Column

Materials needed

- Gloves, clean
 - Large (8650-0030)
 - Small (8650-0029)
- Wrench, open-end, 1/4-inch and 5/16-inch (8710-0510)
- Wrench, adjustable
- Column cutter, ceramic (5181-8836) or diamond (5183-4620)

Procedure

CAUTION

Always wear clean gloves while handling any parts that go inside the GC, QuickProbe, or the analyzer chambers.

WARNING

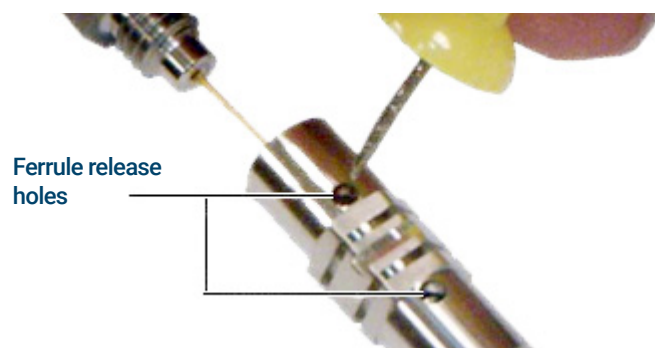
Dangerous voltages exist inside the analyzer chamber, which can result in fatal injury. Do not open the analyzer chamber door for any reason. If access is required, trained service personnel must first disconnect the instrument from the building power source.

- 1 Vent the MSD and open the analyzer chamber. (See "To Vent the MSD and "To Open the Analyzer Chamber" in your Agilent MSD Operating manual.)

WARNING

The GC oven, the analyzer and its components, the QuickProbe, and the GCMSD interface operate under high temperatures. Do not touch any parts in these areas until you are certain they are cool.

- 2 Remove the interface tip seal and spring, from the end of the GC/MSD interface.
- 3 inside the GC oven, remove the ultimate union from its holder.
- 4 Use an adjustable wrench to hold the union body and a 1/4-inch open-ended wrench to loosen the internal nut. Unscrew the internal nut and disconnect the restrictor column from the ultimate union. If the ferrule does not release from the fitting, do not try to pull the column free. Insert a pointed object (such as a thumb pin or a paper clip) into the ferrule release hole, as shown, and press firmly. You will hear a click as the ferrule releases.



- 5 Pull the restrictor column out of the GCMS interface into the GC oven.

Install the Restrictor Column

Materials needed

- Gloves, clean
 - Large (8650-0030)
 - Small (8650-0029)
- Metric ruler
- Wrench, open-end, 1/4-inch and 5/16-inch (8710-0510)
- Column cutter, ceramic (5181-8836) or diamond (5183-4620)
- Preconditioned column
 - DB-1MS, about 0.6 to 0.7 m long × 0.18 mm × 0.18 μm
- Ferrules for GCMS interface
 - 0.40-mm od, for 0.25-mm id columns (5181-3323)
- Interface column nut (05988-20066)
- Ultimate union column fittings
 - UltiMetal Plus Flexible Metal ferrule 0.1 - 0.25 mm column id, 10/pk (G3188-27501)
 - Internal nut, CFT capillary fitting (G2855-20530)
 - Swaging tool (G3440-80227)
- Flashlight
- Magnifying loupe
- Clean wiping paper such as Kim wipe and Alcohol

Procedure

This procedure starts with the instruments cooled down and the restrictor column removed. If this is not the case see **"Remove the Restrictor Column"** on page 55.

CAUTION

Always wear clean gloves while handling any parts that go inside the GC, QuickProbe, or the analyzer chambers.

WARNING

The analyzer, GC/MSD interface, and other components in the analyzer chamber operate at very high temperatures. Do not touch any part until you are sure it is cool.

WARNING

Dangerous voltages exist inside the analyzer chamber, which can result in fatal injury. Do not open the analyzer chamber door for any reason. If access is required, trained service personnel must first disconnect the instrument from the building power source.

- 1 With the MSD unplugged from the building's power mains, open the analyzer door. See "To Open the Analyzer Chamber" in your Agilent MSD Operating manual.
- 2 Slide an interface column nut and 0.40-mm od ferrule for 0.25-mm id columns onto the free end of the DB-1MS, about 0.6 to 0.7 m long × 0.18 mm × 0.18 μm restrictor column. The tapered end of the ferrule must point towards the nut.

5 QuickProbe Maintenance Procedures

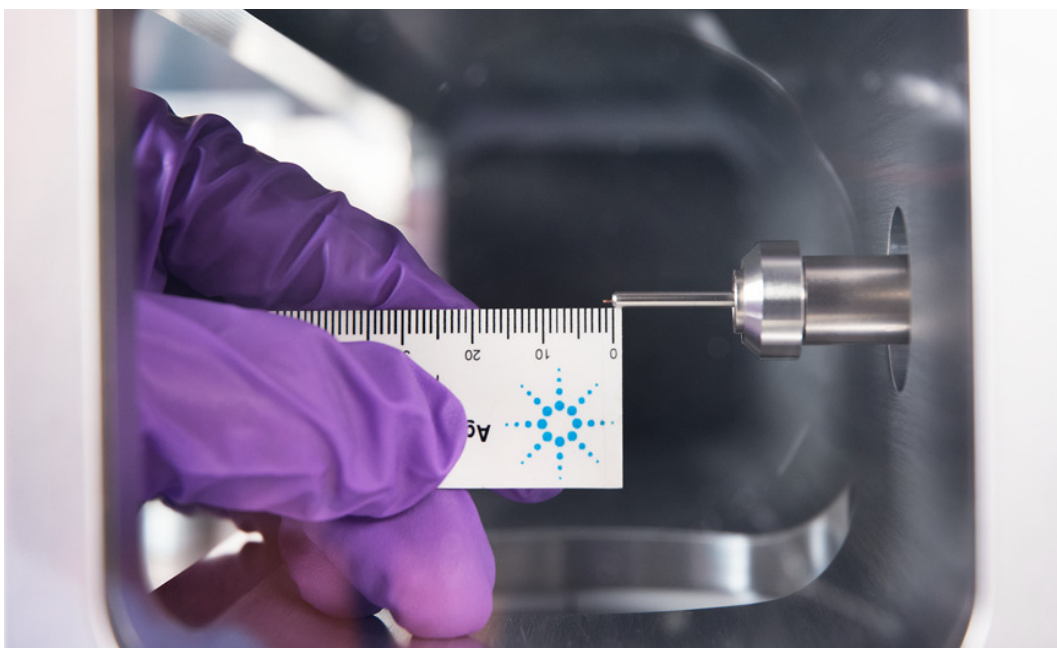
Install the Restrictor Column

- 3 Inside the GC oven, slide the column into the GC/MSD interface until the column extends outside of the analyzer chamber.

CAUTION

Do not break the column off inside the vacuum manifold. Pieces of column could fall or be pulled into the turbo pump and damage it.

- 4 Use the column cutter to score the column 2 cm from its end.
- 5 While holding the column against the column cutter with your thumb, break the column against the edge of the column cutter.
- 6 Use a magnifying loupe to inspect the end for jagged edges or burrs. If the break is not clean and even, repeat steps 4 and 5.
- 7 Use clean wiping paper such as a Kim wipe with alcohol to clean the column end.
- 8 Pulling the column from the GC oven side, adjust so it extends 1 mm past the end of the column guide tube. Use the flashlight and magnifying loupe, if necessary, to see the end of the column inside the analyzer chamber. Do not use your finger to feel for the column end.



- 9 Hand-tighten the interface column nut. Ensure the position of the column does not change as you tighten the nut. Do not over tighten the nut.

5 QuickProbe Maintenance Procedures

Install the Restrictor Column

- 10 Use the ¼-inch open-ended wrench to tighten the nut in the clockwise direction. Continue to tighten until you feel the ferrule grip the column.



- 11 Check the GC oven to ensure that the column does not touch the oven walls.

CAUTION

Use care when placing the tip seal on the GC/MSD interface to avoid damaging the column.

- 12 Install the spring, and tip seal on the GC/MSD interface.

CAUTION

Forcing the analyzer door closed if these parts are misaligned will damage the tip seal or the interface or the ion source, or will keep the sideplate from sealing.

- 13 Gently check the alignment of the ion source and the interface tip seal.

When the ion source is aligned correctly, the analyzer chamber can be closed all the way with no resistance except the spring tension from the interface tip seal.

- 14 You can align the ion source and interface tip seal by wiggling the side plate on its hinge. If the door still will not close, contact your Agilent Technologies service representative.
- 15 Close the analyzer chamber door. See "To Close the Analyzer Chamber" in your Agilent MSD Operating manual.)
- 16 Attach the other end of the column to the ultimate union using a UltiMetal Plus Flexible Metal ferrule, internal nut, and swaging tool. See the G3182B Purged Ultimate Union Kits manual (G3182-90020) for complete instructions.
 - a The length of the restrictor column from the GC/MS interface to the ultimate union should be approximately the width of the GC oven.
 - b Using a magnification loupe, verify the column end is square and free of cracks. If needed, trim it.

5 QuickProbe Maintenance Procedures

Install the Restrictor Column

- c** Pass the column end through the internal nut and the ferrule, as shown.



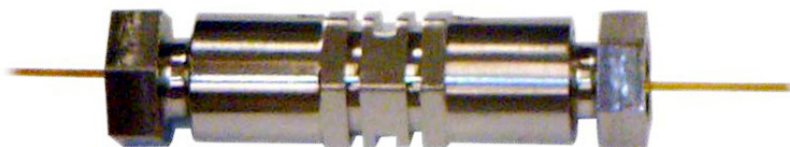
- d** Thread the internal nut into the swaging tool until finger tight.
- e** Use a 1/4-inch open-ended wrench to swage the ferrule to the column. Rotate the wrench clockwise 50 degrees.
- f** Check if the ferrule is gripping the column. If yes, stop. If not, continue to tighten the internal nut in small 5 to 15 degree increments. Check after each increment to see if the ferrule is gripping the column. Stop as soon as gripping occurs but the wrench rotation should not exceed 100 degrees or problems may occur.
- g** Rotate the internal nut clockwise an additional 15 to 20 degrees clockwise to assure the ferrule is properly swaged onto the column.
- h** Remove the internal nut from the swaging tool and column.



- i** Using the column cutter, trim the column at the small end of the ferrule leaving approximately 0.3 mm of the column extending from the ferrule.



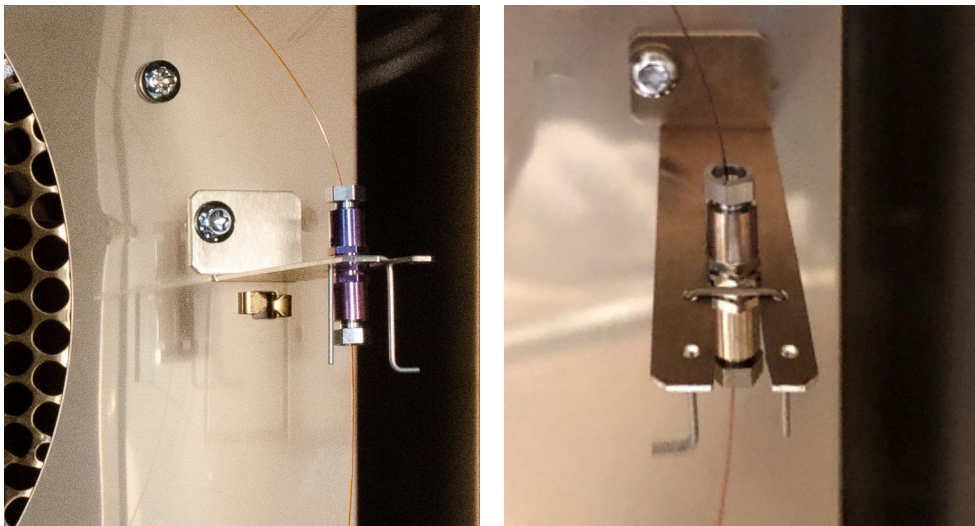
- j** The minimum size of the column head extending from the ferrule is 0.1 mm and the maximum is 0.5 mm. It is important to have 0.5 mm or less column head to prevent column conflict in the union.
- k** Finger-tighten the column to the ultimate union.
- l** Use a 1/4-inch open-end wrench to tighten the internal nut another 15 to 20 degrees.



5 QuickProbe Maintenance Procedures

Install the Restrictor Column

- 17 Place the ultimate union on the bracket and secure using the wire clip.



- 18 Leak check all the connections. See **“Leak Checking”** on page 76.
- 19 Leak check the GCMS interface column nut and ultimate union connections. See **“Leak Checking”** on page 76.

Remove the QuickProbe Inlet

Materials needed

- Gloves, clean
 - -Large (8650-0030)
 - -Small (8650-0029)
- Wrench, open-ended, 1/4-inch and 5/16-inch (8710-0510)
- Wrench, open-ended, 9/16-inch and 5/8-inch (8720-0010)
- Wrench, adjustable
- Torx driver, T10 (5182-3466)
- Column cutter, ceramic (5181-8836) or diamond (5183-4620)

Procedure

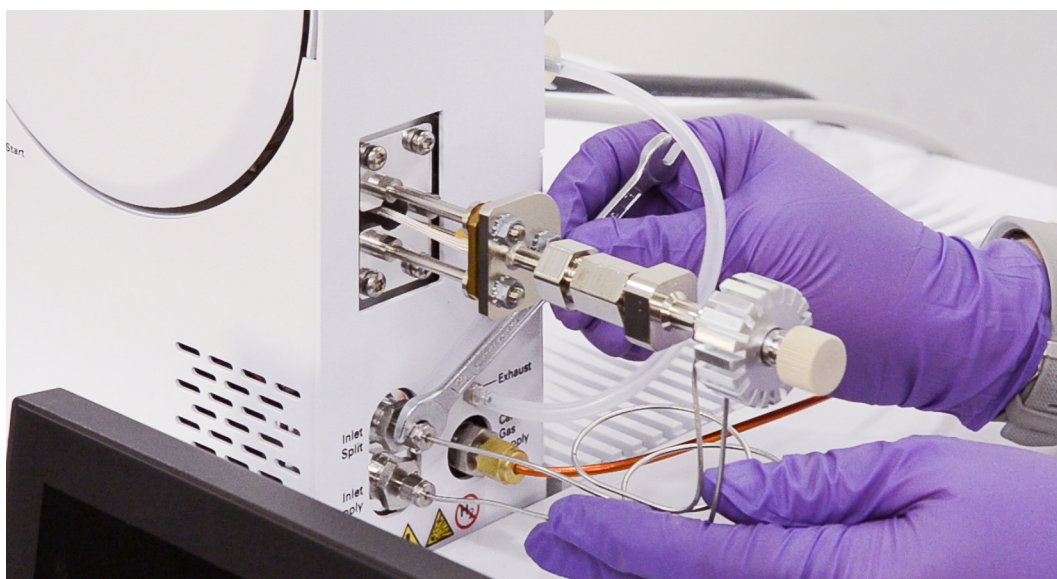
CAUTION

Always wear clean gloves while handling any parts that go inside the GC, QuickProbe, or the analyzer chambers.

WARNING

The analyzer, GC/MSD interface, and other components in the analyzer chamber operate at very high temperatures. Do not touch any part until you are sure it is cool.

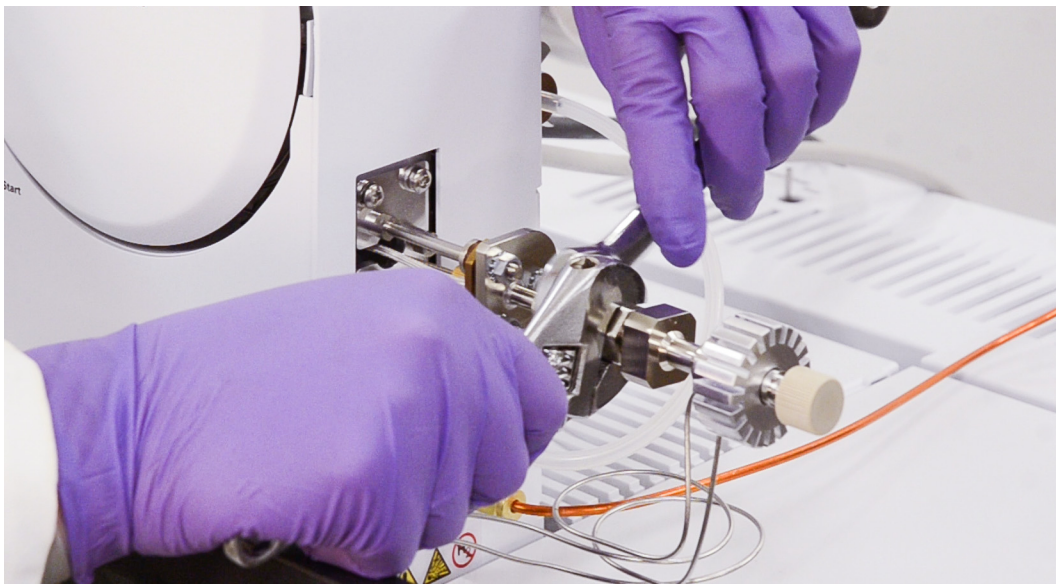
- 1 Vent the MSD. See "To Vent the MS" in your Agilent 5977 or 5975 Series MSD Operating manual.
- 2 Remove the heater block assembly. See ["Remove the Heater Block"](#) on page 69..
- 3 Use a 5/16-inch open-end wrench to remove the Inlet Split and Inlet Supply 1/16" Swagelok tubing from the pneumatics manifold.



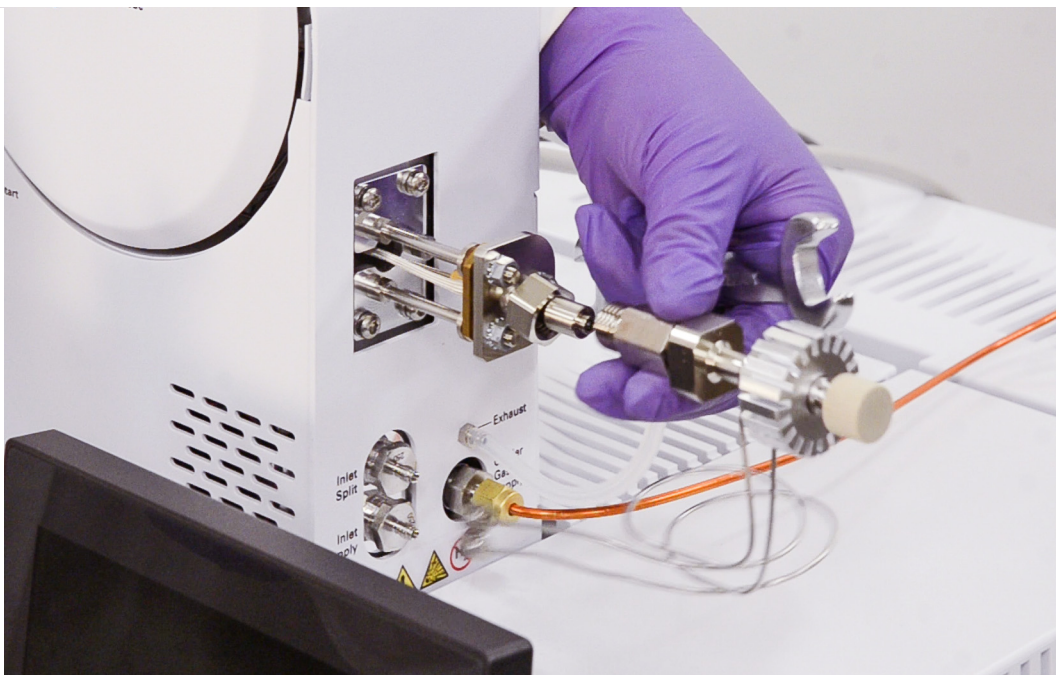
5 QuickProbe Maintenance Procedures

Remove the QuickProbe Inlet

- 4 Use an adjustable wrench and a 5/8-inch open-end wrench to loosen the ferrule holder nut, unthread the nut by hand, and slide it away from the main union.



- 5 Slide the inlet off the ferrule holder to remove the main inlet body assembly and set it aside.



- 6 Agilent recommends replacing the QuickProbe gold seal and liner when you replace the column. See ["Replace the Gold Seal and Liner"](#) on page 65.

Install the Quick Probe Inlet

This procedure is used when the inlet column is installed with a ferrule swaged in place at the inlet end, and the instrument is cooled down and unplugged from the building's power mains supply.

Materials needed

- Gloves, clean
 - -Large (8650-0030)
 - -Small (8650-0029)
- Wrench, open-end, 1/4-inch and 5/16-inch (8710-0510)
- Wrench, open-ended, 9/16-inch and 5/8-inch (8720-0010)
- Wrench, adjustable
- Torx driver, T10 (5182-3466)
- Column cutter, ceramic (5181-8836) or diamond (5183-4620)

Procedure

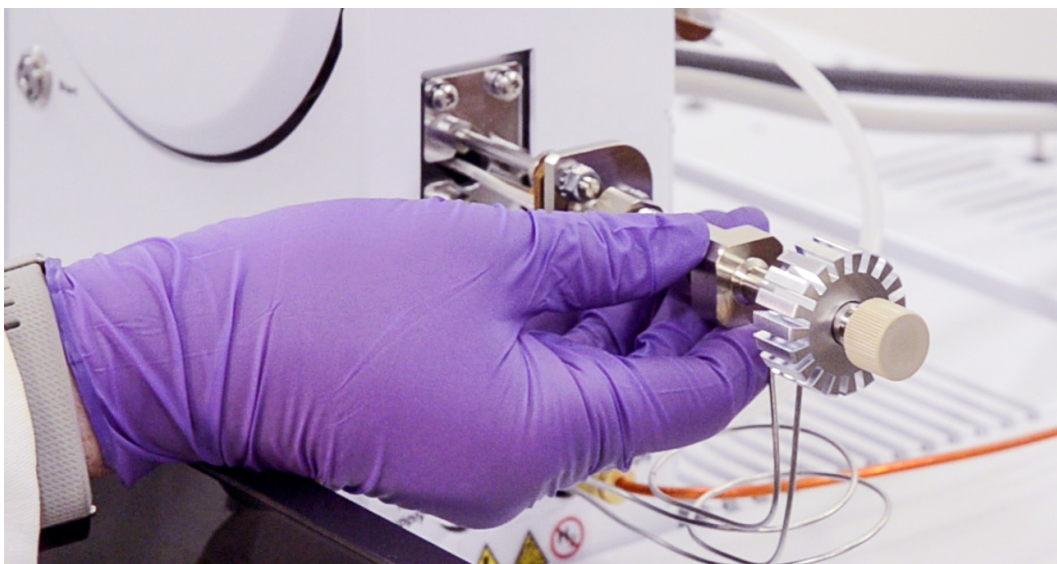
CAUTION

Always wear clean gloves while handling any parts that go inside the GC, QuickProbe, or the analyzer chambers.

WARNING

The analyzer, GC/MSD interface, and other components in the analyzer chamber operate at very high temperatures. Do not touch any part until you are sure it is cool.

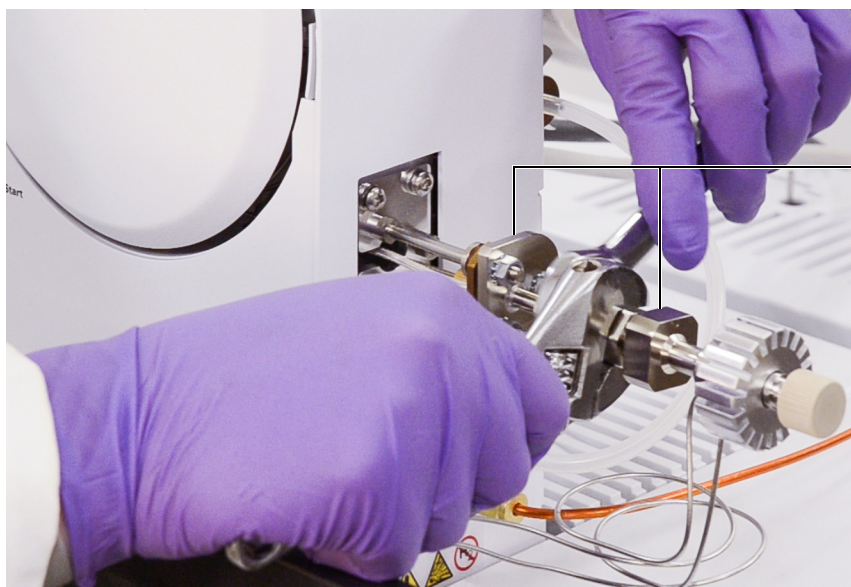
- 1 Slide the QuickProbe inlet assembly over the ferrule holder and hand tighten the ferrule holder nut to the main union of the inlet body assembly.



5 QuickProbe Maintenance Procedures

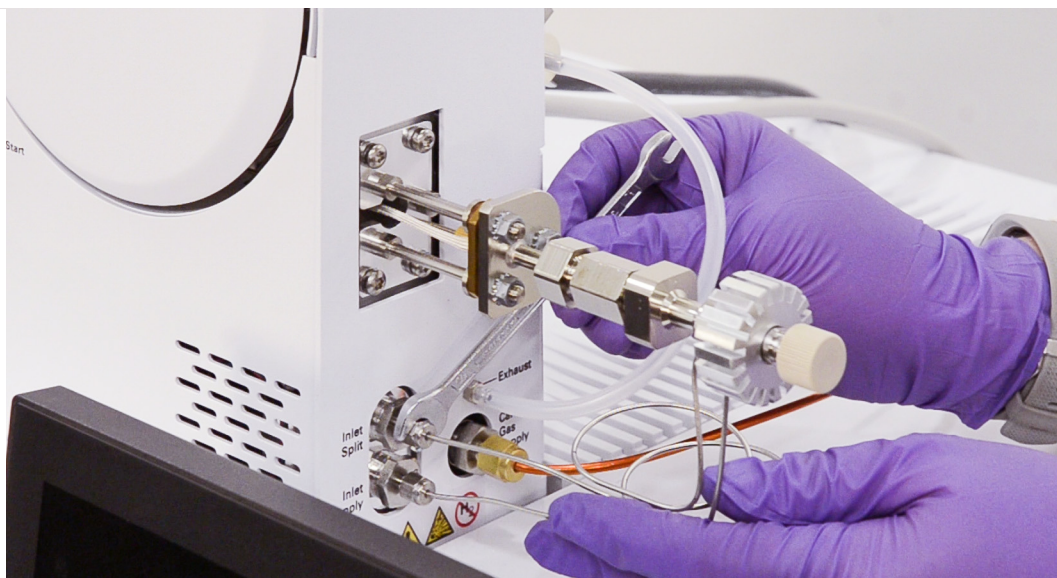
Install the Quick Probe Inlet

- 2 Using the 5/8" and adjustable wrenches, tighten the ferrule holder to the main union by rotating the ferrule holder nut about 90 degrees. Keep the ferrule holder nut's top side edge parallel to the Main Body assembly end top side to fit the heater block's inside profile.



Keep these edges parallel

- 3 Use a 5/16-inch open-end wrench to attach the Inlet Split and Inlet Supply 1/16" Swagelok tubing to the pneumatics manifold.



- 4 Install the inlet heater block. See **"Install the Heater Block"** on page 71.
- 5 Leak check all the connections. See **"Leak Checking"** on page 76.

Replace the Gold Seal and Liner

If installing a new column, Agilent recommends replacing the QuickProbe gold seal and liner. To only replace the liner without removing the inlet see **“Replace the Liner with Inlet Installed”** on page 73.

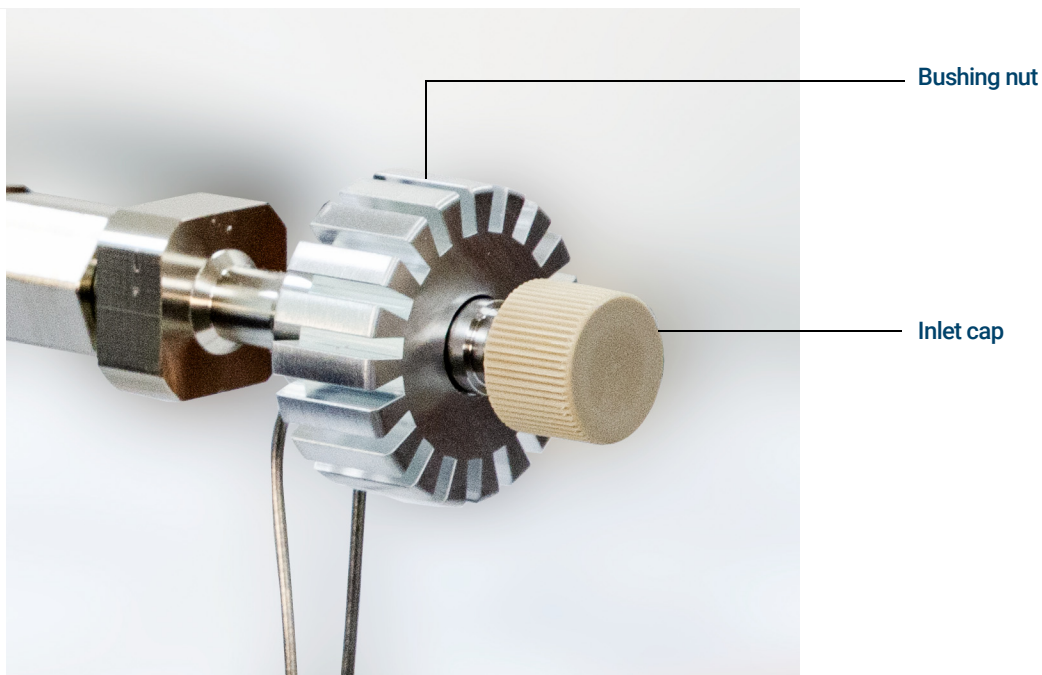
Materials Needed

- Gloves, clean
 - Large (8650-0030)
 - Small (8650-0029)
- Wrench, open-ended, 9/16-inch and 5/8-inch (8720-0010)
- Wrench, adjustable
- Gold Seal and washer (5188-5367)
- Liner (5190-5104) with O-ring (0905-1014)
- Tweezers

Procedure

This procedure is done on a bench and requires that the Inlet is already removed from QuickProbe. See **“Remove the QuickProbe Inlet”** on page 61.

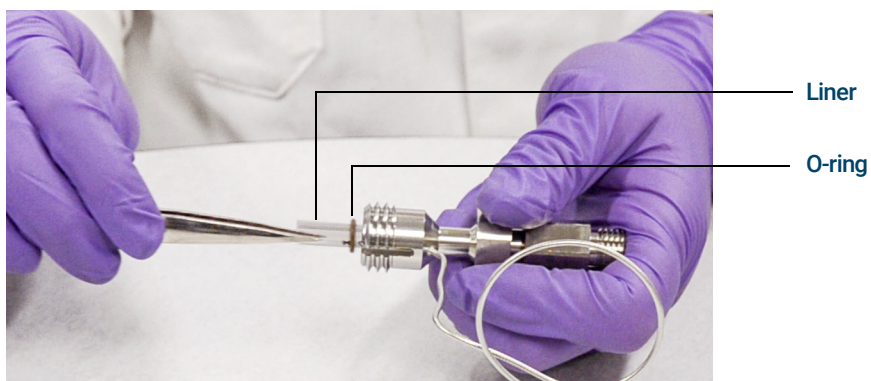
- 1 Remove the inlet cap and the bushing nut.



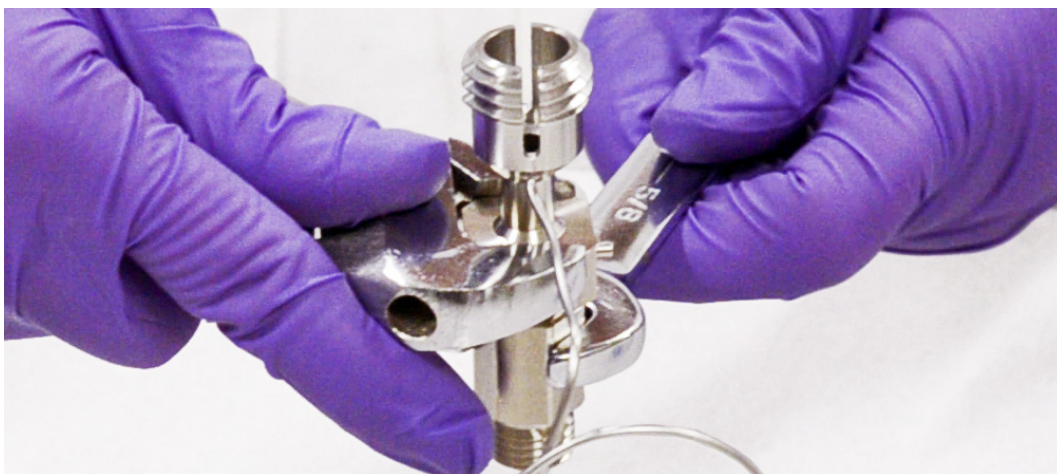
5 QuickProbe Maintenance Procedures

Replace the Gold Seal and Liner

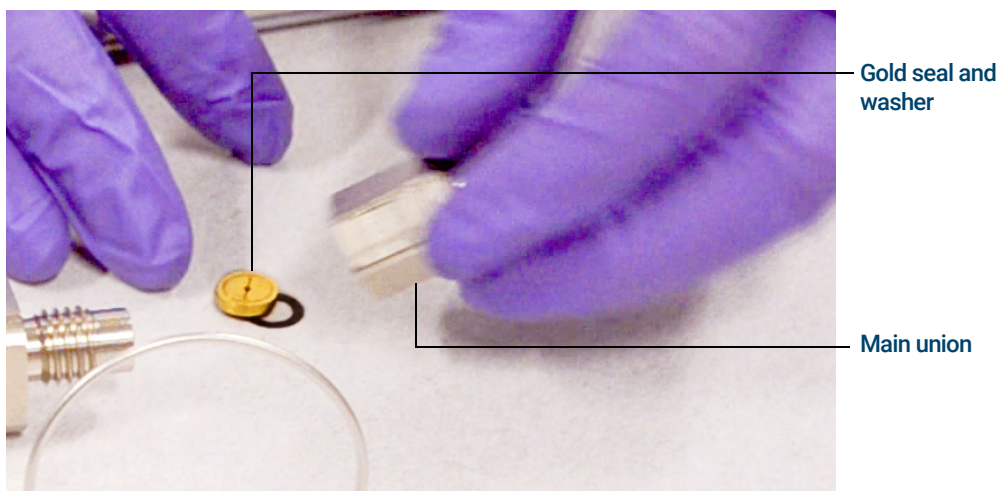
- 2 Using tweezers, remove the liner and the O-ring from the main body and discard.



- 3 Using the adjustable and 5/8" wrenches, loosen and remove the main union from the inlet body.



- 4 Discard the old gold seal and washer located inside the main union.

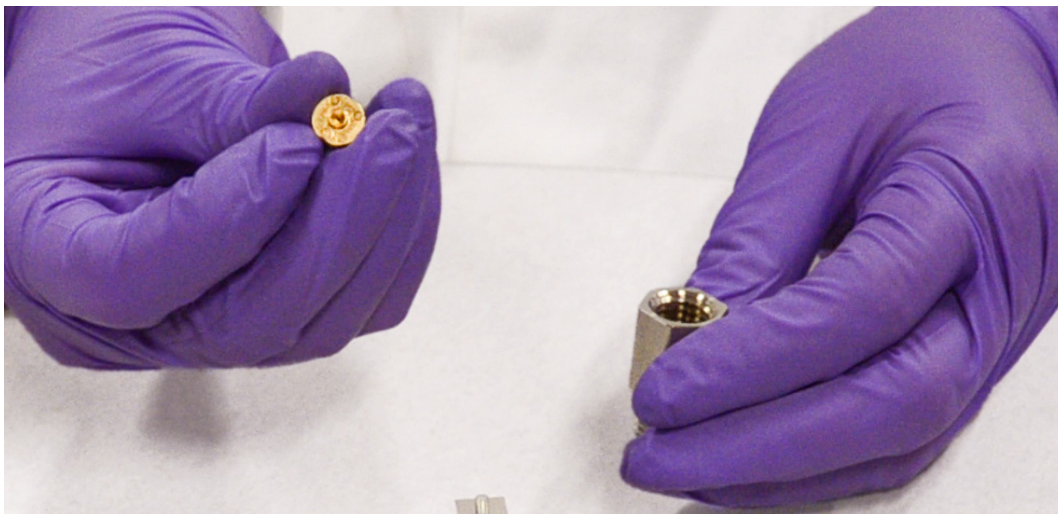


- 5 Inspect the disassembled inlet and if required clean each part.

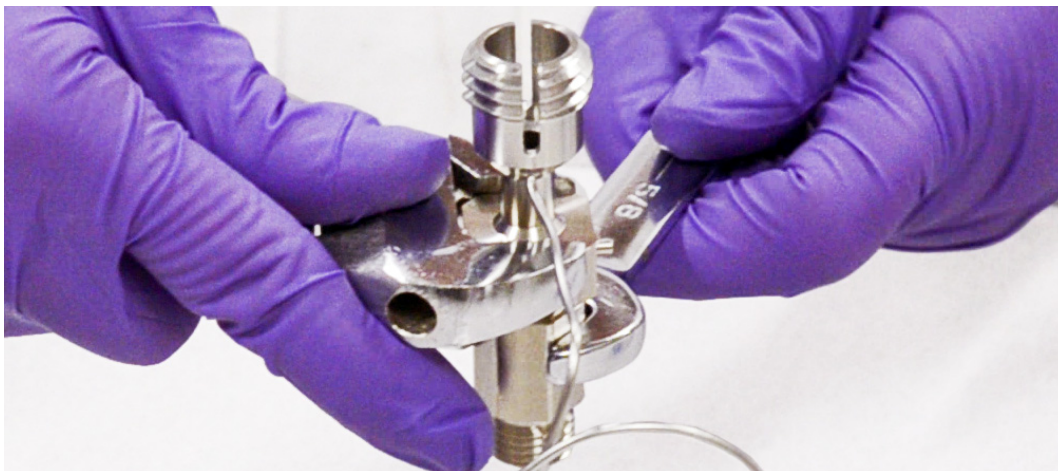
5 QuickProbe Maintenance Procedures

Replace the Gold Seal and Liner

- 6 Place a new washer followed by a new gold seal with the tip down into the main union. With the gold seal centered and the main body held vertically, hand tighten the main union to the main body assembly.



- 7 Using the 5/8" and adjustable wrenches finish tightening the main union to the inlet body.



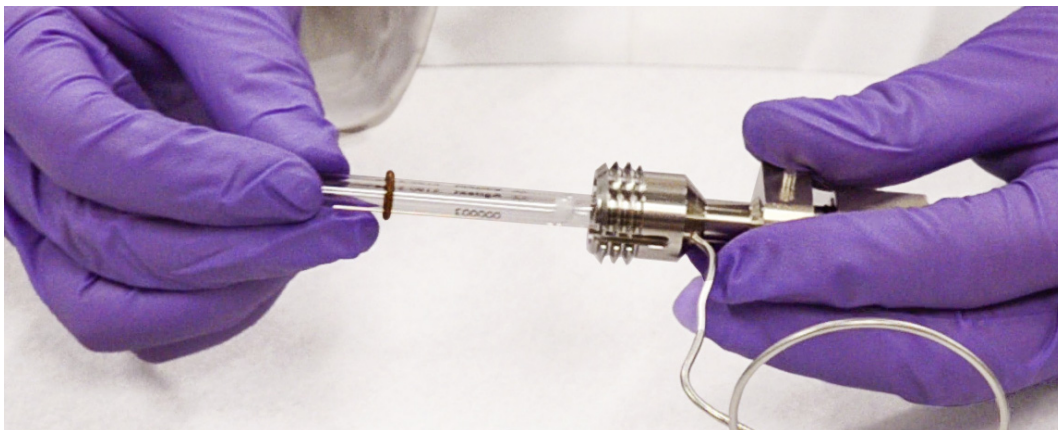
If you are replacing column, now would be the time to do this before installing the inlet. See **"Remove the QuickProbe Column"** on page 48 and **"Install the QuickProbe Column"** on page 50.

- 8 Slide a liner O-ring onto the liner at its midpoint.

5 QuickProbe Maintenance Procedures

Replace the Gold Seal and Liner

- 9 Holding the main body horizontal, slide the liner with O-ring into main body assembly (small OD first) until it is flush with the end of the main body.



- 10 Install the inlet cap and the bushing nut.
- 11 Install the QuickProbe Inlet assembly. See **"Install the Quick Probe Inlet"** on page 63.

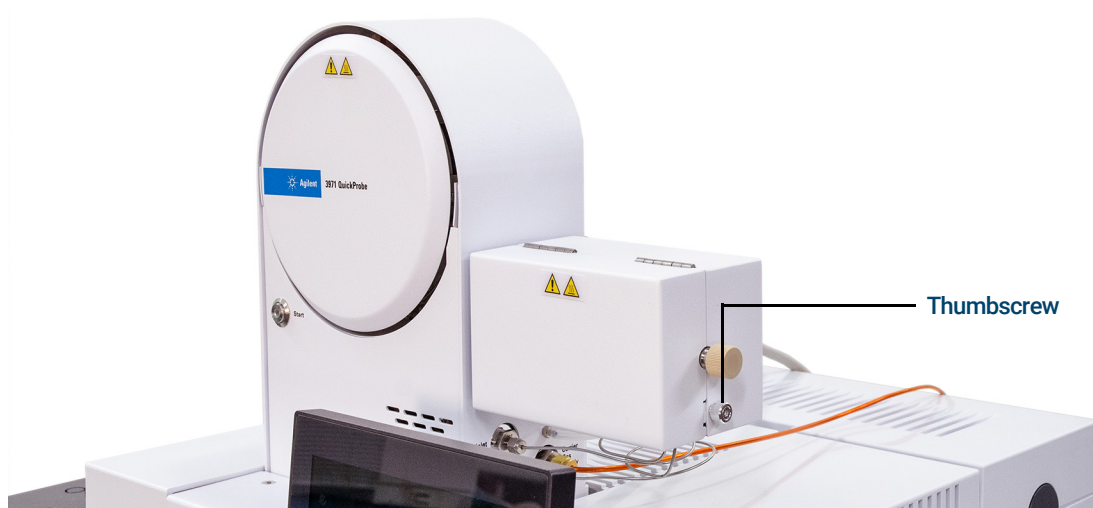
Remove the Heater Block

Material Needed

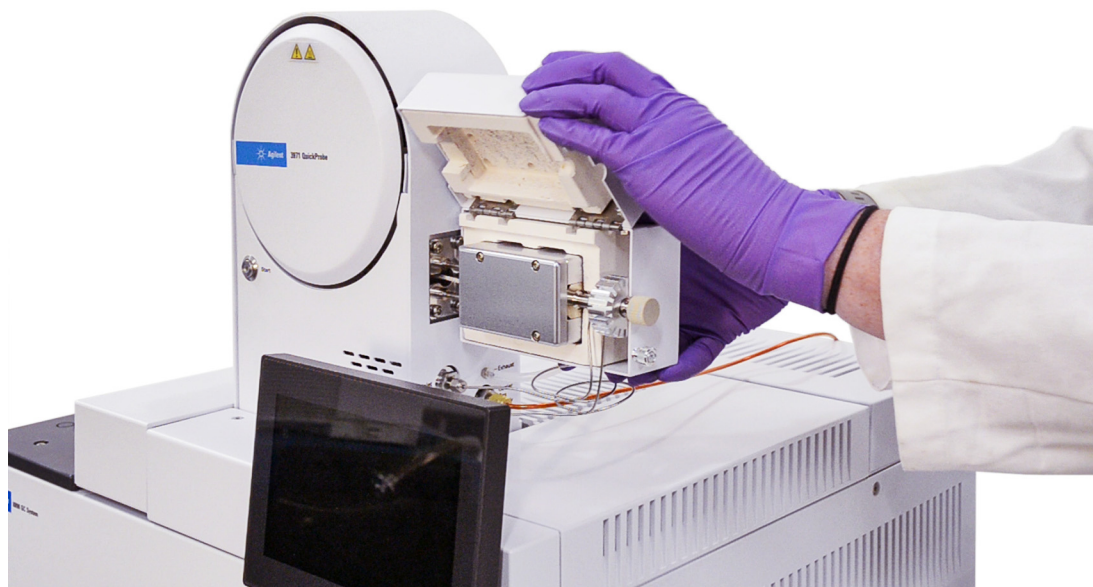
- Gloves, heat resistant
- Wrench, open-end, 1/4-inch and 5/16-inch (8710-0510)
- Torx driver, T10 (5182-3466)

Procedure

- 1 Vent the MS. See the venting procedure in the Operating manual for your MSD.
- 2 Unplug the electronics box from the building's power main supply.
- 3 Remove the inlet cover by loosening the thumb screw and rotating the front of the cover up.



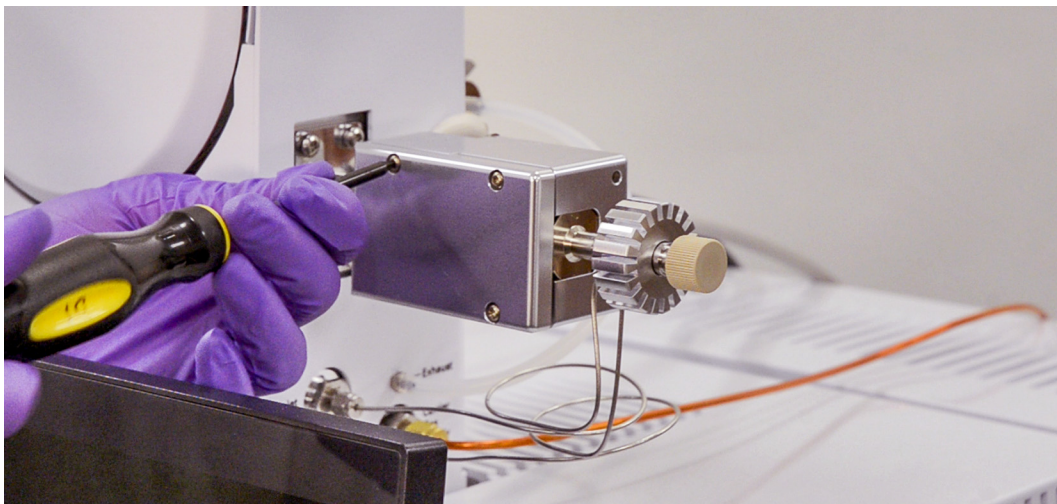
- 4 Pull the cover off from the back of the heater inlet block and put the cover aside.



5 QuickProbe Maintenance Procedures

Remove the Heater Block

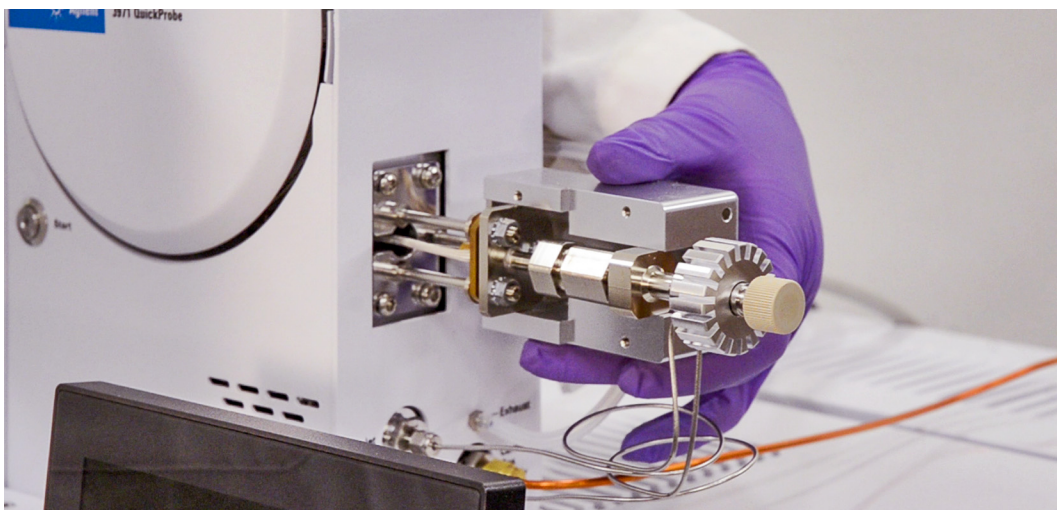
- 5 Use a T10 Torx driver to remove the three (3) screws holding the front plate to the heater block and set the plate and screws aside.



- 6 Unplug the heater block cable from the back panel.



- 7 Remove the heater block and set it aside.



Install the Heater Block

Materials needed

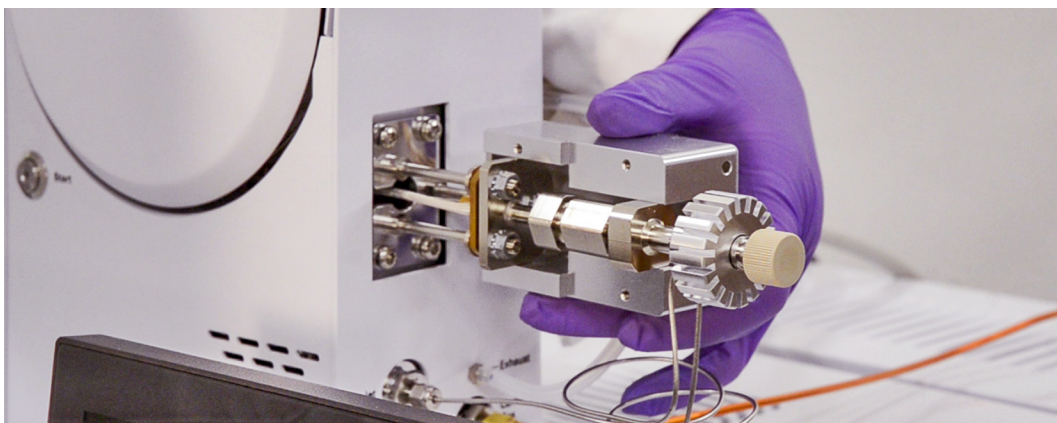
- Gloves, clean
 - Large (8650-0030)
 - Small (8650-0029)
- Wrench, open-ended, 9/16-inch and 5/8-inch (8720-0010)
- Wrench, adjustable
- Torx driver, T10 (5182-3466)

WARNING

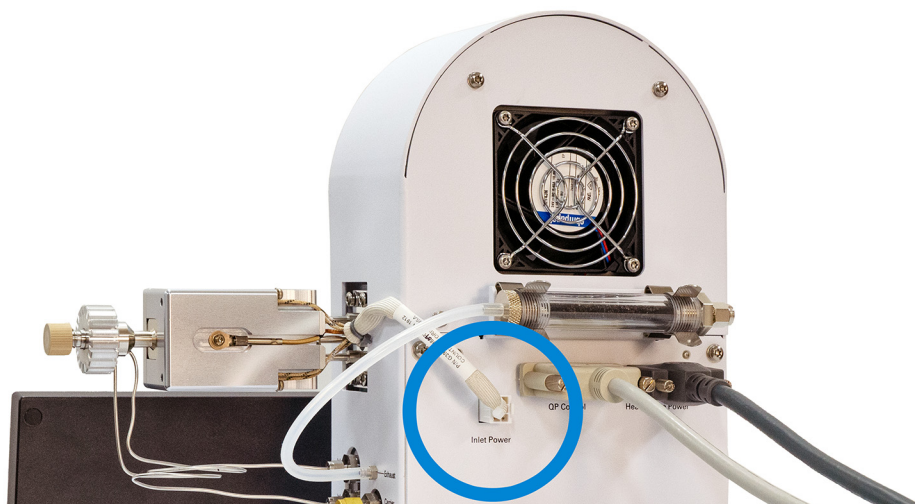
The MS, GC, and QuickProbe operate under high temperatures. Do not touch any parts unless you are certain they are cool.

Procedure

- 1 Verify the electronic box is unplugged from the building's power mains supply.
- 2 Place the heater box with its cover removed on the QuickProbe inlet as shown.



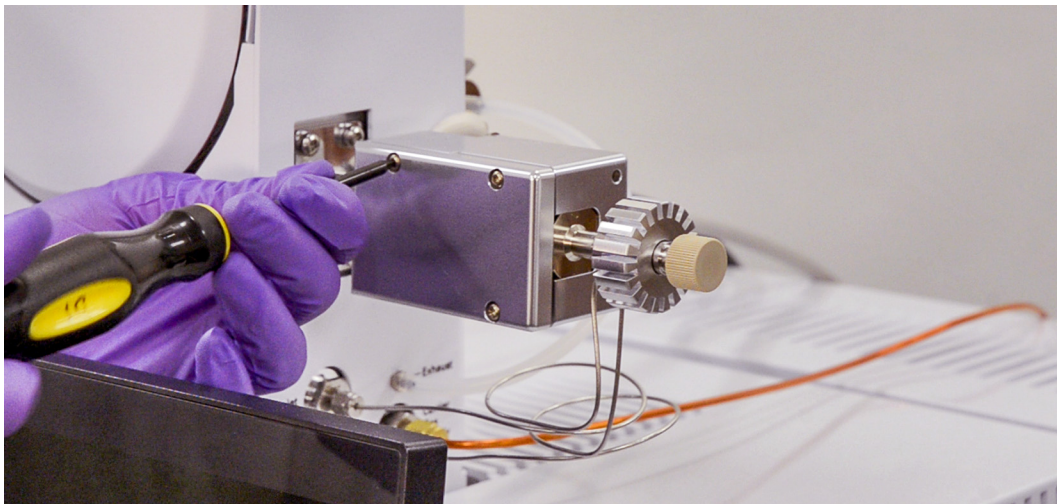
- 3 Plug the heater into the electronic box.



5 QuickProbe Maintenance Procedures

Install the Heater Block

- 4 Perform a leak check if a column or gold seal was installed. See **“Leak Checking”** on page 76.
- 5 Use a T10 Torx driver to attach the cover plate to the inlet heater block with 3 screws.



- 6 Install the heater cover and secure with the cover's thumbscrew.



- 7 Plug the electronics box into the building's power mains supply.

Replace the Liner with Inlet Installed

Materials Needed

- Gloves, clean
 - Large (8650-0030)
 - Small (8650-0029)
- Tweezers
- Inlet liner part number (5190-5104)
- O-ring (0905-1014)

WARNING

The MS, GC, and QuickProbe operate under high temperatures. Do not touch any parts unless you are certain they are cool.

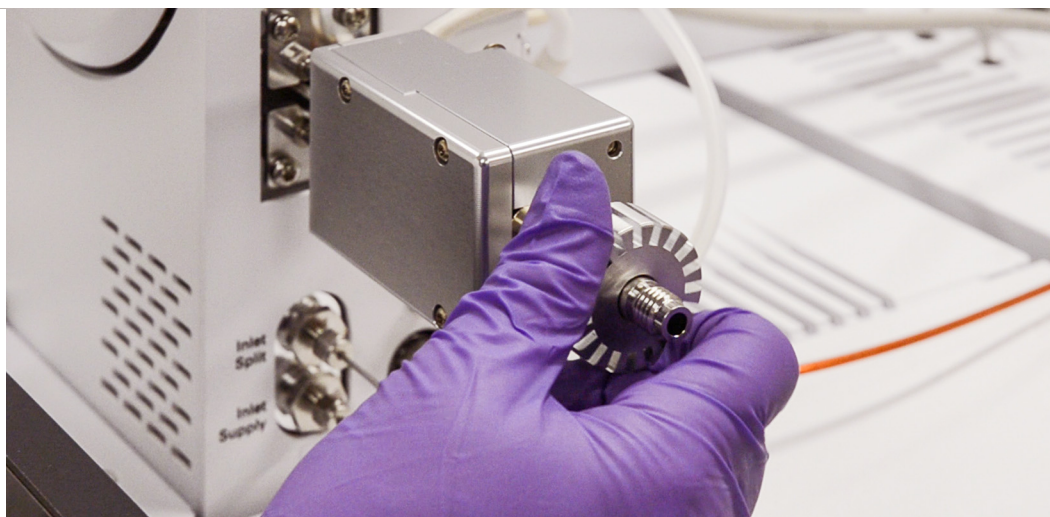
Procedure

- 1 Turn the inlet heater off and set the QuickProbe column temperature to 40 °C.
- 2 Remove the inlet insulation cover to help facilitate cool down.

CAUTION

Ensure the QuickProbe oven, GC oven, and the GC/MSD interface are cool before turning off carrier gas flow to QuickProbe to prevent damage to the column.

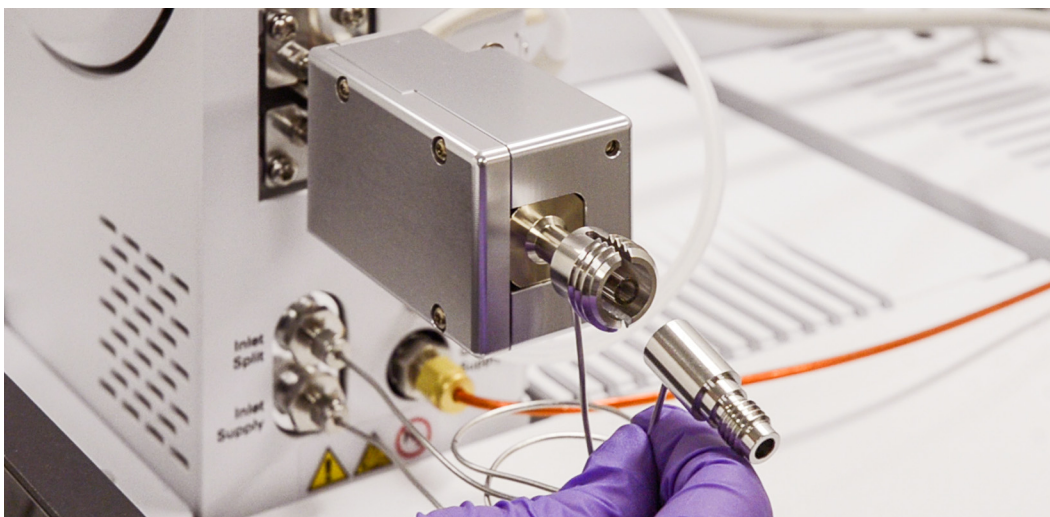
- 3 Remove the inlet cap and the bushing nut.



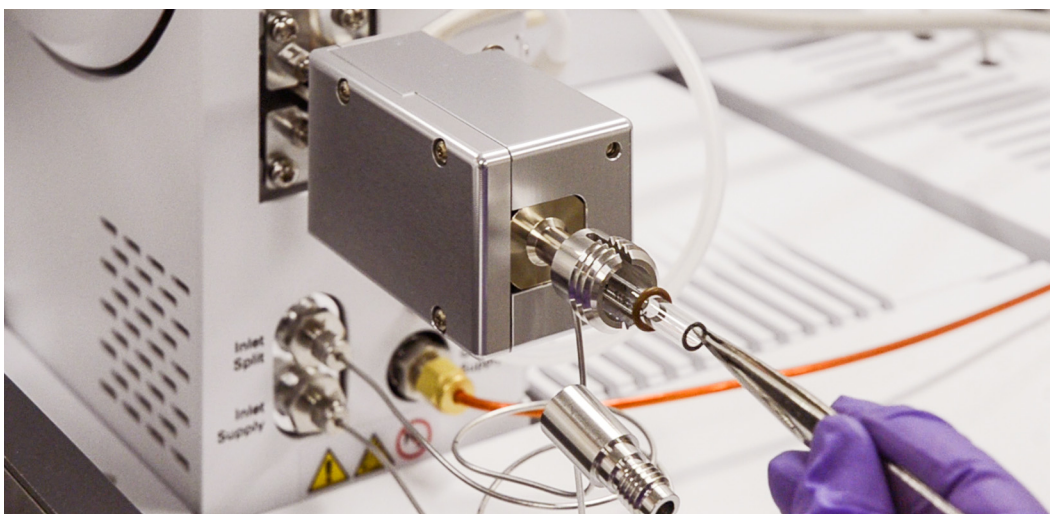
5 QuickProbe Maintenance Procedures

Replace the Liner with Inlet Installed

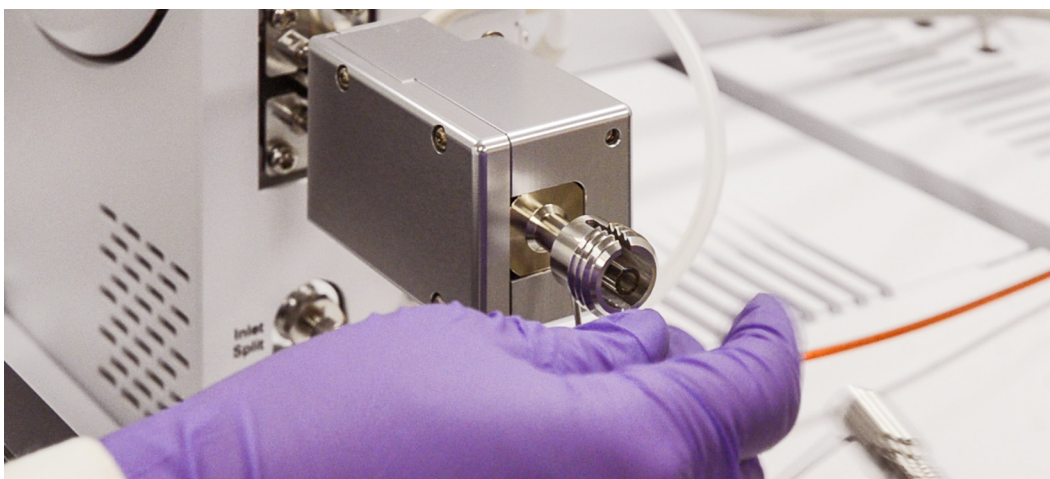
- 4 Remove the bushing fitting by pulling it straight out being careful not to bend the tubing.



- 5 Use tweezers to remove the liner from the inlet body.



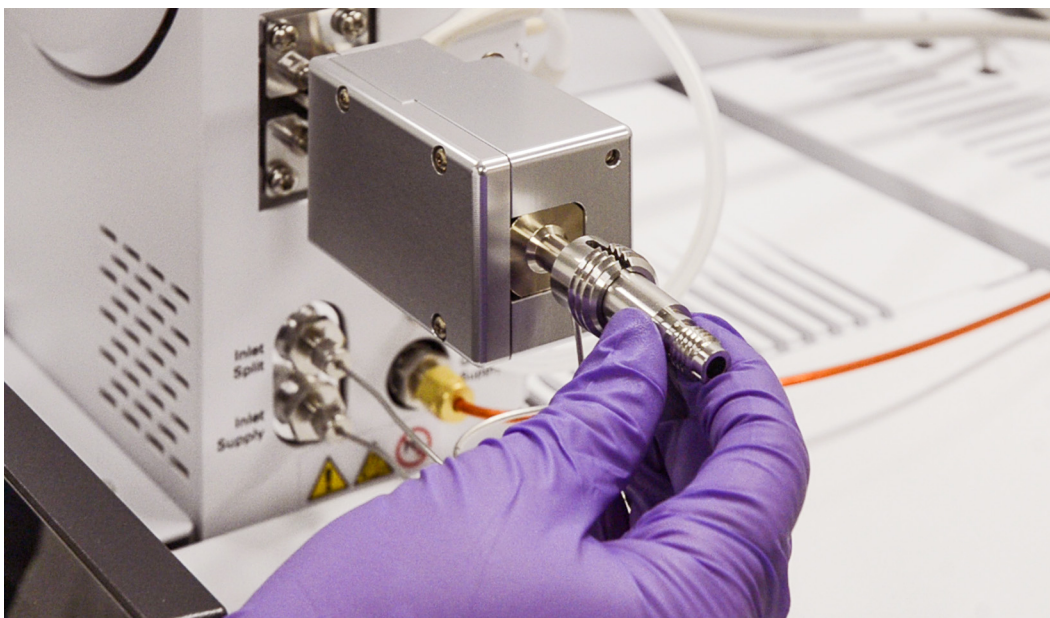
- 6 Place a new O-ring on the new liner and move the o-ring towards the middle of the liner. Insert the liner and push it in until it bottoms out.



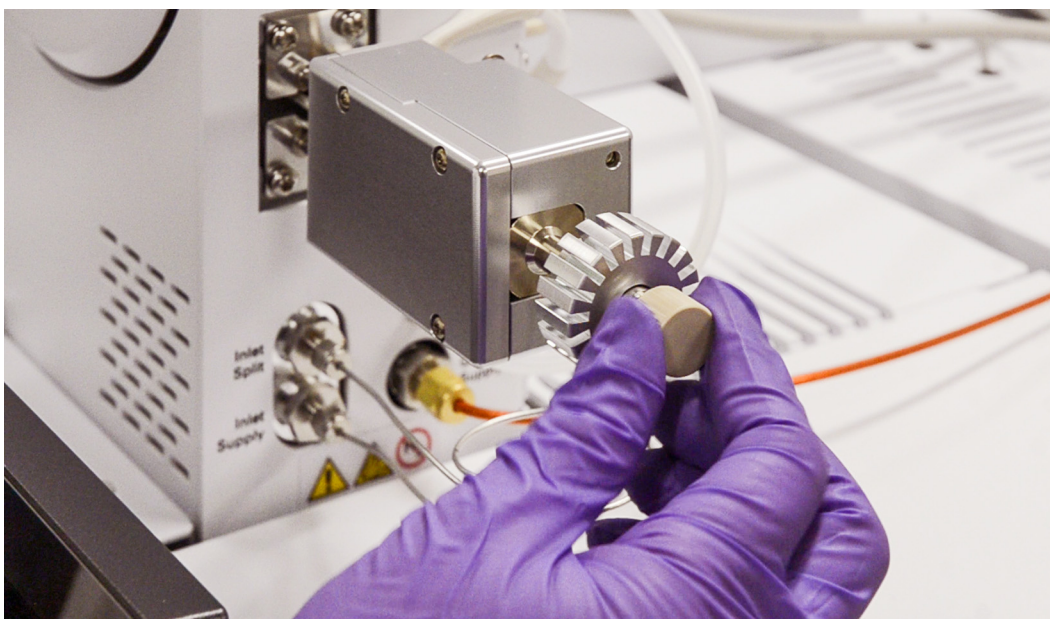
5 QuickProbe Maintenance Procedures

Replace the Liner with Inlet Installed

- 7 Install the entrance bushing into the main body assembly.



- 8 Install the bushing nut followed by the inlet cap.



- 9 Install the inlet insulation cover.
- 10 Load an appropriate standby or sampling method.

Leak Checking

Perform a leak check every time you do maintenance that opens or can disturb connections in the column flow path between the QuickProbe atmospheric inlet and the GCMS interface transfer line. The connectors subject to the largest air leaks are the connections to the GCMS interface and the ultimate union so check those first before removing parts to access the QuickProbe inlet connections.

Materials needed

- Gloves, clean
 - Large (8650-0030)
 - Small (8650-0029)
- Wrench, open-end, 1/4-inch and 5/16-inch (8710-0510)
- Wrench, open-ended, 9/16-inch and 5/8-inch (8720-0010)
- Wrench, adjustable
- Torx driver, T10 (5182-3466)
- Canned air duster

Procedure

WARNING

The MS, GC, and QuickProbe operate under high temperatures. Do not touch any parts unless you are certain they are cool.

- 1 Verify all fittings in the column flow path between the QuickProbe inlet and the GCMS interface were tightened.
- 2 If the column flow path is hot, load a MassHunter data acquisition method that brings the GC, MS and QuickProbe to relatively low temperatures (around 50 °C).

WARNING

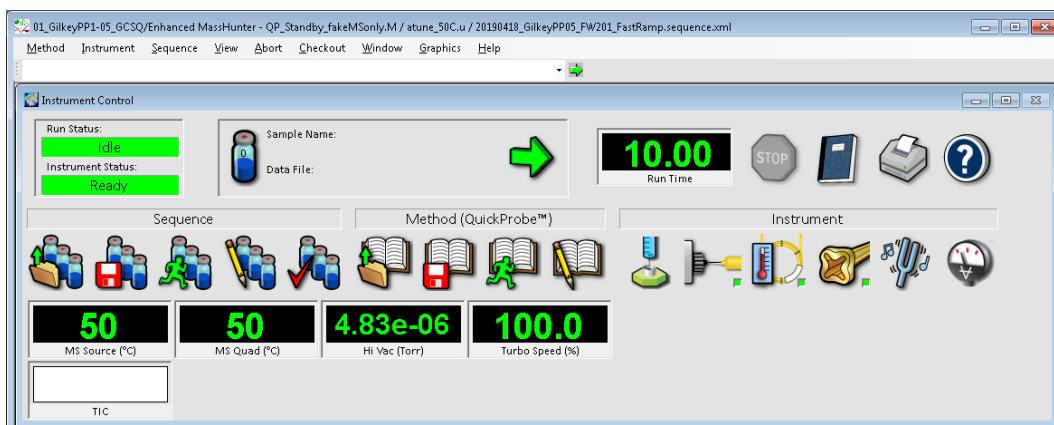
When you perform leak detection on the QuickProbe fittings, you must turn off the QuickProbe column and inlet temperature controls after the flow path is cool and before you open the inlet heater cover. This is done to prevent a shock due to an electrical short, since the heating tubing is biased on 24V. You cannot disconnect power from the electronics box or QuickProbe because the gas flow controller power is required to allow gas flow needed during this Leak Check.

- 3 When the flow path is cool, in MassHunter turn off the QuickProbe inlet heater and column heater, also turn off the GC oven and GCMS interface.
- 4 Verify that the heater block is installed with its cover plate removed on the QuickProbe inlet for access to leak check points.
- 5 Pump down the MSD. See your MSD Operating manual.

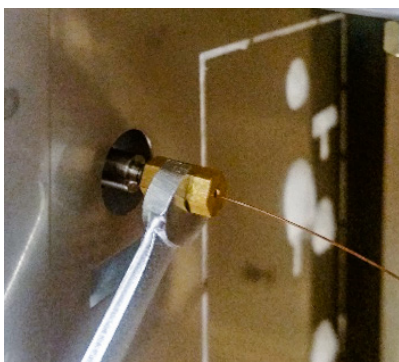
5 QuickProbe Maintenance Procedures

Leak Checking

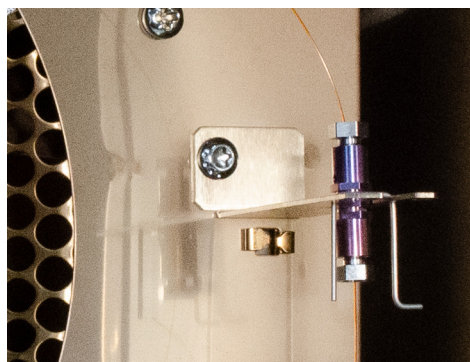
- Let the high vacuum pressure reach $\sim 7 \times 10^{-6}$ Torr or lower.



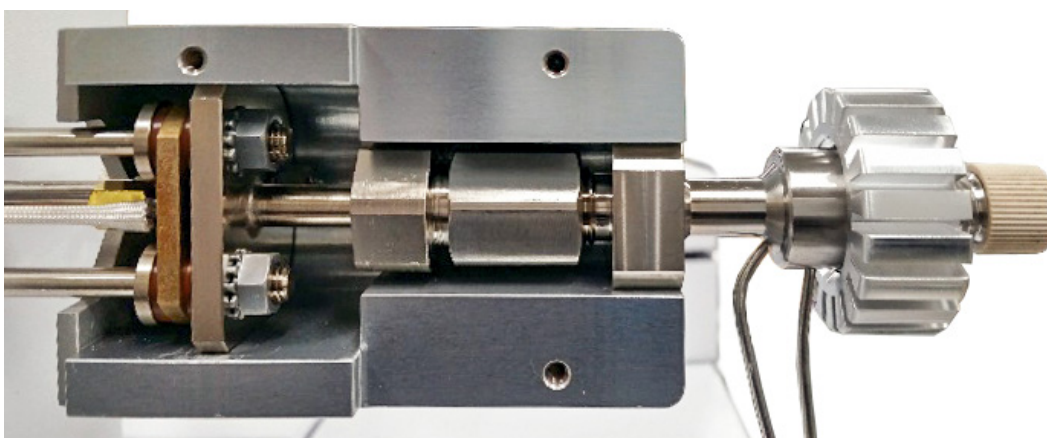
- Use a canned air duster to lightly spray at each of the gas flow path connections, starting at the GCMS interface, through the ultimate union, and ending at the QuickProbe inlet. A change in high vacuum pressure indicates a leak at a given connection.



GCMS interface nut



Both ultimate union column nuts



Leak check the ferrule holder nut, Main union, Main body assembly, bushing nut

- If a leak is found, re-tightened the connection and repeat the test until no more leaks are found.
- Record the vacuum obtained here and review frequently during normal sampling. Repeat this leak check procedure when you note a loss in vacuum.

5 QuickProbe Maintenance Procedures

Leak Checking

Instrument Components

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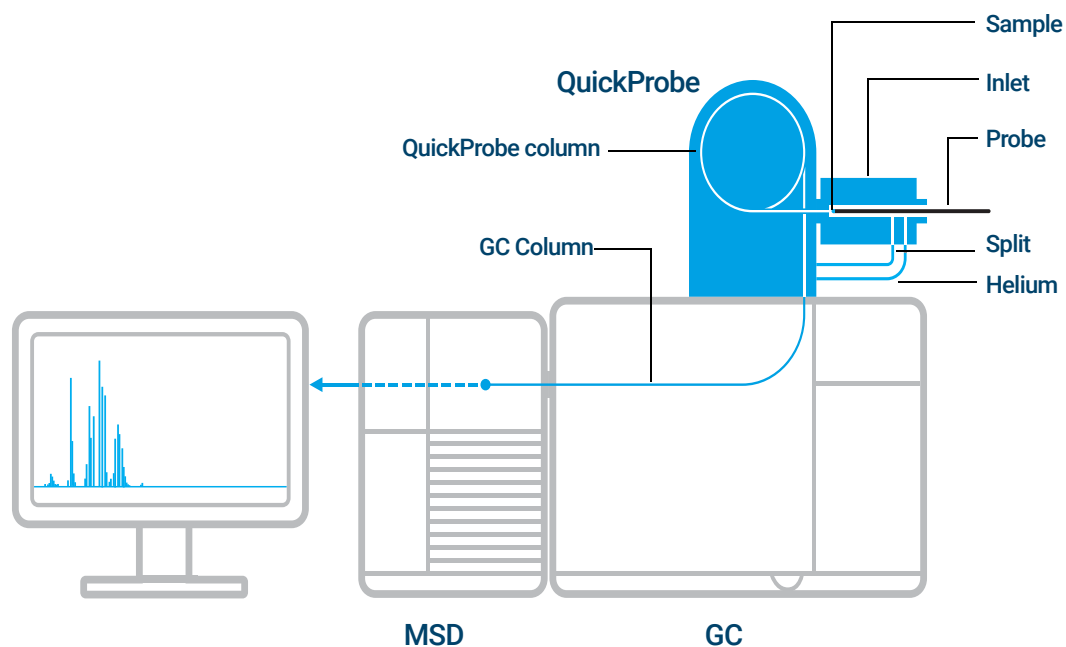
This chapter provides general knowledge and a description of the development of the QuickProbe technology. A schematic diagram of the QuickProbe is included.

The full system is composed of three separate technologies that are grouped together:

- QuickProbe inlet (atmospheric inlet for sample introduction to QuickProbe oven)
- Quickprobe column (low thermal mass ultra-fast GC)
- GC/MSD

Flow Diagram

The heated QuickProbe inlet is located on the right side of QuickProbe and is mounted on the front detector port of a full sized GC. A short section of column runs from the QuickProbe to the MSD transfer-line through the temperature controlled full size GC oven. A micro pump (not shown) serves as a QuickProbe inlet split vent pump to reduce the sample injection time and carryover. The QuickProbe inlet includes a specialty liner (5190-5104) which is sealed by a Viton O-ring at the cooler input side and a helium gas supply line. A carrier gas line controlled by a single channel EPC and a frit flow restriction control element provides the needed helium purge protection flow rate in the 50-80 mL/min range.



QuickProbe heated atmospheric Inlet

The inlet speeds up and simplifies sample insertion. During operation, the air-sensitive GC column, ion source filament, and samples are protected from air by the helium purge flow exiting from the inlet at a rate high enough to prevent room air from entering. When not in use, the inlet can be closed and sealed off.

Gas flow

Helium gas purges the QuickProbe inlet at a rate of 60 mL/min, eliminating air penetration into the system. Helium is also used as a carrier gas, flowing into the QuickProbe column at a rate of about 2 mL/min when the system is at operating temperatures. In addition, a portion of helium is pumped by the QuickProbe split pump at a split flow rate of about 20 mL/min. This averages to a total flow rate of about 75 mL/min.

QuickProbe liner

The QuickProbe liner is 4 mm ID and about 55 mm length. The inlet has a narrow thermal neck before its opening to the room air environment that serves as a thermal conductivity barrier to reduce the probe opening temperature. This is a safety measure to prevent accidental burns during sample introduction.

Sample introduction

An Agilent glass round probe or pocket probe inserted into a probe holder is used for sample injection. Alternatively, an Agilent Thermal Separation Probe (TSP) can also be used.

CAUTION

Always wear gloves when preparing samples for use in QuickProbe to avoid contamination of the probe and probe holder.

- 1 With a probe inserted into the probe holder, touch the rounded end of the glass probe to a prepared sample.
- 2 (Optional) If necessary, wipe the probe with clean wiping paper such as a Kim wipe to reduce the amount of sample.
- 3 Manually insert the probe holder containing the sample into the heated QuickProbe inlet for 4-5 seconds. The sample quickly vaporizes.
- 4 Remove the sample probe holder from the QuickProbe inlet.
- 5 Press the start button on the front of the QuickProbe oven or click the start button in the MassHunter dialog. The fast compound separation in the QuickProbe oven begins. The sample compounds transfer into the MSD for mass analysis.

Sample desorption and injection

After the sample is thermally desorbed and vaporized, it is carried by helium flow into the QuickProbe column. The QuickProbe's inlet and column replace the standard GC oven, inlet, and autosampler. The standard GC is used to mount QuickProbe and maintain the column passing through the GC oven at a controlled temperature around 250-to 320 °C while traveling to the MSD.

The QuickProbe inlet operates slightly above atmospheric pressure. It requires vacuum inside the MSD to pull the carrier gas through the QuickProbe column and into the MSD.

Heating and cooling

The QuickProbe uses a short standard fused silica GC capillary column inserted into a low thermal mass metal tube (1.58 mm OD, 1.27 mm ID) that is resistively heated. The capillary column and heated metal tube are mostly located in an air-cooled enclosure which is mounted on the front detector slot of an Agilent full size GC. About 1 cm of the of the heated metal tube outlet and the column attached to the ultimate union is heated by the GC oven.

QuickProbe column

The QuickProbe uses a 1.3 m long, stainless steel metal tube for resistive heating. The capillary column running through the heating tube is about 1.5 m long with 0.25 mm ID and 0.1 μ HT thin film connected to an ultimate union located inside the GC oven. The helium carrier gas flow rate in this column is about 4 mL/min at 60 °C temperature that results in about 3.2×10^{-5} mBar ionization gauge reading with the split vent pump discharging about 12 mL/min for a total QuickProbe injector liner flow rate of about 16 mL/min giving a split ratio of about 4. The use of the micro pump is needed to reduce the QuickProbe splitless injection time due to its liner volume and with long injection time of semi-volatile compounds (such as 5-10 s) the pump can be turned off for splitless injections. The split pump also serves to reduce carry-over and memory effects. When QuickProbe column is heated to 340 °C, the column flow rate is reduced to about 2.4 mL/min (about 1.8×10^{-5} mBar ionization gauge reading).

Capillary column with restrictor

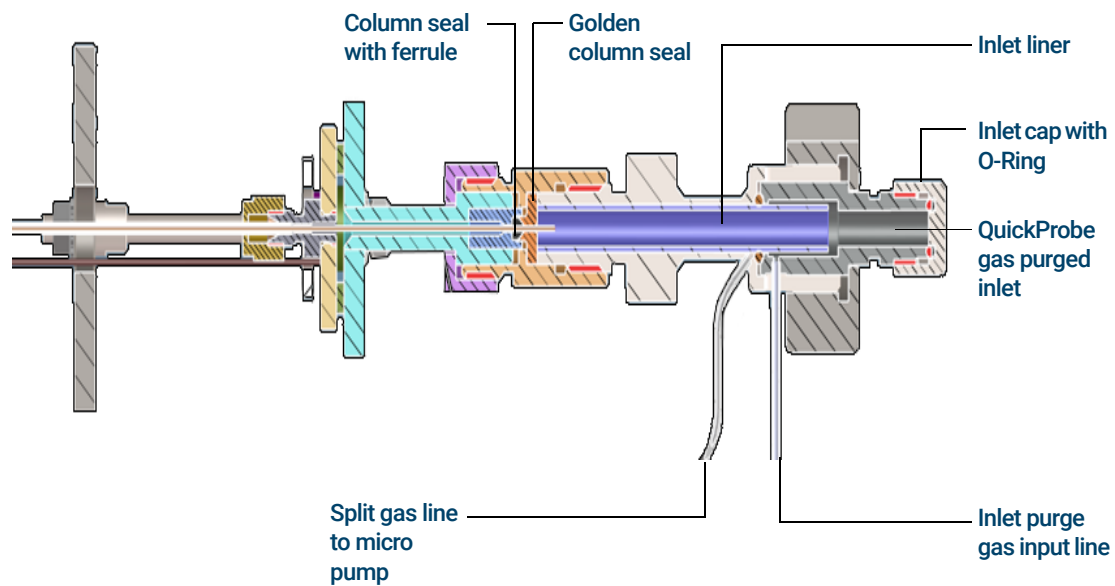
The QuickProbe column is about 1.5 m long with a 0.25 mm ID that is connected to an Agilent ultimate union. The outlet of the ultimate union is attached to a 60 to 70 cm long restrictor column 0.18 mm ID with 0.18 μ film sealed to the MSD transfer line and running into the ion source.

This arrangement reduces flow rate into the ion source by a factor of about 2 and can be varied by adjusting the restrictor length. Typical flows are about 1.5-2.4 mL/min into the ion source (2.4 mL/min at 60 °C initial column temperature) while the split vent pump vents about 20 mL/min for a total QuickProbe injector liner flow rate of about 22 mL/min with a split ratio of about 10. Agilent recommends a DB-1HT column rated at 400 °C for both columns.

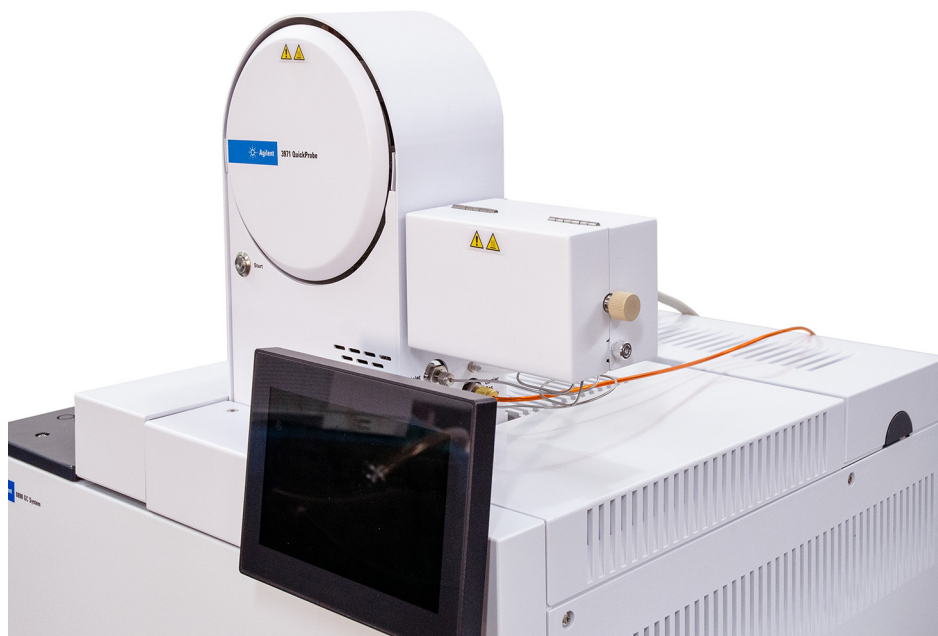
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QuickProbe Front View	84
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Electronics Box Rear Side	85

QuickProbe Inlet

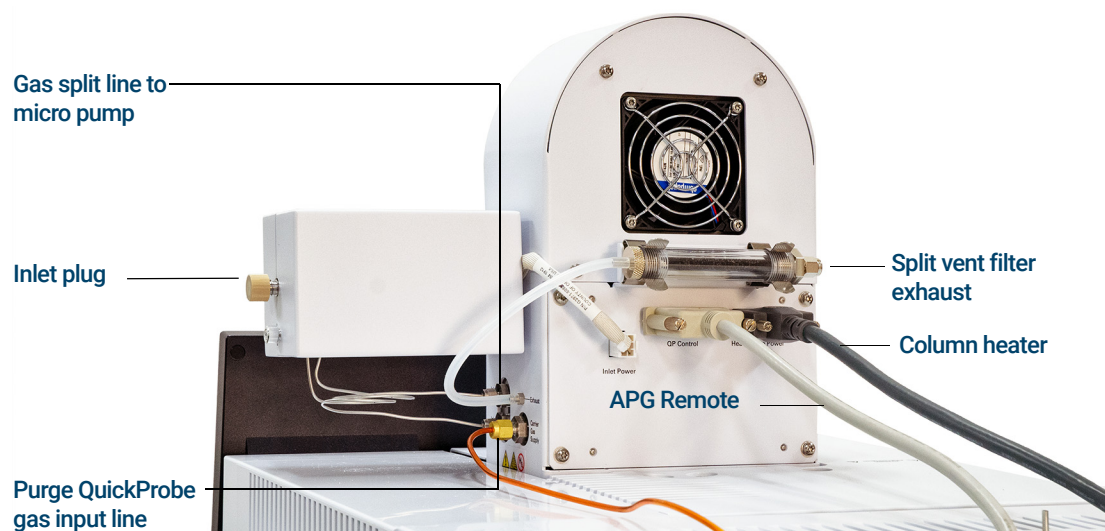
QuickProbe rear side with pneumatics compartment



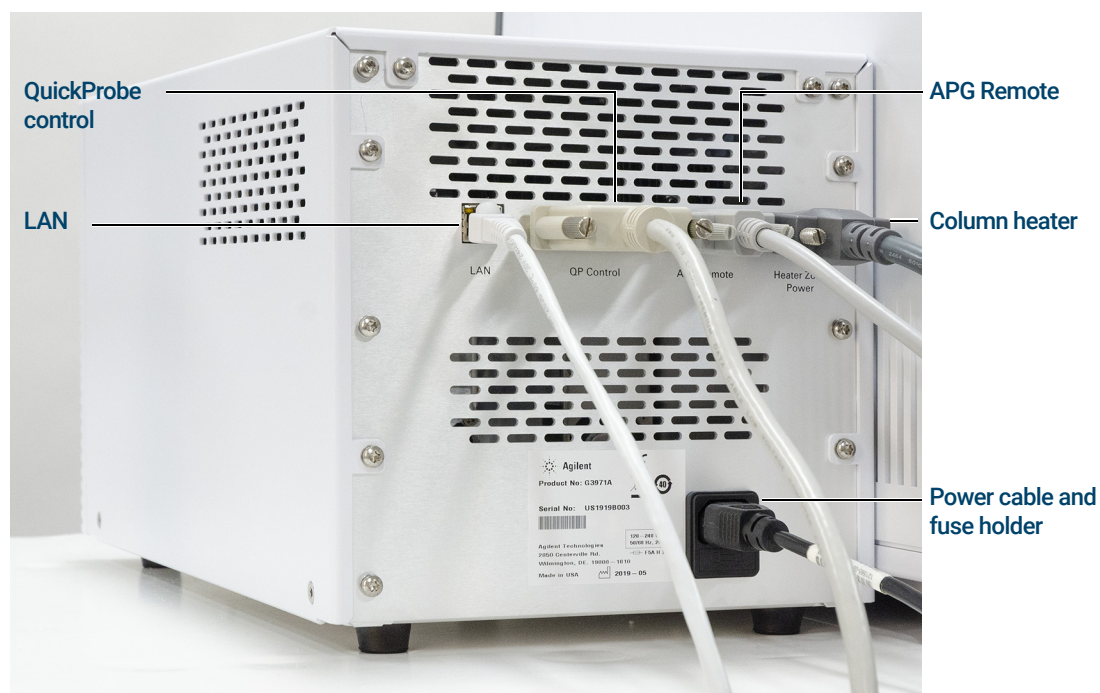
QuickProbe Front View



QuickProbe Oven Rear Side



Electronics Box Rear Side



QuickProbe Column and Fittings 88

Restrictor Column and Fittings 88

QuickProbe Inlet Consumables 89

Insertion Probes 89

TSP Probes 89

Additional Consumables 90

General Tools 90

This chapter contains the consumables used with your QuickProbe.

For parts and consumables required in the GC and MSD instruments in the QuickProbe system, please refer to the documentation supplied with your GC and MSD.

QuickProbe Column and Fittings

This column runs inside the QuickProbe oven.

- Agilent J&W DB-1ht column, 2 m, 0.25 mm, 0.10 μ m (G3903-61006) Included with QuickProbe.

Fittings for column inlet

- Ferrule, 0.4 mm id, 15% graphite/85% Vespel, 0.1 to 0.25 mm column, 10/pk (5181-3323) Included with QuickProbe.
- Ferrule, 0.4 mm id, 15% graphite/85% Vespel, 0.1 to 0.25 mm column, 10/pk (5062-3508) Included with QuickProbe.
- No-Hole Ferrule if storing QuickProbe (5190-4054)

Fittings for ultimate union

Ultimate Union kit (G3182-61580) Included with QuickProbe. The 3 parts listed below are included in this kit.

- Flexible Metal ferrule, UltiMetal Plus, 0.4 mm id, for 0.1 to 0.25 mm id fused silica tubing, 10/pk (G3188-27501)
- Internal nut, CFT capillary fitting (G2855-20530)
- Swaging tool (G3440-80227)

Restrictor Column and Fittings

This column runs between the GC mounted Ultimate union and GCMS interface.

- Agilent J&W DB-1ms column, 1 m, 0.18 mm, 0.18 μ m (G3903-61007) Included with QuickProbe.

Fittings for ultimate union

Ultimate Union kit (G3182-61580) Included with QuickProbe. The 3 parts listed below are included in this kit.

- Flexible Metal ferrule, UltiMetal Plus, 0.4 mm id, for 0.1 to 0.25 mm id fused silica tubing, 10/pk (G3188-27501)
- Internal nut, CFT capillary fitting (G2855-20530)
- Swaging tool (G3440-80227)

Fittings for GCMS Interface

- Ferrule, 0.4 mm id, 15% graphite/85% Vespel, 0.1 to 0.25 mm column, 10/pk (5181-3323) Included with QuickProbe.
- Ferrule, 0.4 mm id, 15% graphite/85% Vespel, 0.1 to 0.25 mm column, 10/pk (5062-3508) Included with QuickProbe.
- Column nut, long (20066) Included with QuickProbe.
- Self Tightening column nut (5190-5233)

QuickProbe Inlet Consumables

- QuickProbe liner, UI, 4 mm id, frit (5190-5104) Included with QuickProbe.
- GC inlet seal, gold plated, with washer (5188-5367) Included with QuickProbe.
- QuickProbe Inlet cap with o-ring

Insertion Probes

- Round tip insertion probe 100/pk (5190-5118) Included with QuickProbe.
Recommended for liquids, dissolved samples, and tablets.
- Pocket tip insertion probe 100/pk (5190-5113)
Recommended for powders
- QuickProbe probe holder (G3971-60200) Included with QuickProbe.
For use with round tip and pocket tip probes

TSP Probes

- TSP solid probe vials 100/pk (5190-3187)
Recommended for solids
- Pocket tip TSP probe holder (G3971-20251)
For use with TSP solid probe vials

Additional Consumables

- External split vent cartridge kit (RDT-1020) Included with QuickProbe. Includes trap and 3 cartridges
- External split vent replacement cartridges 3/pk (RDT-1023)
- Gas Clean carrier gas kit (CP17976)
Includes one 1-position 1/8 in connecting unit (CP7988) and two carrier gas purifiers (CP17973)
- Gas Clean carrier gas purifier, 1/pk (CP17973)

General Tools

- Adapter to allow inlet purge flow rate measurement (19301-60660)
This is an adapter for attaching an independent flow measurement device like a bubble flow meter or electronic flow meter to the QuickProbe inlet for measuring purge flow leaving the inlet.

G3971-68001 Consumables Kit, Quick GC

One each of the following parts are included in this kit.

0100-0090	Tee, 1/8 inch Brass
05988-20066	Column Nut, long for MS interface
0100-2144	1/8-inch Ball Valve
5062-3508	Ferrule, 0.4 mm VG cond .25 col lng 10/PK
5181-3323	Ferrule, 0.4 mm VG 0.1-0.25 col 10/PK
5188-5367	Gold Plated Inlet Seal with Washer
5190-5104	QuickProbe Liner, UI, 4 mm ID, Frit
5190-5118	QuickProbe Probe Round Tip (100/pk)
G3182-61580	Ultimate Union Kit, Deactivated
G3903-61006	QuickProbe DB-1HT 2 m, 0.25 mm, 0.10 µm
G3903-61007	QuickProbe DB-1MS UI 1 m, 0.18 mm, 0.18 µm
G3971-60200	QuickProbe Probe Holder
RDT-1020	Trap, SplitVent and 3 PK Cart.

Acknowledgments

QuickProbe technology was developed by Professor Aviv Amirav and his group at Tel Aviv University. For more information on this technology see the articles below:

- 1 M. Poliak, A. Gordin and A. Amirav "Open Probe – A Novel Method and Device for Ultra Fast Electron Ionization Mass Spectrometry Analysis" Anal. Chem. 82, 5777-5782 (2010).
- 2 Alexander B. Fialkov, Mati Morag and Aviv Amirav "A Low Thermal Mass Fast Gas Chromatograph and its Implementation in Fast Gas Chromatography Mass Spectrometry with Supersonic Molecular Beams" J. Chromtogr. A. 1218, 9375-9383 (2011).
- 3 Aviv Amirav, Uri Keshet, Tal Alon and Alexander B. Fialkov "Open Probe Fast GC-MS – Real Time Analysis with Separation" Int. J. Mass Spectrom. 371, 47-53 (2014).
- 4 Uri Keshet, Tal Alon, Alexander B. Fialkov and Aviv Amirav "Open Probe Fast GC-MS - Combining Ambient Sampling Ultra-Fast Separation and In-Vacuum Ionization for Real Time Analysis" J. Mass Spectrom. 52, 417-426 (2017).

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