



Agilent 8850 Gas Chromatograph

Maintaining Your Gas Chromatograph (GC)

Notices

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Manual Part Number

G3940-90006

Edition

First edition, September 2024

Printed in USA

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Contents

1 About Maintaining the GC

- Overview of Maintenance **8**
- Tools and Materials Required for Maintenance **9**
- Preparing for Maintenance **11**
- Automated Maintenance Procedures **12**
- Viewing Status Data **13**
- Safety **15**

2 Removing Covers

- To Remove the Detector Cover **18**
- To Remove the Top Cover **19**

3 Maintaining the GC

- Consumables and Parts for General GC Maintenance **22**
- To Install the Hydrogen Sensor Calibration Gas Cylinder **25**

4 Maintaining Capillary Columns

- Consumables and Parts for Columns **28**
- To Install a Capillary Column Hanger **30**
- To Condition a Capillary Column **31**
- To Cut a Loop from a Column **33**
- To Reverse a Column and Bakeout Contaminants **34**

5 Maintaining the Split/Splitless Inlet

- Consumables and Parts for the Split/Splitless Inlet **36**
- Exploded Parts View of the Split/Splitless Inlet **39**
- To Install a Capillary Column with the Split/Splitless Inlet **40**
- To Change the Septum on the Split/Splitless Inlet **44**
- To Clean the Septum Seat in the Insert Assembly of the Split/Splitless Inlet **46**
- To Change the Liner and O-Ring on the Split/Splitless Inlet **48**
- To Replace the Gold Seal on the Split/Splitless Inlet **51**
- To Replace the Filter in the Split Vent Trap for the Split/Splitless Inlet **53**

- To Clean the Split/Splitless Inlet **55**
- To Bakeout Contaminants from the Split/Splitless Inlet **57**

6 Maintaining the Purged Packed Inlet

- Consumables and Parts for the Purged Packed Inlet **60**
- Exploded Parts View of the Purged Packed Inlet **62**
- To Install a Capillary Column with the Purged Packed Inlet **63**
- To Change the Septum on the Purged Packed Inlet **67**
- To Clean the Septum Seat in the Purged Packed Inlet **69**
- To Install an Adapter on the Purged Packed Inlet **71**
- To Change the O-Ring on the Purged Packed Inlet **72**
- To Change the Glass Liner on the Purged Packed Inlet **73**
- To Clean the Purged Packed Inlet **75**
- To Bakeout Contaminants from the Purged Packed Inlet **77**
- To Install a Packed Metal Column **78**
- To Install a Packed Column Adapter onto a Detector **81**
- To Condition a Packed Column **83**
- To Install Ferrules on a Packed Metal Column **84**

7 Maintaining the COC Inlet

- Consumables and Parts for the Cool On-Column Inlet **86**
- Exploded Parts View of the Cool On-Column Inlet **89**
- To Install a Capillary Column with the Cool On-Column Inlet **90**
- To Check the Needle-to-Column Size on the COC Inlet **93**
- To Change a Septum on the COC Inlet **94**
- To Install an Insert on the COC Inlet **96**
- To Clean the COC Inlet **98**
- To Replace the 7693A Injector Needle Support Guide **100**
- To Replace a Needle in a Syringe **101**
- To Replace the Fused Silica Needle in a Syringe for the COC Inlet **102**
- To Bakeout Contaminants from the COC Inlet **103**

8 Maintaining the FID

- Consumables and Parts for the FID **106**
- Exploded Parts Views of the Flame Ionization Detector **108**
- To Install a Capillary Column in the FID **110**
- To Replace an FID Jet **113**
- To Perform Maintenance on the FID Collector Assembly **116**
- To Check the FID Leakage Current **124**
- To Check the FID Baseline **125**
- To Install the Optional FID PTFE Chimney Insert **126**
- To Bakeout the FID **127**

9 Maintaining the TCD

- Consumables and Parts for the Thermal Conductivity Detector **130**
- To Install a Capillary Column in the TCD **132**
- To Bakeout Contaminants from the TCD **135**

10 Maintaining EPC Modules

- Consumables and Parts for the Aux EPC **138**
- Installing or Replacing Frits in the Aux EPC **140**
- Consumables and Parts for the PCM **142**
- Calibrating the PCM Interface **143**
- Installing or Replacing Frits in the PCM **144**

A Swagelok Connections

- Making Swagelok Connections **148**
- Using a Swagelok Tee **151**

1

About Maintaining the GC

Overview of Maintenance	8
Tools and Materials Required for Maintenance	9
Preparing for Maintenance	11
Automated Maintenance Procedures	12
Viewing Status Data	13
Safety	15

This section provides an overview of the maintenance procedures included in this document. It also lists the tools needed for routine maintenance and the information needed to safely perform the various maintenance task.

Overview of Maintenance

This manual details the routine tasks needed to maintain the Agilent 8850 Gas Chromatograph (GC). The procedures assume a basic knowledge of tool use and of GC operation. Readers are, for example, expected to know how to:

- Safely turn devices on and off
- Load methods
- Change component temperatures, flows, and pressures
- Make typical pneumatic connections using Swagelok and other standard fittings
- Reset GC service counters

Where to find a procedure

Included in this manual are chapters on maintaining the following GC components:

- Capillary Columns
- Split/Splitless Inlet (SSL)
- Purged Packed Inlet (PPI)
- Cool On-Column Inlet (COC)
- Flame Ionization Detector (FID)
- Thermal Conductivity Detector (TCD)
- Auxiliary Electronic Pressure Control Module (Aux EPC)
- Pneumatics Control Module (PCM)
- Valves

Each chapter includes:

- A list of the most commonly used consumables and parts for the component
- An exploded parts view of the component
- Detailed procedures for routine maintenance tasks associated with the component

Tools and Materials Required for Maintenance

Table 1 lists the tools needed for most GC maintenance procedures. The specific tools required to perform a maintenance procedure are listed in step 1 of each procedure.

Table 1 Tools and materials for GC maintenance

Common tools	Part number
Wrench, open-end, 1/4-inch and 5/16-inch	8710-0510*
Wrench, open-end, 9/16-inch and 7/16-inch	8710-0803
Turn-top inlet wrench	G3452-20512*
Flathead screwdriver	
Column cutter, wafer, 4/pk	5181-8836*
Driver, nut, 1/4-inch	8710-1561*
T-20 Torx key or screwdriver	8710-1807
T-10 Torx key or screwdriver	8710-2140
3-mm hex key wrench	8710-2411
Electronic flow meter(s) or bubble meter(s) capable of calibrated measurements at 1, 10, and 100 mL/min flow ranges	
Electronic leak detector	
Magnifying loupe, 20X	430-1020
Metric ruler	
Bench vise (for setting Swagelok fittings)	
Razor or sharp knife	
Tweezers, or thin needle-nose pliers	8710-0007 8710-0004
Needle-nose pliers	
ESD wrist strap (for installing new components)	9300-1408
Gloves, heat-resistant (for handling hot parts)	
Wooden cotton swab (for removing FID filters)	
Tools and materials for cleaning procedures	
Cleaning brushes—The FID cleaning kit contains appropriate brushes for cleaning detectors and inlets	9301-0985
Cleaning brushes—For cleaning split/splitless inlet split vent fitting, FID and collectors	8710-1346
Jet cleaning wire (.010-inch)	
Clean, lint-free cloth (to protect contamination-sensitive detector parts)	
Small ultrasonic cleaning bath with aqueous detergent (for cleaning detector and inlet parts)	
Gloves, clean, lint-free, nylon (for handling contamination-sensitive parts)	large: 8650-0030 small: 8650-0029

1 About Maintaining the GC

Tools and Materials Required for Maintenance

Table 1 Tools and materials for GC maintenance

Common tools	Part number
Steel wool, 0- or 00-grade (for cleaning an inlet's septum seating surfaces)	

* Included with the GC ship kits

Preparing for Maintenance

For automated maintenance procedures available through the GC, the GC will make the instrument safe to work on and walk you through the steps required to replace the part selected.

Before routine maintenance procedures, the GC must be made ready. This process can include:

- Setting low temperatures to avoid burns and other injuries
- Setting reduced flows to avoid safety hazards and to prevent damage to the instrument
- Turning off the GC and disconnecting the GC from power
- Making other settings to prevent damage to the instrument (electronics, columns, and so forth) or to connected instruments

To put the GC in a general standby state suitable for most maintenance, use the touchscreen: **Maintenance > Instrument > Perform Maintenance > Maintenance Mode > Start Maintenance**. Follow the prompts. To exit maintenance mode and restore the previous GC settings, select **Finished**.

If you turned off the GC or changed other settings, return to the **Maintenance Mode** screen as needed. Note that the **Maintenance Mode** ends when the GC is turned off.

WARNING

If you choose to perform maintenance without using the GC's built-in features, first cool all heated zones in the instrument, including auxiliary heaters or other heated devices you might contact during maintenance. Then turn off the GC and unplug the power cord.

Automated Maintenance Procedures

The GC provides many automated procedures that walk you through routine maintenance tasks and which automatically include steps such as cool downs, leak tests, EMF resets, and even blank runs to confirm baseline performance. Access and run these procedures from both the touchscreen and the browser interface. Navigate to **Maintenance**, select the device (inlet, detector, and so forth), and then choose **Perform Maintenance** to see the list of available automated procedures. Select the desired test from the available listing and select **Start Maintenance** to begin. These procedures require an idle GC, and will not run if the GC is not idle.

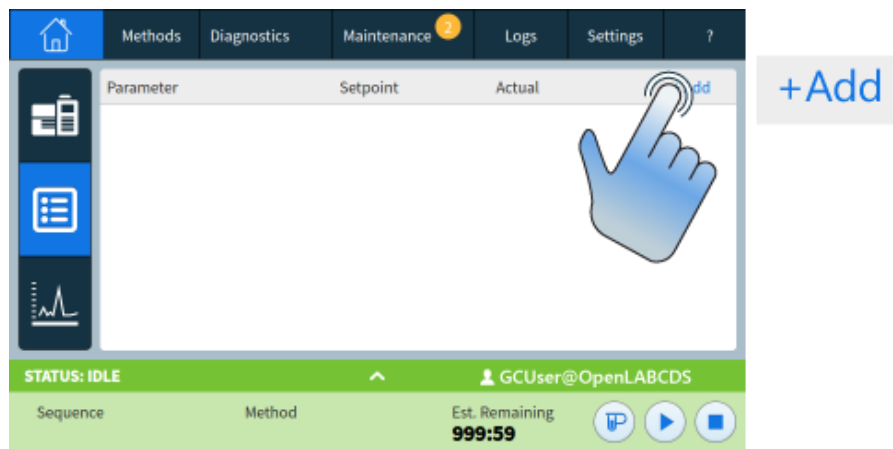
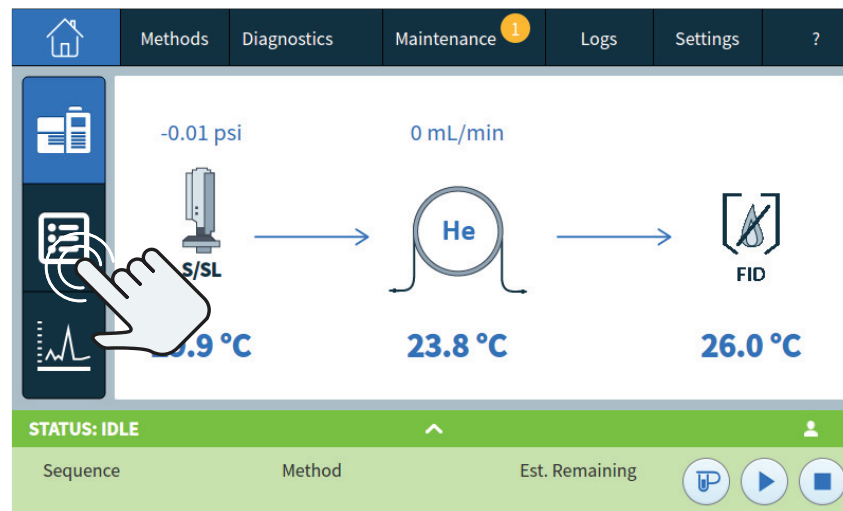
Note that Agilent data systems can prevent automated confirmation runs in maintenance procedures. For example, a data system can prevent the GC from performing a blank diagnostic run after replacing certain parts. If you have a GC operating with a data system, and later use the data system to disable local run features, you may notice that certain maintenance procedures will no longer perform the blank run (or another diagnostic run). This behavior is normal. If you wish to perform a confirmation blank run after the maintenance is complete, you can do so manually using the data system. Tests such as leak checks and pressure checks will run during maintenance, since these do not start a run.

Viewing Status Data

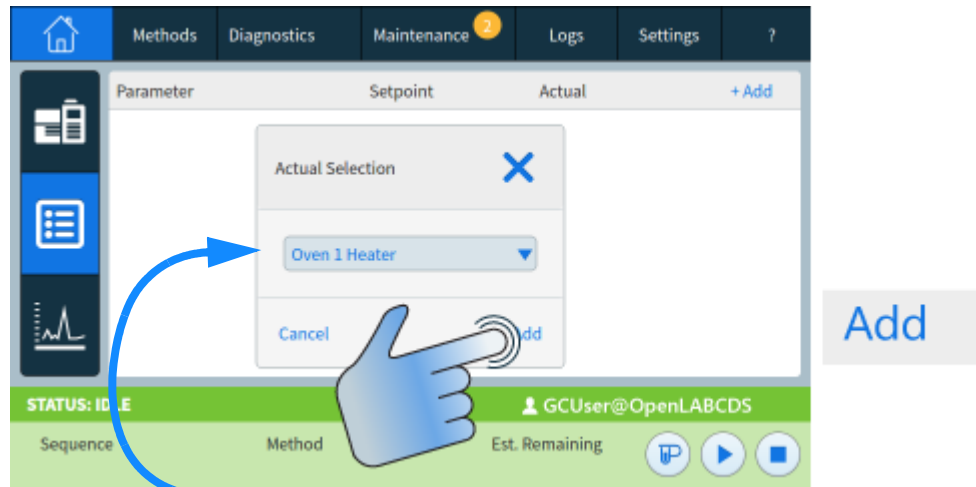
The GC can display signal and other data that can be very useful during maintenance. For example:

- Instrument status: Readiness state, running state.
- Instrument status details: Not ready modules, error modules, warnings.
- Module status details: **Actual/Setpoint** pairs for each module, quick **On/Off** for certain modules, firmware version and instrument IP address.

Add an item to the GC status listing as follows:



1 About Maintaining the GC
Viewing Status Data



Select the desired item from the drop-down list, then touch Add.

Safety

Refer to the GC's Safety Manual for important information about safety concerns when working on the GC.

Magnetic Fields: The 8850 GC contains a magnet on the underside of the lid. Magnets may affect the functioning of pacemakers, implanted heart defibrillator's, or other active implanted medical devices (AIMD). Users that wear an AIMD are advised to avoid these magnets when the lid is open (8850).

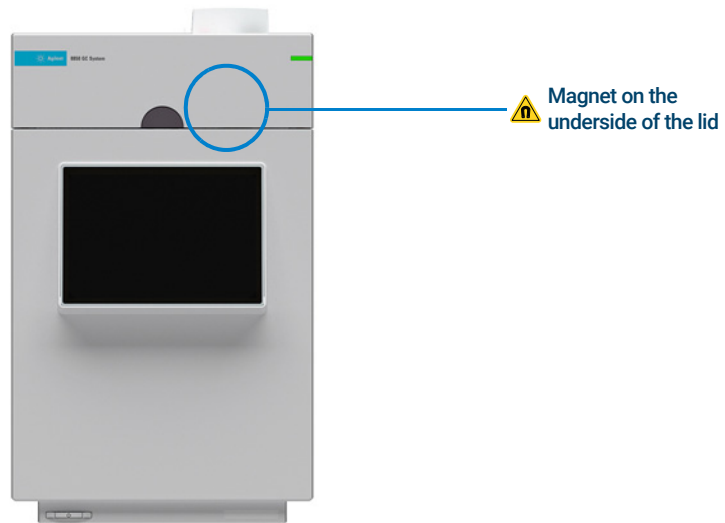


Figure 1. 8850 GC

1 About Maintaining the GC
Safety

2

Removing Covers

To Remove the Detector Cover 18

To Remove the Top Cover 19

This section describes how to remove covers as needed for routine maintenance.

Only the covers listed in this chapter should be removed. Removing other GC covers can compromise the safety features of the GC, leading to personal injury or damage to the instrument.

2 Removing Covers

To Remove the Detector Cover

To Remove the Detector Cover

This cover protects the detector.

To remove the detector cover, gently press the locking tab on the side of the cover, and lift the cover from the lid.

CAUTION

Do not force the cover, either when installing it or closing it. This could break the plastic parts.

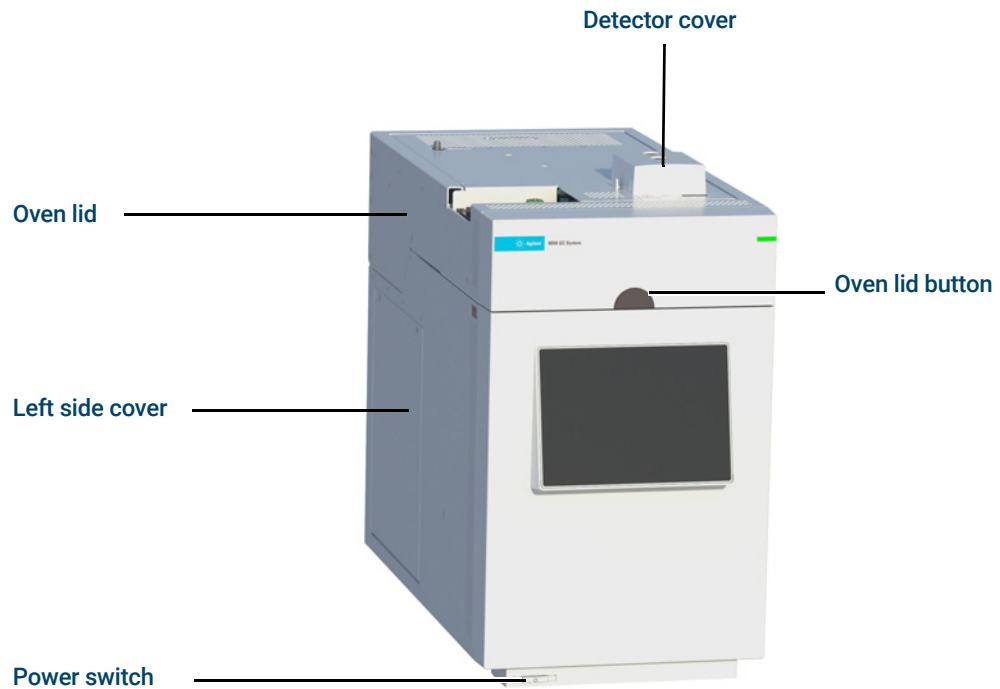


Figure 2. 8850 GC covers

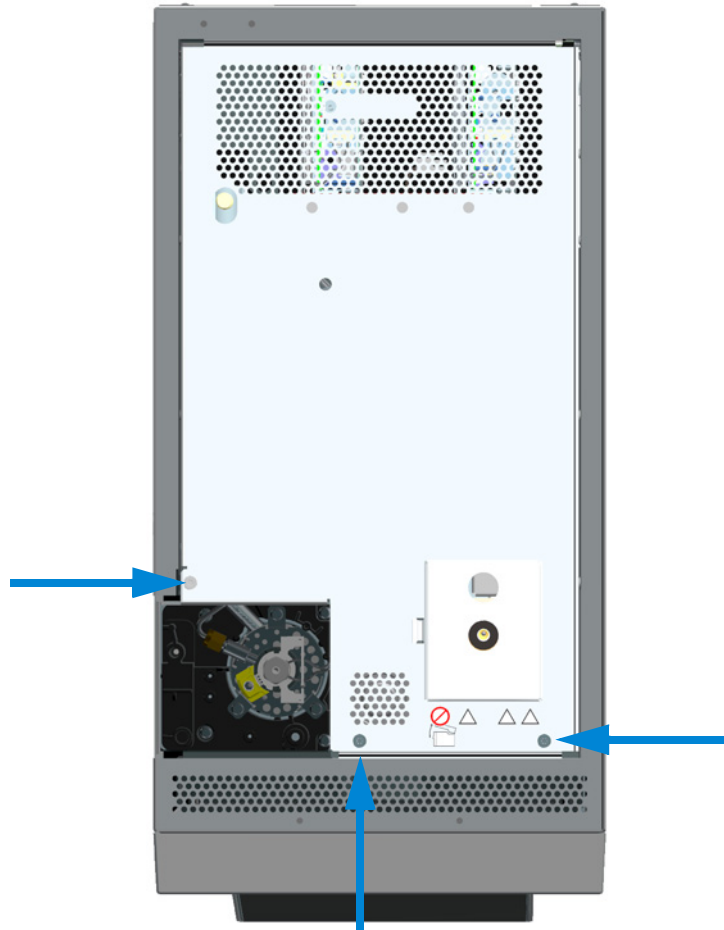
2 Removing Covers

To Remove the Top Cover

To Remove the Top Cover

The top cover protects the flow manifolds in the back top of the GC.

- 1 Remove the ALS injector.
- 2 Remove the screws T-20 Torx (3 places), lift the front of the top cover and gently pull forward.



2 Removing Covers

To Remove the Top Cover

3

Maintaining the GC

Consumables and Parts for General GC Maintenance **22**

To Install the Hydrogen Sensor Calibration Gas Cylinder **25**

Consumables and Parts for General GC Maintenance

Table 2 lists consumable parts for the hydrogen sensor module accessory and for general GC maintenance.

Table 2 Consumables and parts for general GC maintenance

Description	Part number
Hydrogen sensor parts	
Calibration gas cylinder, 2 percent hydrogen gas in 17 L compressed air	5190-6890
Cylinder stand with locking screw	1400-3583
Pressure regulator, with gage	G3440-80153
Fittings and hardware	
Fittings kit, 1/8-inch brass, 20/pk	5080-8750
Plug, 1/8-inch brass 6/pk	5180-4124
Tee, 1/8-inch brass 2/pk	5180-4160
Union, 1/8-inch brass 2/pk	5180-4127
Cross, union 1/8-inch brass	0100-0161
GC Supply Gas Installation Kit with Gas Purifiers	19199N
Installation kit for GCs without gas purifiers	19199M
PTFE tape	0460-1266
Copper tubing, 1/8-inch 12 ft.	5021-7107
Copper tubing, 1/8-inch od, 50 ft	5180-4196
Gas regulators	
Regulator, 2-stage, brass body, stainless steel diaphragms, 125 psi max, CGA350, hydrogen, argon/methane, with 1/8-inch fitting. For 1/4-inch tubing purchase a 1/4-inch adapter.	5183-4642
Regulator, 2-stage, brass body, stainless steel diaphragms, 125 psi max, CGA346, air, with 1/8-inch fitting. For 1/4-inch tubing purchase a 1/4-inch adapter.	5183-4641
Regulator, 2-stage, brass body, stainless steel diaphragms, 125 psi max, CGA590, industrial air, with 1/8-inch fitting. For 1/4-inch tubing purchase a 1/4-inch adapter.	5183-4645
Regulator, 2-stage, brass body, stainless steel diaphragms, 125 psi max, CGA580, helium, argon, nitrogen, 1/8-inch fitting. For 1/4-inch tubing purchase a 1/4-inch adapter.	5183-4644
Regulator, 2-stage, brass body, stainless steel diaphragms, 125 psi max, CGA540, oxygen, 1/8-inch fitting. For 1/4-inch tubing purchase a 1/4-inch adapter.	5183-4643
Gas Clean Filters	
Gas Clean connecting unit, 1-position), 1/4-inch	CP7980
Gas Clean connecting unit, 1-position), 1/8-inch	CP7988
Gas Clean connecting unit, 2-position), 1/4-inch	CP738406

3 Maintaining the GC

Consumables and Parts for General GC Maintenance

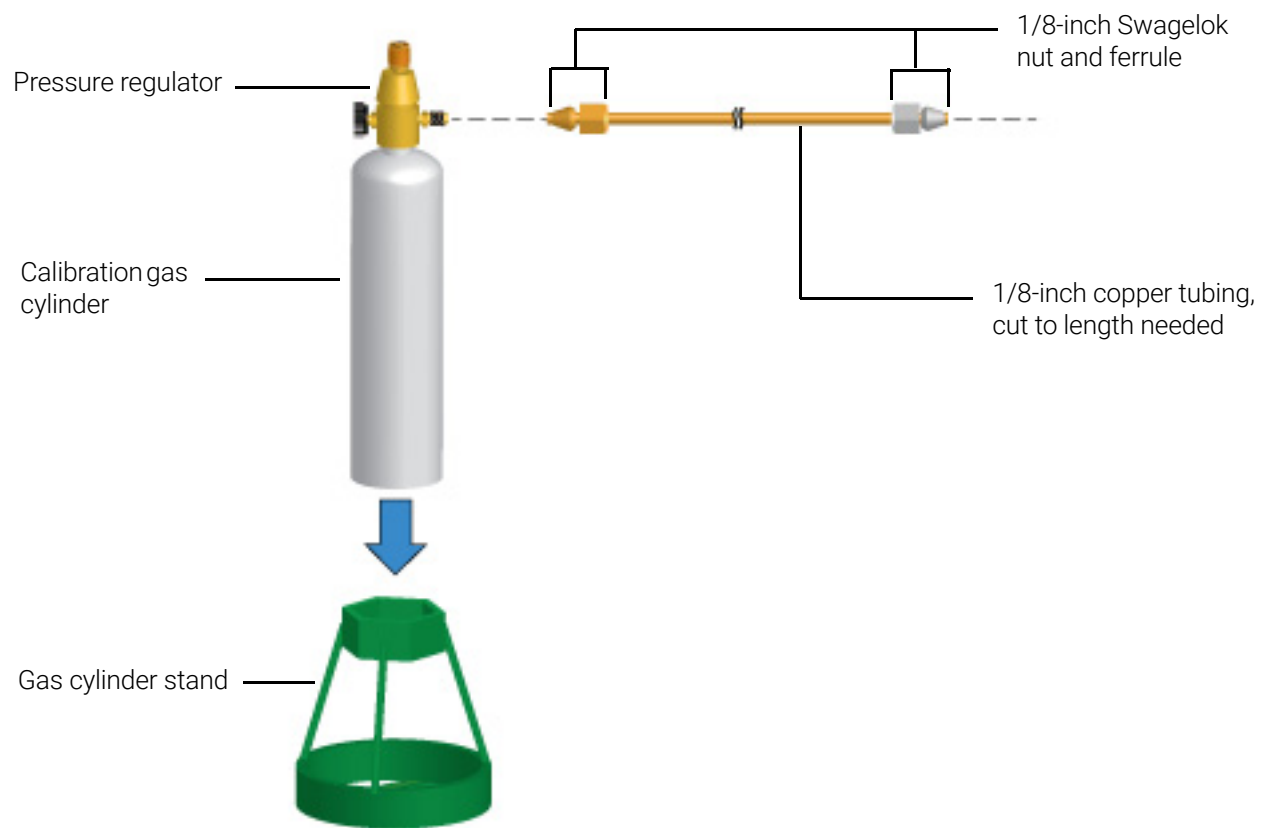
Table 2 Consumables and parts for general GC maintenance (continued)

Description	Part number
Gas Clean connecting unit, 2-position), 1/8-inch	CP738407
Gas Clean Smart Sensor for 8890 (replacement sensor)	CP179885
Gas Clean kit (connecting unit for one filter, one carrier gas filter, 1/8-inch connections, mounting bracket, and Smart Sensor) for new GC	
Connect unit, Gas Clean, 4 filter, 1/4-inch, 1/pk	CP7989
Gas Clean connecting unit, 4-position), 1/8-inch fittings	CP736520
Gas Clean high-flow connecting unit, 2-position), with 1/4-inch fittings, for high-flow applications such as ICP-MS or ICP-OES	CP17984
High flow connecting unit 1/8-inch	CP17985
Gas Clean filter GC-MS, 1/pk	CP17973
Gas Clean filter oxygen, 1/pk	CP17970
Gas Clean filter moisture, 1/pk	CP17971
Gas Clean filter charcoal, 1/pk	CP17972
Gas Clean filter kit for TCD	CP738408
Gas Clean Filter kit (connecting unit for one filter, including one carrier gas filter, 1/8-inch connections, a smart sensor, and mounting bracket for the GC) for carrier gas only	CP179880
Gas Clean Filter kit (connecting unit for four filters, including four filters, 1/4-inch connections) for FID, FPD, NPD	CP7995
Gas Clean Filter kit (connecting unit for four filters, including four filters, 1/8-inch connections) for FID, FPD, NPD	CP736530
TCD filter kit (with oxygen and moisture filters) for TCD	C0738408
Flush head, Gas Clean connecting unit, used to purge gas lines after installing connecting unit	CP7987
Gas Clean wall-mounting bracket for 1-position) connecting unit only	CP7981

For additional general consumables and filters, refer to the Agilent web site and Parts Finder software. For additional information about choosing the correct gas line filters, see the *8850 GC, GC/MS, and ALS Site Preparation Guide* and visit the Agilent web site.

3 Maintaining the GC

Consumables and Parts for General GC Maintenance



To Install the Hydrogen Sensor Calibration Gas Cylinder

WARNING

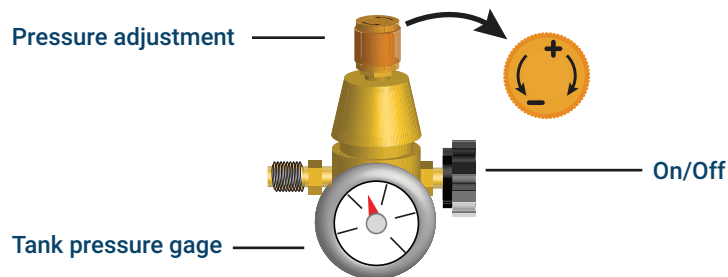
Connect only the Agilent calibration gas to the hydrogen sensor fitting. The calibration gas is 2% hydrogen in air and is not potentially explosive. Gases with higher concentrations of hydrogen can create a dangerous condition in the oven or damage the hydrogen sensor.

WARNING

Be careful! The oven and/or detector may be hot enough to cause burns. While hydrogen sensor calibration can be performed at any temperature, cool the oven and detector to safe handling temperatures, < 40 °C, before continuing.

This procedure describes how to replace an existing hydrogen calibration gas cylinder. If not replacing an existing cylinder, skip to **step 4**.

- 1 Make sure the old cylinder is empty.
- 2 Turn the pressure regulator completely off and set the output pressure as low as possible (full CCW).



- 3 Remove the pressure regulator from the old cylinder.
- 4 Install the pressure regulator onto the new cylinder.
- 5 Install the new cylinder into the stand.
- 6 Turn on the pressure in the new cylinder.
- 7 Check for leaks in the external fittings between the gas cylinder and the GC using a leak detection fluid. Correct any leaks. Be careful not to let any fluid contact GC electronics. Use leak detection fluid only on connections outside of the GC.
- 8 Initiate calibration. Using the touchscreen, select **Settings** > **Calibration** > **H2 Sensor** > **Start Calibration**.
- 9 When prompted to set the calibration flow, select **Set Flow** to confirm.
- 10 Allow the oven to cool to the set point before continuing with the calibration. Actual oven temperature will display. Select **Continue** when the temperature setpoint has been met.
- 11 Open the GC oven lid and connect a flowmeter tube to the sensor tube in the oven. At the GC touchscreen, select **Turn On**. The hydrogen sensor module will begin to send calibration gas across the sensor.

3 Maintaining the GC

To Install the Hydrogen Sensor Calibration Gas Cylinder

Connect the flow meter to the hydrogen sensor tube next on the right front side of the oven (top down view shown).



- 12 While continuing to measure the flow rate from the tube, adjust the pressure regulator on the calibration gas cylinder until the flow rate is approximately 30 mL/min (+/- 3 mL). Remove the flowmeter and tubing and close the oven door.



27.0 - 33.0 mL/min

- 13 Allow the calibration cycle to complete. (approximately 5 minutes total time)
- 14 Turn off the calibration gas. You may disconnect the gas from the GC if desired.

If calibration fails

If a calibration fails, from the touchscreen, go to **Settings** then choose **Service Mode > H2 Sensor > Calibration**. The first line will indicate that the hydrogen sensor calibration failed. Check the following:

- Check the calibration gas. Is it the correct type? Is the tank empty or low?
- Check for leaks in the calibration gas supply.
- Check for restrictions in the supply tubing.
- Check if the calibration gas is flowing at the expected rate of 30 mL/min. Adjust the pressure as needed.

The GC records hydrogen sensor calibration events in its Maintenance log.

4

Maintaining Capillary Columns

Consumables and Parts for Columns	28
To Install a Capillary Column Hanger	30
To Condition a Capillary Column	31
To Cut a Loop from a Column	33
To Reverse a Column and Bakeout Contaminants	34

Consumables and Parts for Columns

See the Agilent catalog for consumables and supplies for a more complete listing, or visit the Agilent Web site for the latest information (www.agilent.com).

Table 3 Nuts, ferrules, and hardware for capillary columns

Column id (mm)	Description	Typical use	Part number/quantity
.530	Ferrule, Vespel/graphite, 0.8-mm id	0.45-mm and 0.53-mm capillary columns	5062-3512 (10/pk)
	Ferrule, graphite, 1.0-mm id	0.53-mm capillary columns	5080-8773 (10/pk)
	Ferrule, graphite, 0.8-mm id	0.53-mm capillary columns	500-2118 (10/pk)
	Column nut, finger-tight (for 0.53-mm columns)	Connect column to inlet or detector	5020-8293
.320	Ferrule, Vespel/graphite, 0.5-mm id	0.32-mm capillary columns	5062-3514 (10/pk)
	Ferrule, graphite, 0.5-mm id	0.1-mm, 0.2-mm, 0.25-mm, and 0.32-mm capillary columns	5080-8853 (10/pk)
	Column nut, finger-tight (for .100- to .320-mm columns)	Connect column to inlet or detector	5020-8292
.250	Ferrule, Vespel/graphite, 0.4-mm id	0.1-mm, 0.2-mm, and 0.25-mm capillary columns	5181-3323 (10/pk)
	Ferrule, graphite, 0.5-mm id	0.1-mm, 0.2-mm, 0.25-mm, and 0.32-mm capillary columns	5080-8853 (10/pk)
	Column nut, finger-tight (for .100- to .320-mm columns)	Connect column to inlet or detector	5020-8292
.100 and .200	Ferrule, Vespel/graphite, 0.37-mm id	0.1-mm and 0.2-mm capillary columns	5062-3516 (10/pk)
	Ferrule, Vespel/graphite, 0.4-mm id	0.1-mm, 0.2-mm, and 0.25-mm capillary columns	5181-3323 (10/pk)
	Ferrule, graphite, 0.5-mm id	0.1-mm, 0.2-mm, 0.25-mm, and 0.32-mm capillary columns	5080-8853 (10/pk)
	Ferrule, graphite, 0.4-mm id		500-2114 (10/pk)
	Column nut, finger-tight (for .100- to .320-mm columns)	Connect column to inlet or detector	5020-8292
All	Ferrule, no-hole	Testing	5181-3308 (10/pk)
	Capillary column blanking nut	Testing—use with any ferrule	5020-8294
	Column nut, universal	Connect column to inlet or detector	5181-8830 (2/pk)
	Column nut, collared, self-tightening	Connect column to inlet or detector	G3440-81011
	Collar for self-tightening nut	Connect column to inlet or detector	G3440-81012
	Column nut, collared, self-tightening MSD	Connect column to inlet or detector	G3440-81013
	Column cutter, ceramic wafer	Cutting capillary columns	5181-8836 (4/pk)
	Pencil, diamond tipped	Cutting capillary columns	420-1000
	Ferrule tool kit	Ferrule installation	440-1000

4 Maintaining Capillary Columns

Consumables and Parts for Columns

Table 4 Capillary column hangers

Description	Part Number
5-7-inch Column hanger	G3940-67240

To Install a Capillary Column Hanger

Agilent capillary columns are wound on wire frames that slip over a hanger connected to the bottom of the oven lid.



Figure 3. Capillary column hanger

WARNING

Be careful! The oven may be hot enough to cause burns. If the oven is hot, wear heat-resistant gloves to protect your hands.

WARNING

Wear safety glasses to protect your eyes from flying particles while handling, cutting, or installing glass or fused silica capillary columns. Use care in handling these columns to prevent puncture wounds.

- 1 Place GC in maintenance mode: **Maintenance > Instrument > Perform Maintenance > Maintenance Mode > Start Maintenance**. Wait for the GC to become ready.
- 2 Gently squeeze to insert the ends of the hanger into the slots in the top of the oven lid.

To Condition a Capillary Column

This conditioning procedure provides generic instructions. Always follow the column manufacturer's recommendations.

- 1 Gather the following:
 - One 1/4-inch wrench
 - No-hole ferrule. See **"Consumables and Parts for Columns"** on page 28.
 - Column nut

WARNING

Do not use hydrogen as the carrier for conditioning! It could vent into the oven and present an explosion hazard.

WARNING

Be careful! The oven and all internal GC components may be hot enough to cause burns. If the oven is hot, wear heat-resistant gloves to protect your hands.

WARNING

Wear safety glasses to protect your eyes from flying particles while handling, cutting, or installing glass or fused silica capillary columns. Use care in handling these columns to prevent puncture wounds.

- 2 Manually set the inlet and oven temperature to < 40 °C, and wait for the inlet, oven, and all other parts you might come into contact with inside the oven to cool before continuing.
- 3 Install the column into the inlet using new ferrules. If the column is already installed, skip this step. An installed column can be conditioned while connected to a detector.

NOTE

Perform the column installation procedure manually. Do not use the automated column installation wizard.

- **"To Install a Capillary Column with the Split/Splitless Inlet"**
 - **"To Install a Capillary Column with the Purged Packed Inlet"**
 - **"To Install a Capillary Column with the Cool On-Column Inlet"**
- 4 Cap any open column fittings, for example, the detector column fitting.
 - 5 Turn off all detectors.
 - 6 Set a minimum velocity of 30 cm/s, or as recommended by the column manufacturer.
 - 7 Set the oven to 120 °C.
 - 8 Let gas flow through the column for 15 to 30 minutes to remove air.
 - 9 Program the oven from 120 °C to the maximum temperature limit for the column. Increase the temperature at a rate of 10 to 15 °C/min. Hold at the maximum temperature for 30 minutes.
 - 10 Manually set the oven temperature to < 40 °C, and wait for the oven, column and all other parts you might come into contact with inside the oven to cool before continuing.

4 Maintaining Capillary Columns

To Condition a Capillary Column

WARNING

Be careful! The oven and/or detector may be hot enough to cause burns. If the detector is hot, wear gloves to protect your hands.

WARNING

Wear safety glasses to protect your eyes from flying particles while handling, cutting, or installing glass or fused silica capillary columns. Use care in handling these columns to prevent puncture wounds.

11 If not already installed, attach the column to the detector. For details, select your specific detector.

NOTE

Perform the installation procedure manually. Do not use the automated installation wizard.

- [To Install a Capillary Column in the FID](#)
- [To Install a Capillary Column in the TCD](#)

12 Restore the analytical method.

- For FID, immediately turn off the flame.

13 After the GC becomes ready, wait 10 minutes, then ignite the detector flame.

To Cut a Loop from a Column

- 1 Gather the following:
 - New ferrule(s) for the column inlet connection
 - Column cutter
- 2 Place GC in maintenance mode: **Maintenance > Instrument > Perform Maintenance > Maintenance Mode > Start Maintenance** and wait for the GC to become ready.

WARNING

Be careful! The oven and/or inlet may be hot enough to cause burns. If the inlet is hot, wear heat-resistant gloves to protect your hands.

WARNING

Wear safety glasses to protect your eyes from flying particles while handling, cutting, or installing glass or fused silica capillary columns. Use care in handling these columns to prevent puncture wounds.

- 3 Loosen the inlet column nut and remove the column from the inlet.
- 4 Uncoil one loop of column from the column hanger.
- 5 Cut the unwanted loop from the column.
- 6 Install the column into the inlet using the new ferrules.

NOTE

Perform the installation procedure manually. Do not use the automated column installation wizard.

- [“To Install a Capillary Column with the Split/Splitless Inlet”](#)
 - [“To Install a Capillary Column with the Purged Packed Inlet”](#)
 - [“To Install a Capillary Column with the Cool On-Column Inlet”](#)
- 7 Exit maintenance mode. Select **Maintenance > Instrument > Perform Maintenance > Maintenance Mode > Finished**.

To Reverse a Column and Bakeout Contaminants

- 1 Gather the following:
 - 1/4-inch wrench
 - Column cutter
- 2 Place GC in maintenance mode: **Maintenance > Instrument > Perform Maintenance > Maintenance Mode > Start Maintenance** and wait for the GC to become ready.

WARNING

Be careful! The oven and/or detector may be hot enough to cause burns. If the detector is hot, wear gloves to protect your hands.

WARNING

Wear safety glasses to protect your eyes from flying particles while handling, cutting, or installing glass or fused silica capillary columns. Use care in handling these columns to prevent puncture wounds.

- 3 Disconnect the column from the inlet and detector.
- 4 If necessary, cut a loop from the column. See **“To Cut a Loop from a Column”** on page 33. Do not attach the column to the inlet.
- 5 Remove the column from the hanger and reverse its position (inlet and detector ends) and place the column back on the hanger.
- 6 Attach the column to the inlet.

NOTE

Perform the installation procedure manually. Do not use the automated column installation wizard.

- **“To Install a Capillary Column with the Split/Splitless Inlet”**
 - **“To Install a Capillary Column with the Purged Packed Inlet”**
 - **“To Install a Capillary Column with the Cool On-Column Inlet”**
- 7 Attach your column to the detector.
 - **To Install a Capillary Column in the FID**
 - **To Install a Capillary Column in the TCD**
 - 8 Exit maintenance mode. Select **Maintenance > Instrument > Perform Maintenance > Maintenance Mode > Finished**.
 - 9 Set the column flow to the normal operating value, or set the capillary column gas velocity to 30 cm/s.
 - 10 Purge the column with carrier flow for at least 10 minutes before heating the oven.
 - 11 Set the inlet temperature to 300 °C or 25 °C above the normal operating temperature.
 - 12 Set the column oven 25 °C above the GC method final oven temperature to bake contaminants out of the inlet, mostly through the split vent. Do not exceed the column manufacturer’s maximum temperature limit.
 - 13 Bakeout for 30 minutes.

5

Maintaining the Split/Splitless Inlet

- Consumables and Parts for the Split/Splitless Inlet 36
- Exploded Parts View of the Split/Splitless Inlet 39
- To Install a Capillary Column with the Split/Splitless Inlet 40
- To Change the Septum on the Split/Splitless Inlet 44
- To Clean the Septum Seat in the Insert Assembly of the Split/Splitless Inlet 46
- To Change the Liner and O-Ring on the Split/Splitless Inlet 48
- To Replace the Gold Seal on the Split/Splitless Inlet 51
- To Replace the Filter in the Split Vent Trap for the Split/Splitless Inlet 53
- To Clean the Split/Splitless Inlet 55
- To Bakeout Contaminants from the Split/Splitless Inlet 57

Consumables and Parts for the Split/Splitless Inlet

See the Agilent catalog for consumables and supplies for a more complete listing, or visit the Agilent Web site for the latest information (www.agilent.com).

Table 5 Split, splitless, direct, and direct connect inlet liners

Mode	Description	Deactivated	Part number
Split	Low-pressure drop, glass wool, single taper, 870 µL	Yes	5183-4647
Split	Glass wool, 990 µL	No	19251-60540
Split	MS Certified, single taper, glass wool	Yes	5188-6576
Split—Manual only	Empty pin and cup, 800 µL	No	18740-80190
Split—Manual only	Packed pin and cup, 800 µL	No	18740-60840
Split or splitless	Ultra Inert, low pressure drop, glass wool	Yes	5190-2295
Splitless	Single taper, glass wool, 900 µL	Yes	5062-3587
Splitless	Single taper, no glass wool, 900 µL	Yes	5181-3316
Splitless	Dual taper, no glass wool, 800 µL	Yes	5181-3315
Splitless	MS Certified, single taper, glass wool	Yes	5188-6568
Splitless	Ultra Inert, low-frit liner, 4-mm (1/pk)	Yes	5190-5112
Splitless	Ultra Inert, low-frit liner, 4-mm (5/pk)	Yes	5190-5112-005
Splitless—Direct inject	2-mm id, quartz, 250 µL	No	18740-80220
Splitless—Direct inject	2-mm id, 250 µL	Yes	5181-8818
Direct inject —Headspace or purge and trap	1.5-mm id, 140 µL	No	18740-80200
Direct column connect	Single taper, splitless 4-mm id	Yes	G1544-80730
Direct column connect	Dual taper, splitless 4-mm id	Yes	G1544-80700
Universal	Ultra Inert, mid-frit liner, 4-mm (1/pk)	Yes	5190-5105
Universal	Ultra Inert, mid-frit liner, 4-mm (5/pk)	Yes	5190-5105-005

Table 6 Nuts, ferrules, and hardware for capillary columns

Column id (mm)	Description	Typical use	Part number/quantity
.530	Ferrule, Vespel/graphite, 0.8-mm id	0.45-mm and 0.53-mm capillary columns	5062-3512 (10/pk)
	Ferrule, graphite, 1.0-mm id	0.53-mm capillary columns	5080-8773 (10/pk)
	Ferrule, graphite, 0.8-mm id	0.53-mm capillary columns	500-2118 (10/pk)
	Column nut, finger-tight (for 0.53-mm columns)	Connect column to inlet or detector	5020-8293

5 Maintaining the Split/Splitless Inlet

Consumables and Parts for the Split/Splitless Inlet

Table 6 Nuts, ferrules, and hardware for capillary columns (continued)

Column id (mm)	Description	Typical use	Part number/quantity
.320	Ferrule, Vespel/graphite, 0.5-mm id	0.32-mm capillary columns	5062-3514 (10/pk)
	Ferrule, graphite, 0.5-mm id	0.1-mm, 0.2-mm, 0.25-mm, and 0.32-mm capillary columns	5080-8853 (10/pk)
	Column nut, finger-tight (for .100- to .320-mm columns)	Connect column to inlet or detector	5020-8292
.250	Ferrule, Vespel/graphite, 0.4-mm id	0.1-mm, 0.2-mm, and 0.25-mm capillary columns	5181-3323 (10/pk)
	Ferrule, graphite, 0.5-mm id	0.1-mm, 0.2-mm, 0.25-mm, and 0.32-mm capillary columns	5080-8853 (10/pk)
	Column nut, finger-tight (for .100- to .320-mm columns)	Connect column to inlet or detector	5020-8292
.100 and .200	Ferrule, Vespel/graphite, 0.37-mm id	0.1-mm and 0.2-mm capillary columns	5062-3516 (10/pk)
	Ferrule, Vespel/graphite, 0.4-mm id	0.1-mm, 0.2-mm, and 0.25-mm capillary columns	5181-3323 (10/pk)
	Ferrule, graphite, 0.5-mm id	0.1-mm, 0.2-mm, 0.25-mm, and 0.32-mm capillary columns	5080-8853 (10/pk)
	Ferrule, graphite, 0.4-mm id		500-2114 (10/pk)
	Column nut, finger-tight (for .100- to .320-mm columns)	Connect column to inlet or detector	5020-8292
All	Ferrule, no-hole	Testing	5181-3308 (10/pk)
	Capillary column blanking nut	Testing—use with any ferrule	5020-8294
	Column nut, universal	Connect column to inlet or detector	5181-8830 (2/pk)
	Column nut, collared, self-tightening	Connect column to inlet or detector	G3440-81011
	Collar for self-tightening nut	Connect column to inlet or detector	G3440-81012
	Column nut, collared, self-tightening MSD	Connect column to inlet or detector	G3440-81013
	Column cutter, ceramic wafer	Cutting capillary columns	5181-8836 (4/pk)
	Pencil, diamond tipped	Cutting capillary columns	420-1000
	Ferrule tool kit	Ferrule installation	440-1000

Table 7 Other consumables and parts for the split/splitless inlet

Description/quantity	Part number
Septum retainer nut for headspace	18740-60830
Septum retainer nut	18740-60835
11-mm septum, high-temperature, low-bleed, 50/pk	5183-4757
11-mm septum, prepierced, long life, 50/pk	5183-4761
Nonstick fluorocarbon liner O-ring (for temperatures up to 350 °C), 10/pk	5188-5365

5 Maintaining the Split/Splitless Inlet

Consumables and Parts for the Split/Splitless Inlet

Table 7 Other consumables and parts for the split/splitless inlet (continued)

Description/quantity	Part number
Graphite O-ring for split liner (for temperatures above 350 °C), 10/pk	5180-4168
Graphite O-ring for splitless liner (for temperatures above 350 °C), 10/pk	5180-4173
Split vent trap PM kit, single cartridge	5188-6495
Retaining nut	G1544-20590
Gold-plated seal (standard application)	5188-5367
Gold-plated seal with cross (high split flows) (includes SS washer)	5182-9652
Stainless steel washer (0.375-inch od), 12/pk	5061-5869
Reducing nut	18740-20800
Column nut, blanking plug	5020-8294
Capillary inlet preventative maintenance kit, split	5188-6496
Capillary inlet preventative maintenance kit, splitless	5188-6497

5 Maintaining the Split/Splitless Inlet
Exploded Parts View of the Split/Splitless Inlet

Exploded Parts View of the Split/Splitless Inlet

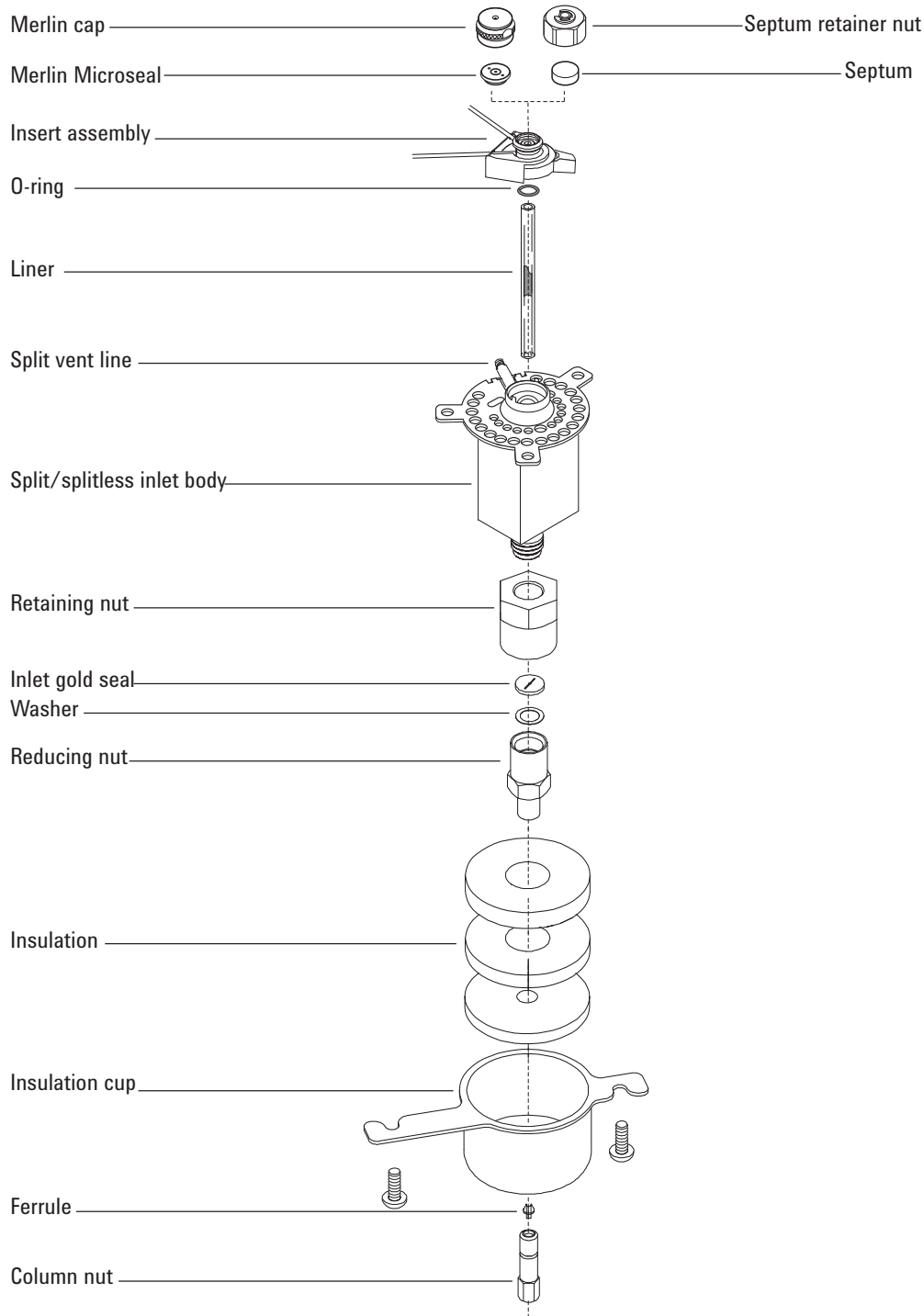


Figure 4. Split/splitless inlet exploded parts

To Install a Capillary Column with the Split/Splitless Inlet

WARNING

Do not use hydrogen as the carrier for conditioning! It could vent into the oven and present an explosion hazard.

- 1 Gather the following, see **“Consumables and Parts for the Split/Splitless Inlet”** on page 36:
 - Column
 - Ferrule(s)
 - Column nut
 - Septum
 - Column cutter
 - Isopropanol
 - Lab tissue
 - Metric ruler
 - Two 1/4-inch open-end wrenches
 - Lint-free gloves
- 2 Launch the GC maintenance wizard: **Maintenance > Column > Perform Maintenance > Install Column > Start Maintenance**. Wait for the GC to become ready. The wizard will guide you through the maintenance steps described below.

WARNING

Be careful! The oven and/or inlet may be hot enough to cause burns. If either is hot, wear heat-resistant gloves to protect your hands.

WARNING

Wear safety glasses to protect your eyes from flying particles while handling, cutting, or installing glass or fused silica capillary columns. Use care in handling these columns to prevent puncture wounds.

- 3 Verify that the correct glass liner is installed. See **“Consumables and Parts for the Split/Splitless Inlet”** on page 36.
- 4 Place the column on the hanger with the ends pointing up and the label to the front.

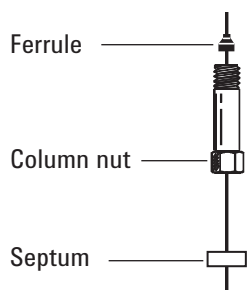
CAUTION

Wear clean, lint-free gloves to prevent contamination of parts with dirt and skin oils.

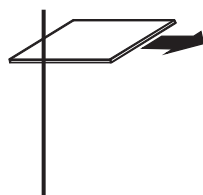
- 5 Place a septum, capillary column nut, and ferrule on the column.

5 Maintaining the Split/Splitless Inlet

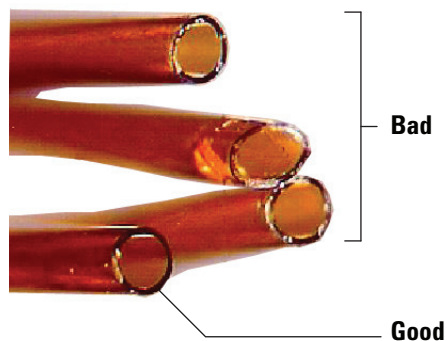
To Install a Capillary Column with the Split/Splitless Inlet



- 6 Score the column using a glass scribing tool. The score must be square to ensure a clean break.



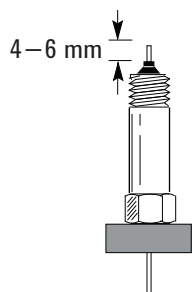
- 7 Break off the column end by supporting it against the column cutter opposite the scribe. Inspect the end with a magnifying loupe to make certain there are no burrs or jagged edges.



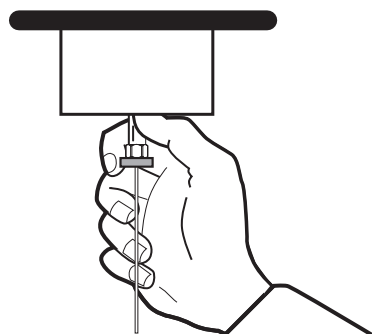
- 8 Wipe the column walls with a tissue dampened with isopropanol to remove fingerprints and dust.
- 9 Position the column so it extends 4 to 6 mm above the end of the ferrule. Slide the septum up the column to hold the column nut at this position.

5 Maintaining the Split/Splitless Inlet

To Install a Capillary Column with the Split/Splitless Inlet



10 Thread the column nut into the inlet but do not tighten.



11 Adjust the column position so that the septum contacts the bottom of the column nut. Finger-tighten the column nut until it begins to grip the column.

12 Tighten the column nut an additional 1/4 to 1/2 turn with a wrench so that the column cannot be pulled from the fitting with gentle pressure.

13 If available, plug in the new column's Smart ID key. See **Figure 5**.

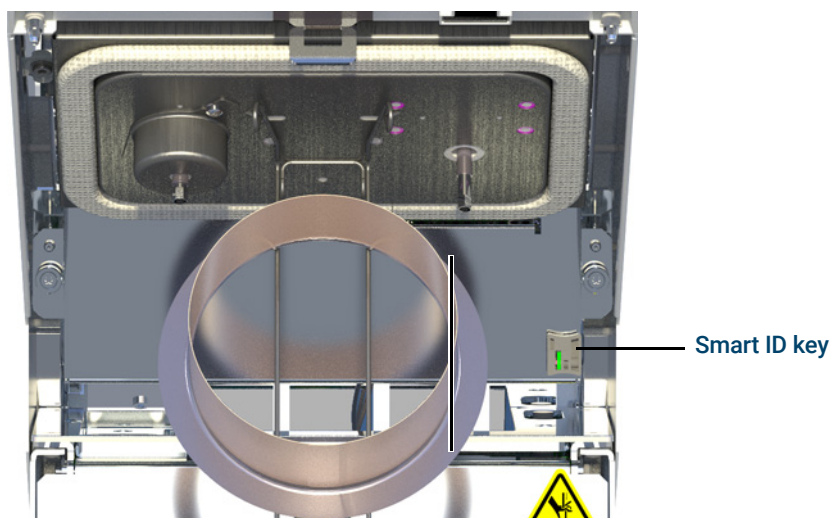


Figure 5. Insert Smart ID key

14 Configure the new column.

15 Condition the column per the manufacturer's recommendation. See **To Condition a Capillary Column**.

5 Maintaining the Split/Splitless Inlet

To Install a Capillary Column with the Split/Splitless Inlet

- 16 Install the column into the detector.
 - **To Install a Capillary Column in the FID**
 - **To Install a Capillary Column in the TCD**
- 17 The GC maintenance wizard will perform checks at the appropriate times, including **Leak & Restriction** tests, and will automatically reset the maintenance counters.
- 18 Select **Finished**, then select **OK** to exit the GC maintenance wizard.
- 19 After the column is installed at both inlet and detector, establish a flow of carrier gas and purge as recommended by the column manufacturer.
- 20 Restore the analytical method.
 - For FID, immediately turn off the flame.
- 21 After the GC becomes ready, wait 10 minutes then ignite the detector flame or bead.

WARNING

Be careful! The oven, inlet, and/or detector may be hot enough to cause burns. If they are hot, wear heat-resistant gloves to protect your hands.

- 22 Allow the oven, inlet, and detector to equilibrate at operating temperature, then retighten the fittings.

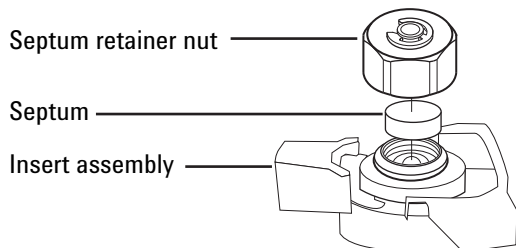
To Change the Septum on the Split/Splitless Inlet

- 1 Gather the following:
 - Replacement septum, see “**Consumables and Parts for the Split/Splitless Inlet**” on page 36.
 - Wrench, hex for changing septum
 - 0- or 00-grade steel wool (optional)
 - Tweezers
 - Wrench, capillary inlet (optional)
- 2 Launch the GC maintenance wizard: **Maintenance > Inlets**, select the inlet, then select **Perform Maintenance > Replace Septum > Start Maintenance**. The wizard will walk through the steps needed to replace the septum (those same steps are repeated below).

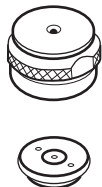
WARNING

Be careful! The oven and/or inlet may be hot enough to cause burns. If the inlet is hot, wear heat-resistant gloves to protect your hands.

- 3 Remove the septum retainer nut or Merlin cap.
- 4 Use tweezers to remove the septum or Merlin Microseal from the insert assembly. Do not gouge or scratch the interior of the insert assembly.



- 5 Firmly press the new septum or Merlin Microseal into the fitting. The metal parts side of the Merlin Microseal should face down (toward the oven).



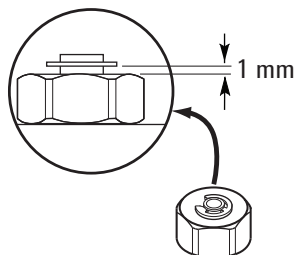
5 Maintaining the Split/Splitless Inlet

To Change the Septum on the Split/Splitless Inlet

- 6 Install the septum retainer nut or Merlin cap and finger-tighten. Tighten the septum retainer nut until the C-ring is about 1 mm above the nut.

CAUTION

Overtightening the septum nut can cause contamination.



- 7 Select **Maintenance > Inlets > Septum injections**, then touch **Reset Counter**.
- 8 Perform an inlet **Leak & Restriction** test and reset the maintenance counters.
- 9 Select **Finished**, then select **OK** to exit the GC maintenance wizard.
- 10 Restore the analytical method.

5 Maintaining the Split/Splitless Inlet

To Clean the Septum Seat in the Insert Assembly of the Split/Splitless Inlet

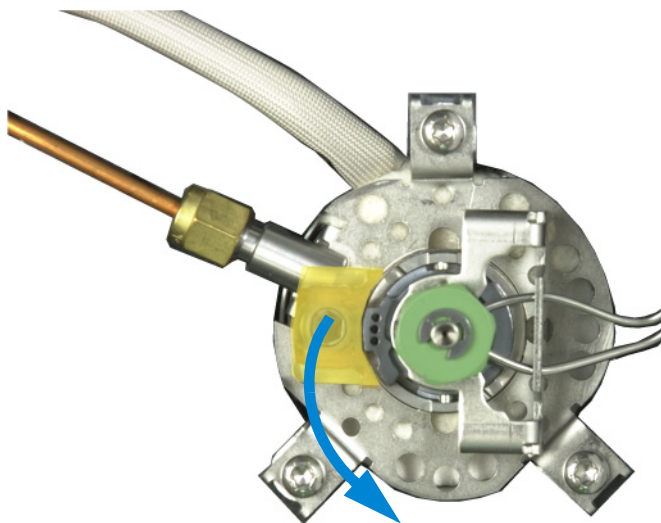
To Clean the Septum Seat in the Insert Assembly of the Split/Splitless Inlet

- 1 Gather the following:
 - Replacement septum, see “**Consumables and Parts for the Split/Splitless Inlet**” on page 36.
 - Wrench, hex for changing septum
 - 0- or 00-grade steel wool (optional)
 - Tweezers
 - Compressed, filtered, dry air or nitrogen
 - Wrench, capillary inlet (optional)
- 2 Manually set the inlet and oven temperature to $< 40\text{ }^{\circ}\text{C}$, and wait for the inlet, oven, and other parts you might come into contact with inside the oven, to cool before continuing. Alternately, place the GC in maintenance mode: **Maintenance > Instrument > Perform Maintenance > Maintenance Mode > Start Maintenance**.

WARNING

Be careful! The oven and/or inlet may be hot enough to cause burns. If either is hot, wear heat-resistant gloves to protect your hands.

- 3 Slide the locking tab forward (counterclockwise). Lift the insert assembly straight up and away from the inlet to avoid chipping or breaking the liner.

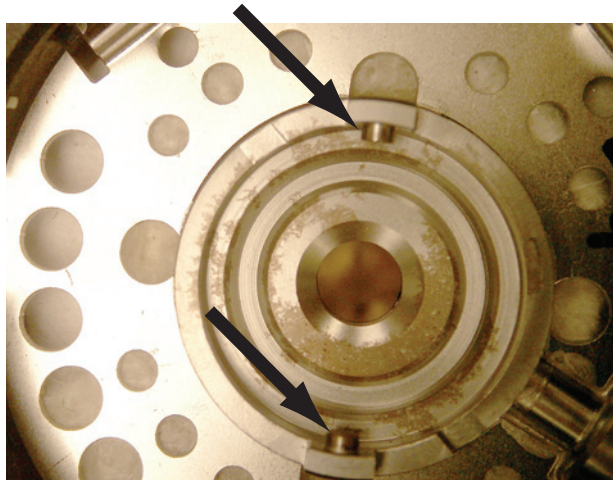


- 4 Remove the septum retainer nut or Merlin cap.
- 5 Use tweezers to remove the septum or Merlin Microseal from the retainer nut. See “**To Change the Septum on the Split/Splitless Inlet**” on page 44.
- 6 Scrub the residue from the retainer nut and septum holder with a small piece of rolled-up steel wool and tweezers. Do not do this over the inlet.

5 Maintaining the Split/Splitless Inlet

To Clean the Septum Seat in the Insert Assembly of the Split/Splitless Inlet

- 7 Use compressed air or nitrogen to blow away the pieces of steel wool and septum.
- 8 Line up the tab on the bottom of the insert assembly with the slot on the inlet body and push down to connect. Slide the locking tab to the left.



- 9 Firmly press the new septum or Merlin Microseal into the fitting. See **"To Change the Septum on the Split/Splitless Inlet"** on page 44.
- 10 Replace the septum retainer nut or Merlin cap and finger-tighten. See **"To Change the Septum on the Split/Splitless Inlet"** on page 44.
- 11 Exit maintenance mode. Select **Maintenance > Instrument > Perform Maintenance > Maintenance Mode > Finished**.
- 12 Select **Maintenance > Inlet > Septum injections**, then select **Reset**.
- 13 Perform a **Leak & Restriction** test.
- 14 Restore the analytical method.

5 Maintaining the Split/Splitless Inlet

To Change the Liner and O-Ring on the Split/Splitless Inlet

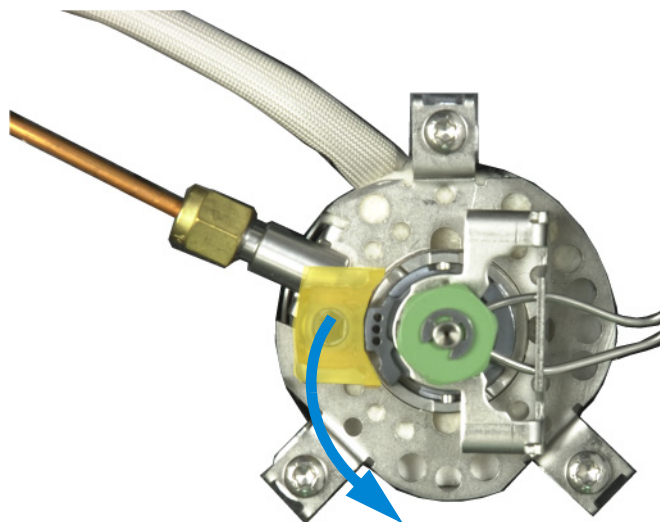
To Change the Liner and O-Ring on the Split/Splitless Inlet

- 1 Gather the following:
 - Replacement O-ring, see “**Consumables and Parts for the Split/Splitless Inlet**” on page 36.
 - Replacement liner
 - Tweezers
 - Wrench, hex for changing septum (optional)
 - Wrench, capillary inlet (optional)
 - Lint-free gloves
- 2 Launch the GC maintenance wizard: **Maintenance > Inlets**, select the inlet, then select **Perform Maintenance > Replace Liner > Start Maintenance**. The wizard will walk through the steps needed to replace the liner and O-ring (those same steps are repeated below).

WARNING

Be careful! The oven and/or inlet may be hot enough to cause burns. If either is hot, wear heat-resistant gloves to protect your hands.

- 3 Slide the locking tab forward (counterclockwise). Lift the insert assembly straight up and away from the inlet to avoid chipping or breaking the liner.



5 Maintaining the Split/Splitless Inlet

To Change the Liner and O-Ring on the Split/Splitless Inlet

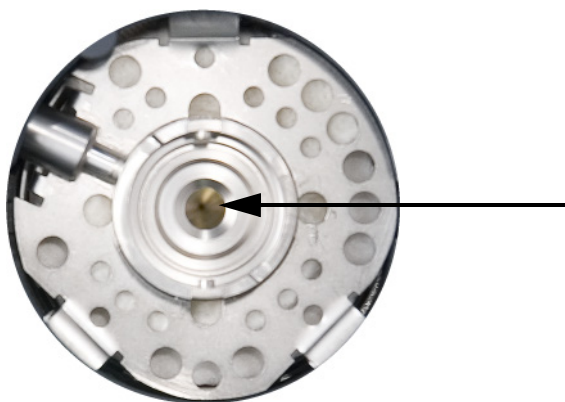
- 4 Loosen the O-ring from the sealing surface with tweezers.



- 5 Grasp the liner with tweezers and pull it out.



- 6 Inspect the surface of the gold seal for graphite or rubber septum contamination. If required, replace the gold seal. See [“To Replace the Gold Seal on the Split/Splitless Inlet”](#) on page 51.



- 7 Clean the inlet if there is visible or suspected contamination. See [“To Clean the Split/Splitless Inlet”](#) on page 55.
- 8 Clean O-ring residue from sealing surface.

CAUTION

Wear clean, lint-free gloves to prevent contamination of parts with dirt and skin oils.

5 Maintaining the Split/Splitless Inlet

To Change the Liner and O-Ring on the Split/Splitless Inlet

- 9 Slide a new O-ring onto the replacement liner.
- 10 Return the liner to the inlet, pushing it all the way in until the liner contacts the gold seal.



- 11 Line up the tab on the bottom of the insert assembly with the slot on the inlet body and push down to connect. Slide the locking tab to the back.
- 12 Turn on the inlet. Allow the inlet and column to purge with carrier gas for 15 minutes before heating the inlet or the column oven.
- 13 Bakeout contaminants. See **"To Bakeout Contaminants from the Split/Splitless Inlet"** on page 57.
- 14 Configure the new column.
- 15 The GC maintenance wizard will perform checks at the appropriate times, including **Leak & Restriction** tests, and will automatically reset the maintenance counters.
- 16 Select **Finished**, then select **OK** to exit the GC installation wizard.
- 17 Restore the analytical method.

To Replace the Gold Seal on the Split/Splitless Inlet

- 1 Gather the following:
 - Replacement gold seal, see **“Consumables and Parts for the Split/Splitless Inlet”** on page 36.
 - Replacement washer
 - 1/4-inch wrench (for column)
 - 1/2-inch wrench
 - Lint-free gloves
- 2 Launch the GC maintenance wizard: **Maintenance > Inlets**, select the inlet, then select **Perform Maintenance > Replace Gold Seal (bottom) > Start Maintenance**. The wizard will walk through the steps needed to replace the liner and O-ring (those same steps are repeated below). Wait for the GC to become ready.

WARNING

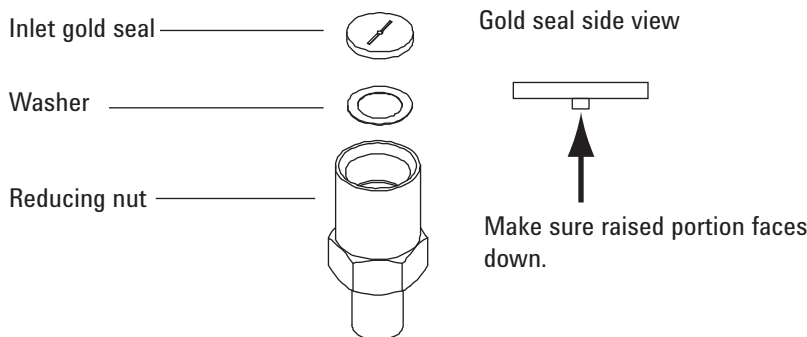
Be careful! The oven and/or inlet may be hot enough to cause burns. If either is hot, wear heat-resistant gloves to protect your hands.

- 3 Remove the inlet liner.
- 4 Remove the column from the inlet. Cap the open end of the column to prevent contamination. Remove the insulation cup around the base of the inlet.
- 5 Loosen and remove the reducing nut. Remove the washer and seal inside the reducing nut.

CAUTION

Wear clean, lint-free gloves to prevent contamination of parts with dirt and skin oils.

- 6 Put on gloves to protect the new gold seal and washer from contamination. Put a new washer in the reducing nut and place the new gold seal on top of it (raised portion facing down).



- 7 Replace the reducing nut and tighten securely with a wrench.
- 8 Replace the inlet liner.
- 9 Install the column and the insulation cup.

5 Maintaining the Split/Splitless Inlet

To Replace the Gold Seal on the Split/Splitless Inlet

- 10 Bakeout contaminants. See [“To Bakeout Contaminants from the Split/Splitless Inlet”](#) on page 57.
- 11 Perform an inlet **Leak & Restriction** test and reset the maintenance counters.
- 12 Select **Finished**, then select **OK** to exit the GC installation wizard.
- 13 Restore the analytical method.

5 Maintaining the Split/Splitless Inlet

To Replace the Filter in the Split Vent Trap for the Split/Splitless Inlet

To Replace the Filter in the Split Vent Trap for the Split/Splitless Inlet

- 1 Gather the following:
 - New split vent filter cartridge. See “**Consumables and Parts for the Split/Splitless Inlet**” on page 36.
- 2 Launch the GC maintenance wizard: **Maintenance > Inlets**, select the inlet, then select **Perform Maintenance > Replace Split Vent Trap > Start Maintenance**. The wizard will walk through the steps needed to replace the filter (those same steps are repeated below).

WARNING

Be careful! The oven and/or inlet may be hot enough to cause burns. If either is hot, wear heat-resistant gloves to protect your hands.

WARNING

The split vent trap may contain residual amounts of any samples or other chemicals you have injected into the GC. Follow your company's safety procedures for handling these types of substances while replacing the trap filter cartridge.

- 3 Remove the top cover. See “**To Remove the Top Cover**” on page 19.
- 4 Completely loosen the knurled nut that secures the split vent trap in place.

Knurled nut secured

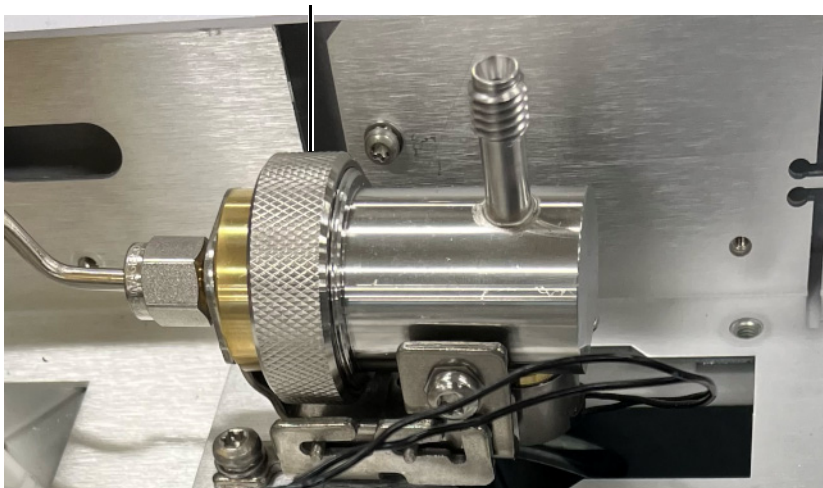


Figure 6. Loosen the knurled nut

- 5 Slide the trap assembly back from the guided mounting bracket and tilt up to expose the filter.

5 Maintaining the Split/Splitless Inlet

To Replace the Filter in the Split Vent Trap for the Split/Splitless Inlet

- 6 Remove the old filter cartridge and two O-rings.
- 7 Verify the new O-rings are seated properly on the new filter cartridge.
- 8 Install the new filter cartridge then reassemble the trap using your fingers to fully tighten the knurled nut. The nut should thread easily.

If the knurled nut does not thread easily, loosen, reassemble the 2 parts of the trap, and thread again. Do not force it.
- 9 The GC maintenance wizard will perform checks at the appropriate times, including **Leak & Restriction** tests, and will automatically reset the maintenance counters.
- 10 Select **Finished**, then select **OK** to exit the GC maintenance wizard.
- 11 Install the top cover.

To Clean the Split/Splitless Inlet

- 1 Gather the following:
 - Replacement septum, see “[Consumables and Parts for the Split/Splitless Inlet](#)” on page 36.
 - Replacement liner
 - Replacement O-ring
 - Replacement gold seal
 - Replacement washer
 - Solvent that will clean the type of deposits in your inlet
 - Compressed, filtered, dry air or nitrogen
 - Beaker
 - Cleaning brushes—The FID cleaning kit (part number 9301-0985) contains appropriate brushes
 - Lint-free gloves
- 2 Manually set the inlet and oven temperature to < 40 °C, and wait for the inlet, oven, and other parts you might come into contact with inside the oven, to cool before continuing. Alternately, place the GC in maintenance mode: **Maintenance > Instrument > Perform Maintenance > Maintenance Mode > Start Maintenance.**
- 3 When cooled, turn off the inlet and oven heaters.

WARNING

Be careful! The oven and/or inlet may be hot enough to cause burns. If the inlet is hot, wear heat-resistant gloves to protect your hands.

- 4 Remove the inlet liner, O-ring, and septum. See “[To Change the Liner and O-Ring on the Split/Splitless Inlet](#)” on page 48.
- 5 Remove the column and column hanger from the oven.
- 6 Remove the reducing nut, gold seal, and washer. See “[To Replace the Gold Seal on the Split/Splitless Inlet](#)” on page 51.
- 7 Place a beaker in the oven under the inlet to catch the solvent. Close the oven lid. Check the position of the beaker by looking through the inlet. The beaker should be in line with the inlet to catch the solvent.

CAUTION

Wear clean, lint-free gloves to prevent contamination of parts with dirt and skin oils.

- 8 Soak a cleaning brush in the solvent and scrub the inside of the insert assembly. Repeat 10 times.
- 9 Rinse the inlet with the solvent.
- 10 Blow the inside of the inlet dry with compressed air or nitrogen.
- 11 Install the gold seal, washer, and reducing nut.

5 Maintaining the Split/Splitless Inlet

To Clean the Split/Splitless Inlet

- 12 Install the liner, O-ring, and septum.
- 13 Install the column. See [“To Install a Capillary Column with the Split/Splitless Inlet”](#) on page 40.
- 14 Exit maintenance mode. Select **Maintenance > Instrument > Perform Maintenance > Maintenance Mode > Finished**.
- 15 Bakeout contaminants. See [“To Bakeout Contaminants from the Split/Splitless Inlet”](#) on page 57.
- 16 Perform an inlet **Leak & Restriction** test.
- 17 On the GC, select **Maintenance > Inlets**, then reset the counters for the parts you changed.
- 18 Restore the analytical method.

To Bakeout Contaminants from the Split/Splitless Inlet

- 1 Put the inlet into split mode.
- 2 Set the column flow to the normal operating value, or set the capillary column gas velocity to 30 cm/s.
- 3 Set the inlet split vent flow to 200 mL/min.
- 4 Purge the column with carrier flow for at least 10 minutes before heating the oven.
- 5 If the column is attached to the detector, set the detector 25 °C above normal operating temperature.

WARNING

Be careful! The oven, inlet, and/or detector may be hot enough to cause burns. If they are hot, wear heat-resistant gloves to protect your hands.

- 6 If the column is not attached to the detector, cap the detector fitting.
- 7 Set the inlet temperature to 300 °C or 25 °C above the normal operating temperature to bakeout contaminants from the inlet, mostly through the split vent.
- 8 Set the column oven 25 °C above the GC method final oven temperature to bake contaminants from the column. Do not exceed the column manufacturer's maximum temperature limit.
- 9 Bakeout for 30 minutes or until the detector baseline is free of contamination peaks.

5 Maintaining the Split/Splitless Inlet
To Bakeout Contaminants from the Split/Splitless Inlet

6

Maintaining the Purged Packed Inlet

- Consumables and Parts for the Purged Packed Inlet 60
- Exploded Parts View of the Purged Packed Inlet 62
- To Install a Capillary Column with the Purged Packed Inlet 63
- To Change the Septum on the Purged Packed Inlet 67
- To Clean the Septum Seat in the Purged Packed Inlet 69
- To Install an Adapter on the Purged Packed Inlet 71
- To Change the O-Ring on the Purged Packed Inlet 72
- To Change the Glass Liner on the Purged Packed Inlet 73
- To Clean the Purged Packed Inlet 75
- To Bakeout Contaminants from the Purged Packed Inlet 77
- To Install a Packed Metal Column 78
- To Install a Packed Column Adapter onto a Detector 81
- To Condition a Packed Column 83
- To Install Ferrules on a Packed Metal Column 84

Consumables and Parts for the Purged Packed Inlet

See the Agilent catalog for consumables and supplies for a more complete listing, or visit the Agilent Web site for the latest information (www.agilent.com).

Table 8 Purged packed inlet parts

Description	Part number/quantity
Preventative maintenance kit	5188-6498
Purged packed glass liners and column adapters	
Glass liner	5080-8732 (25/pack) or 5181-3382 deactivated (5/pack)
0.53-mm column adapter	19244-80540
1/8-inch column adapter	19243-80530
1/4-inch column adapter	19243-80540
Recommended septa and O-rings for the purged packed inlet	
11-mm solid septum, low-bleed, red	5181-1263 (50/pk)
11-mm septum with partial through-hole, low-bleed, red	5181-3383 (50/pk)
11-mm septum, low-bleed, gray	5080-8896 (50/pk)
Merlin Microseal septum (30 psi)	5181-8815
11-mm high-temperature silicone septum (350 °C and higher)	5182-0739 (50/pk)
Viton O-ring (Top insert weldment)	5080-8898 (12/pk)
Packed column adapters for detectors	
1/8-inch packed column adapter	G3450-20342

Table 9 Nuts and ferrules for packed columns

Description	Typical use	Part number/quantity
1/8-inch id Swagelok stainless steel nut, front ferrule, back ferrule	1/8-inch column	5080-8751 (20 each/pk)
1/8-inch id Swagelok brass nut, front ferrule, back ferrule	1/8-inch column	5080-8750 (20 each/pk)
1/8-inch id Vespel/ graphite ferrule	1/8-inch column	0100-1332 (10/pk)
1/8-inch id brass tubing nut	1/8-inch column	5180-4103 (10/pk)

6 Maintaining the Purged Packed Inlet

Consumables and Parts for the Purged Packed Inlet

Table 10 Nuts, ferrules, and hardware for capillary columns

Column id (mm)	Description	Typical use	Part number/quantity
.530	Ferrule, Vespel/graphite, 0.8-mm id	0.45-mm and 0.53-mm capillary columns	5062-3512 (10/pk)
	Ferrule, graphite, 1.0-mm id	0.53-mm capillary columns	5080-8773 (10/pk)
	Ferrule, graphite, 0.8-mm id	0.53-mm capillary columns	500-2118 (10/pk)
	Column nut, finger-tight (for 0.53-mm columns)	Connect column to inlet or detector	5020-8293
.320	Ferrule, Vespel/graphite, 0.5-mm id	0.32-mm capillary columns	5062-3514 (10/pk)
	Ferrule, graphite, 0.5-mm id	0.1-mm, 0.2-mm, 0.25-mm, and 0.32-mm capillary columns	5080-8853 (10/pk)
	Column nut, finger-tight (for .100 to 320-mm columns)	Connect column to inlet or detector	5020-8292
.250	Ferrule, Vespel/graphite, 0.4-mm id	0.1-mm, 0.2-mm, and 0.25-mm capillary columns	5181-3323 (10/pk)
	Ferrule, graphite, 0.5-mm id	0.1-mm, 0.2-mm, 0.25-mm, and 0.32-mm capillary columns	5080-8853 (10/pk)
	Column nut, finger-tight (for .100 to 320-mm columns)	Connect column to inlet or detector	5020-8292
.100 and .200	Ferrule, Vespel/graphite, 0.37-mm id	0.1-mm and 0.2-mm capillary columns	5062-3516 (10/pk)
	Ferrule, Vespel/graphite, 0.4-mm id	0.1-mm, 0.2-mm, and 0.25-mm capillary columns	5181-3323 (10/pk)
	Ferrule, graphite, 0.5-mm id	0.1-mm, 0.2-mm, 0.25-mm, and 0.32-mm capillary columns	5080-8853 (10/pk)
	Ferrule, graphite, 0.4-mm id		500-2114 (10/pk)
	Column nut, finger-tight (for .100- to .320-mm columns)	Connect column to inlet or detector	5020-8292
All	Ferrule, no-hole	Testing	5181-3308 (10/pk)
	Capillary column blanking nut	Testing—use with any ferrule	5020-8294
	Column nut, universal	Connect column to inlet or detector	5181-8830 (2/pk)
	Column nut, collared, self-tightening	Connect column to inlet or detector	G3440-81011
	Collar for self-tightening nut	Connect column to inlet or detector	G3440-81012
	Column nut, collared, self-tightening MSD	Connect column to inlet or detector	G3440-81013
	Column cutter, ceramic wafer	Cutting capillary columns	5181-8836 (4/pk)
	Pencil, diamond tipped	Cutting capillary columns	420-1000
	Ferrule tool kit	Ferrule installation	440-1000

Exploded Parts View of the Purged Packed Inlet

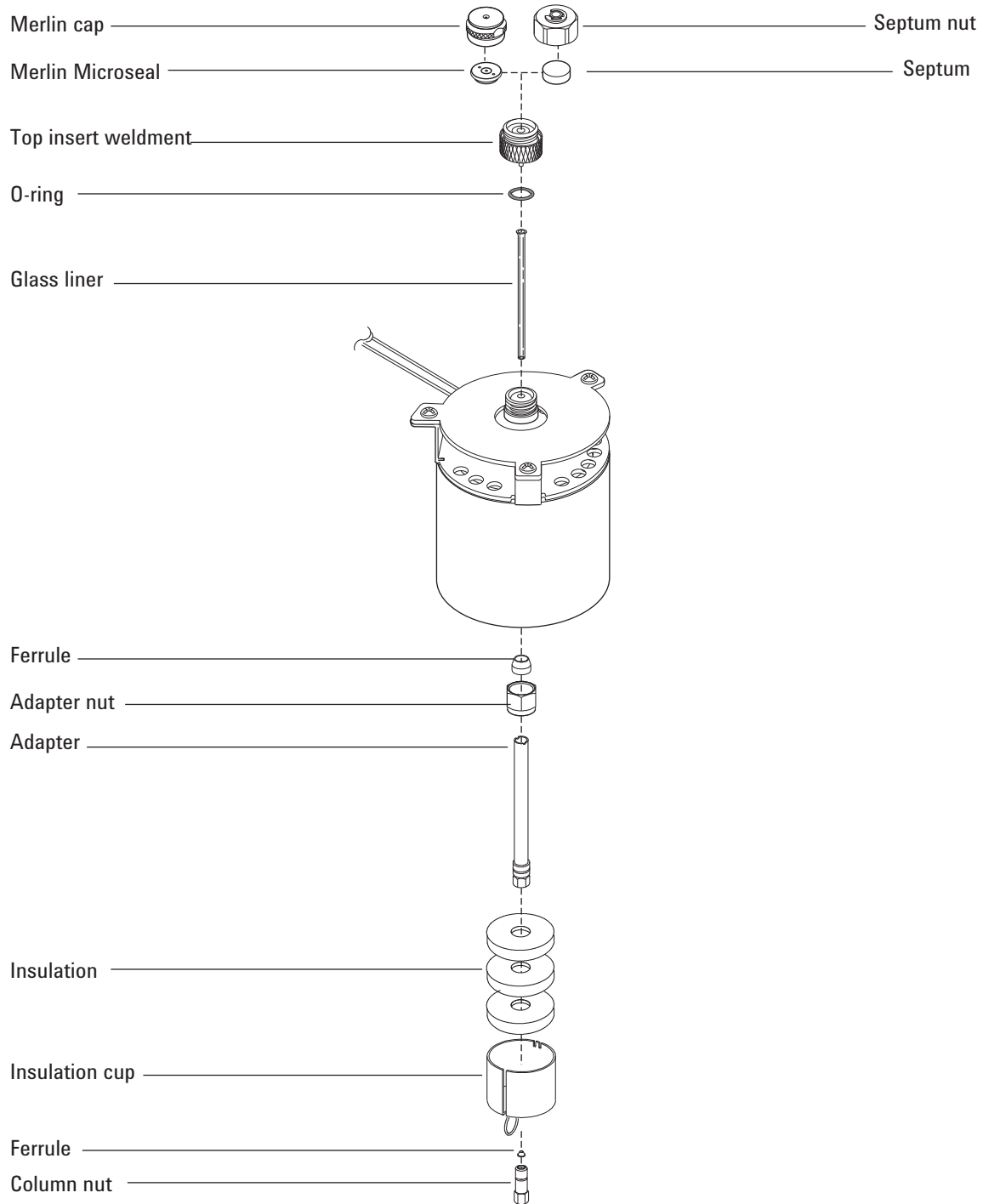


Figure 7. Purged packed inlet exploded parts

To Install a Capillary Column with the Purged Packed Inlet

- 1 Gather the following:
 - Column
 - Ferrule, see **“Consumables and Parts for the Purged Packed Inlet”** on page 60.
 - Column nut
 - Glass liner
 - Viton O-ring
 - 0.53-mm column adapter
 - Septum
 - Two 1/4-inch wrenches
 - Metric ruler
 - Lint-free gloves
- 2 Launch the GC maintenance wizard: **Maintenance > Column > Perform Maintenance > Install Column > Start Maintenance**. Wait for the GC to become ready.
The wizard will guide you through the maintenance steps described below.

WARNING

Be careful! The oven and/or inlet may be hot enough to cause burns. If the inlet is hot, wear heat-resistant gloves to protect your hands.

WARNING

Wear safety glasses to protect your eyes from flying particles while handling, cutting, or installing glass or fused silica capillary columns. Use care in handling these columns to prevent puncture wounds.

- 3 Install a 0.53-mm column adapter. See **“To Install an Adapter on the Purged Packed Inlet”** on page 71.

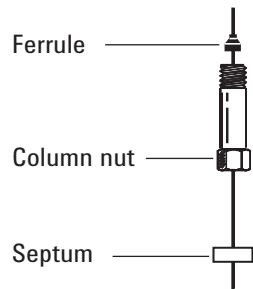
CAUTION

Wear clean, lint-free gloves to prevent contamination of parts with dirt and skin oils.

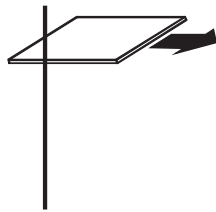
- 4 Install a new Viton O-ring. See **“To Change the O-Ring on the Purged Packed Inlet”** on page 72.
- 5 Place a septum, capillary column nut, and ferrule on the column.

6 Maintaining the Purged Packed Inlet

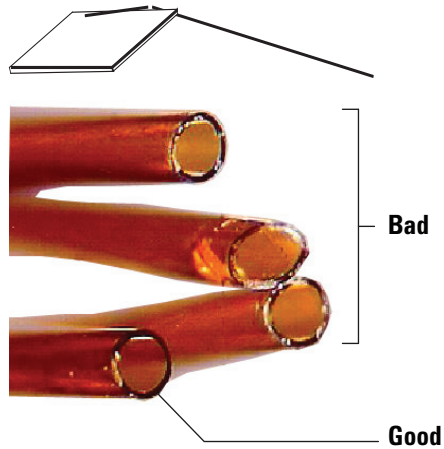
To Install a Capillary Column with the Purged Packed Inlet



- 6 Score the column using a glass scribing tool. The score must be square to ensure a clean break.



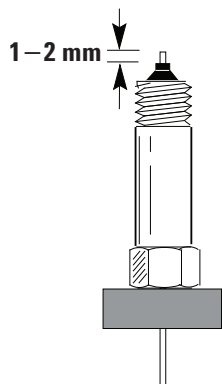
- 7 Break off the column end by supporting it against the column cutter opposite the scribe. Inspect the end with a magnifying loupe to make certain there are no burrs or jagged edges.



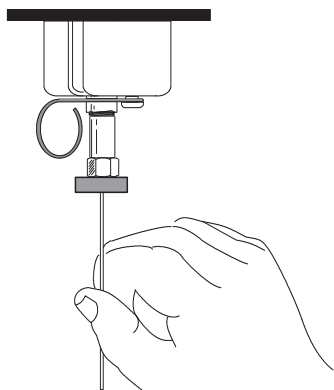
- 8 Wipe the column walls with a tissue dampened with isopropanol to remove fingerprints and dust.
- 9 Position the column so it extends 1 to 2 mm above the end of the ferrule. Slide the septum up the column to hold the column nut at this fixed position.

6 Maintaining the Purged Packed Inlet

To Install a Capillary Column with the Purged Packed Inlet



10 Thread the column nut into the inlet adapter but do not tighten.



11 Adjust the column position so that the septum is even with the bottom of the column nut. Finger-tighten the column nut until it begins to grip the column.

12 Tighten the column nut an additional 1/4 to 1/2 turn with a wrench so that the column cannot be pulled from the fitting with gentle pressure.

13 If available, plug in the new column's Smart ID key. See **Figure 8**.

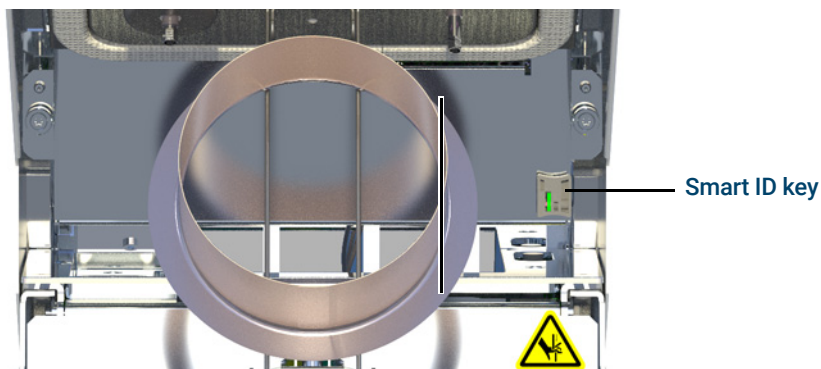


Figure 8. Insert Smart ID key

14 Configure the new column.

15 Condition the column per the manufacturer's recommendation. See **"To Condition a Capillary Column"**.

16 Install the column into the detector.

6 Maintaining the Purged Packed Inlet

To Install a Capillary Column with the Purged Packed Inlet

NOTE

Perform the column installation procedure manually. Do not use the automated column installation wizard.

- [To Install a Capillary Column in the FID](#)
- [To Install a Capillary Column in the TCD](#)

17 The GC maintenance wizard will perform checks at the appropriate times, including **Leak & Restriction** tests, and will automatically reset the maintenance counters.

18 Select **Finished**, then select **OK** to exit the GC maintenance wizard.

19 After the column is installed at both inlet and detector, establish a flow of carrier gas and purge as recommended by the column manufacturer.

20 Restore the analytical method.

21 After the GC becomes ready, wait 10 minutes then ignite the detector flame.

WARNING

Be careful! The oven, inlet, and/or detector may be hot enough to cause burns. If the oven, inlet, or detector is hot, wear heat-resistant gloves to protect your hands.

22 Allow the oven, inlet, and detector to equilibrate at operating temperature, then retighten the fittings.

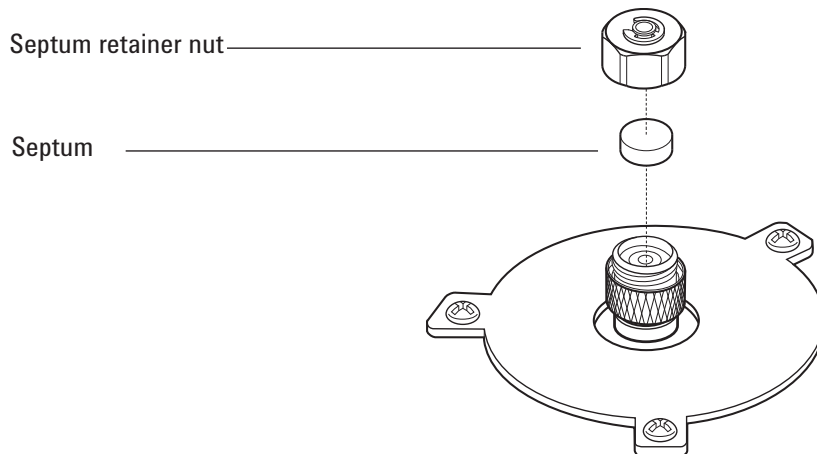
To Change the Septum on the Purged Packed Inlet

- 1 Gather the following:
 - Replacement septum, see “Consumables and Parts for the Purged Packed Inlet” on page 60.
 - Septum nut wrench
 - 0- or 00-grade steel wool (optional)
 - Tweezers
- 2 Launch the GC maintenance wizard: **Maintenance > Inlets**, select the inlet, then select **Perform Maintenance > Replace Septum > Start Maintenance**. Wait for the GC to become ready. The wizard will guide you through the maintenance steps described below.

WARNING

Be careful! The oven and/or inlet may be hot enough to cause burns. If the inlet is hot, wear heat-resistant gloves to protect your hands.

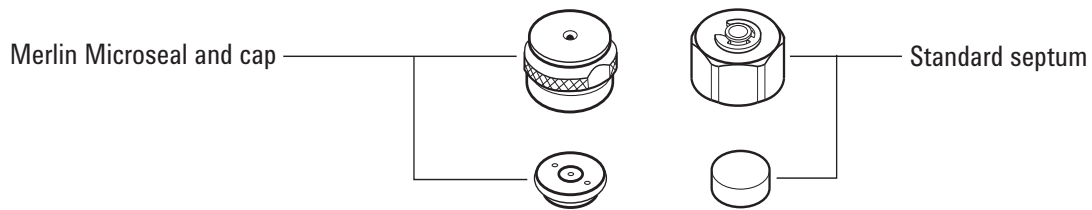
- 3 Remove the septum retainer nut or Merlin cap.
- 4 Use tweezers to remove the septum or Merlin Microseal from the retainer nut. Do not gouge or scratch the interior of the septum head.



- 5 Firmly press the new septum or Merlin Microseal into the fitting. The metal parts side of the Merlin Microseal should face down (toward the oven).

6 Maintaining the Purged Packed Inlet

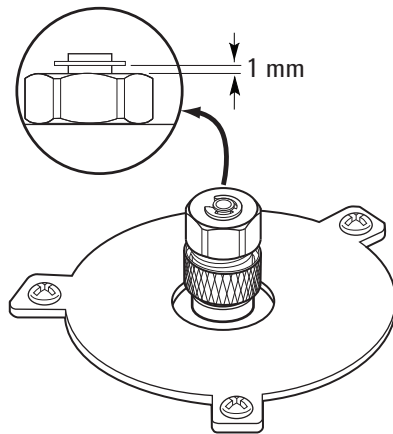
To Change the Septum on the Purged Packed Inlet



- 6 Replace the septum retainer nut or Merlin cap and finger-tighten. Tighten the septum retainer nut until the C-ring is about 1 mm above the nut.

CAUTION

Overtightening the septum nut can cause contamination.



- 7 The GC maintenance wizard will perform checks at the appropriate times, including **Leak & Restriction** tests, and will automatically reset the maintenance counters.
- 8 Select **Finished**, then select **OK** to exit the GC maintenance wizard.
- 9 Restore the analytical method.

To Clean the Septum Seat in the Purged Packed Inlet

- 1 Gather the following:
 - Replacement septum, see **“Consumables and Parts for the Purged Packed Inlet”** on page 60.
 - Septum nut wrench
 - 0- or 00-grade steel wool (optional)
 - Tweezers
 - Compressed, filtered, dry air or nitrogen
 - Ultrasonic cleaning bath
 - Lint-free gloves
- 2 Manually set the inlet and oven temperature to < 40 °C, and wait for the inlet, oven, and other parts you might come into contact with inside the oven, to cool before continuing. Alternately, place the GC in maintenance mode: **Maintenance > Instrument > Perform Maintenance > Maintenance Mode > Start Maintenance.**

WARNING

Be careful! The oven and/or inlet may be hot enough to cause burns. If the inlet is hot, wear heat-resistant gloves to protect your hands.

- 3 Remove the septum retainer nut or Merlin cap.
- 4 Loosen the top insert assembly and remove.

CAUTION

Wear clean, lint-free gloves to prevent contamination of parts with dirt and skin oils.

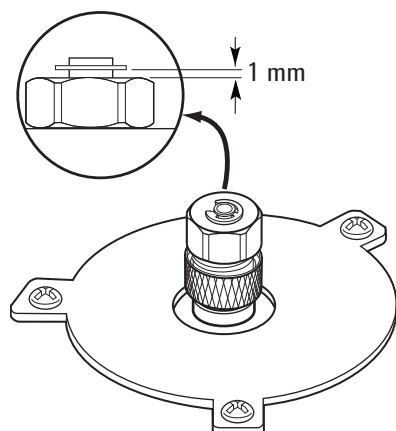
- 5 Use tweezers to remove the septum or Merlin Microseal from the top insert assembly. Do not gouge or scratch the interior of the septum head.
- 6 Scrub the residue from the top insert assembly and septum nut with a small piece of rolled-up steel wool and tweezers. Ultrasonically clean the retainer nut and top insert assembly.
- 7 Use compressed air or nitrogen to blow away the pieces of steel wool and septum.
- 8 Wearing gloves, inspect the O-ring and replace, if necessary. See **“To Change the O-Ring on the Purged Packed Inlet”** on page 72.
- 9 Install the top insert assembly and hand-tighten firmly.
- 10 Firmly press the new septum or Merlin Microseal into the fitting.
- 11 Install the septum retainer nut or Merlin cap and finger-tighten. Tighten the septum retainer nut until the C-ring is about 1 mm above the nut.

CAUTION

Overtightening the septum nut can cause contamination.

6 Maintaining the Purged Packed Inlet

To Clean the Septum Seat in the Purged Packed Inlet



12 Perform an inlet **Leak & Restriction** test and reset the maintenance counters.

13 Exit maintenance mode. Select **Maintenance > Instrument > Perform Maintenance > Maintenance Mode > Finished**.

14 Select **Maintenance > Inlets > Septum injections**, then select **Reset Counter**.

15 Restore the analytical method.

To Install an Adapter on the Purged Packed Inlet

- 1 Gather the following:
 - Brass tubing nut, see “Consumables and Parts for the Purged Packed Inlet” on page 60.
 - Adapter (0.53 mm, 1/8-inch packed)
 - 7/16-inch and 9/16-inch wrench
 - Vespel/graphite ferrule
 - Methanol
 - Lint-free gloves
 - Insulation cup
- 2 Place GC in maintenance mode: **Maintenance > Instrument > Perform Maintenance > Maintenance Mode > Start Maintenance**. Wait for the GC to become ready.

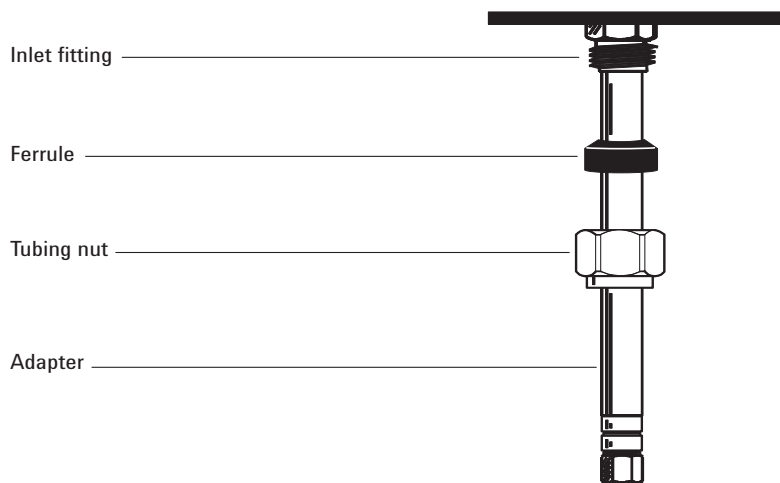
WARNING

Be careful! The oven and/or inlet may be hot enough to cause burns. If the inlet is hot, wear heat-resistant gloves to protect your hands.

CAUTION

Wear clean, lint-free gloves to prevent contamination of parts with dirt and skin oils.

- 3 Clean the end of the adapter with a lint-free cloth and methanol to remove contamination such as fingerprints.
- 4 Place the tubing nut and Vespel/graphite ferrule on the adapter.



- 5 Insert the adapter straight into the inlet base as far as possible.
- 6 Hold the adapter in this position and finger-tighten the nut.
- 7 Tighten an additional 1/4 turn with a wrench.
- 8 Install the insulation cup over the capillary adapter.
- 9 Exit maintenance mode. Select **Maintenance > Instrument > Perform Maintenance > Maintenance Mode > Finished**.

To Change the O-Ring on the Purged Packed Inlet

- 1 Gather the following:
 - Replacement O-ring, see “**Consumables and Parts for the Purged Packed Inlet**” on page 60.
 - Septum nut wrench
 - Tweezers
 - Lint-free gloves
- 2 Launch the GC maintenance wizard: **Maintenance > Inlets**, select the inlet, then select **Perform Maintenance > Replace O-Ring > Start Maintenance**. Wait for the GC to become ready. The wizard will guide you through the maintenance steps described below.

WARNING

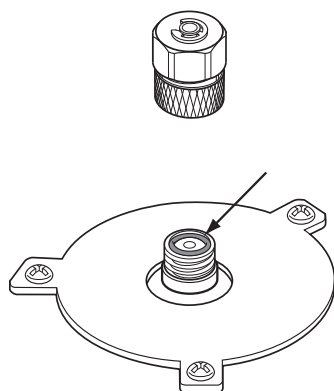
Be careful! The oven and/or inlet may be hot enough to cause burns. If the inlet is hot, wear heat-resistant gloves to protect your hands.

- 3 Loosen the top insert assembly to remove the top portion of the inlet.

CAUTION

Wear clean, lint-free gloves to prevent contamination of parts with dirt and skin oils.

- 4 Use tweezers to remove the old O-ring.



- 5 Insert a new O-ring.
- 6 Install and tighten the top insert assembly.
- 7 The GC maintenance wizard will perform checks at the appropriate times, including **Leak & Restriction** tests, and will automatically reset the maintenance counters.
- 8 Select **Finished**, then select **OK** to exit the GC maintenance wizard.
- 9 Restore the analytical method.

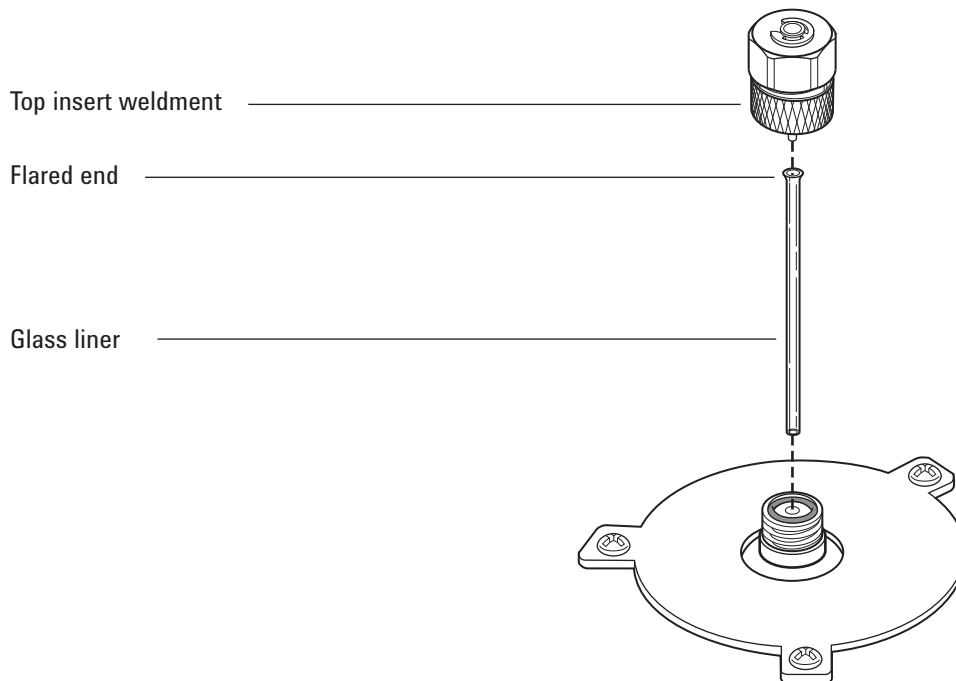
To Change the Glass Liner on the Purged Packed Inlet

- 1 Gather the following:
 - Replacement glass liner, see **“Consumables and Parts for the Purged Packed Inlet”** on page 60.
 - Lint-free gloves
- 2 Launch the GC maintenance wizard: **Maintenance > Inlets**, select the inlet, then select **Perform Maintenance > Replace Liner > Start Maintenance**. Wait for the GC to become ready. The wizard will guide you through the maintenance steps described below.

WARNING

Be careful! The oven and/or inlet may be hot enough to cause burns. If the inlet is hot, wear heat-resistant gloves to protect your hands.

- 3 Loosen the top insert assembly to remove the top portion of the inlet.



- 4 Use a thin wire or wood splint to carefully lift and remove the old glass liner.

CAUTION

Wear clean, lint-free gloves to prevent contamination of parts with dirt and skin oils.

6 Maintaining the Purged Packed Inlet

To Change the Glass Liner on the Purged Packed Inlet

- 5 Wearing gloves, inspect the O-ring and replace, if necessary. See **“To Change the O-Ring on the Purged Packed Inlet”** on page 72.
- 6 Wearing gloves, grasp the flared end (top) of the replacement glass liner with tweezers and install it in the inlet. If the glass liner does not seat properly because a capillary column is installed, remove the column, install the glass liner, and replace the column. See **“To Install a Capillary Column with the Purged Packed Inlet”** on page 63.
- 7 Install the top insert assembly and hand-tighten firmly.
- 8 Configure the new liner.
- 9 The GC maintenance wizard will perform checks at the appropriate times, including **Leak & Restriction** tests, and will automatically reset the maintenance counters.
- 10 Select **Finished**, then select **OK** to exit the GC maintenance wizard.
- 11 Restore the analytical method.

To Clean the Purged Packed Inlet

- 1 Gather the following:
 - Replacement O-ring, see **“Consumables and Parts for the Purged Packed Inlet”** on page 60.
 - Replacement glass liner
 - Replacement septum
 - Solvent that will clean the type of deposits in your inlet
 - Compressed, filtered, dry air or nitrogen
 - Beaker
 - Cleaning brushes—The FID cleaning kit (part number 9301-0985) contains appropriate brushes
 - Lint-free gloves
- 2 Manually set the inlet and oven temperature to < 40 °C, and wait for the inlet, oven, and other parts you might come into contact with inside the oven, to cool before continuing. Alternately, place the GC in maintenance mode: **Maintenance > Instrument > Perform Maintenance > Maintenance Mode > Start Maintenance.**
- 3 When cooled, turn off the inlet and oven heaters.

WARNING

Be careful! The oven and/or inlet may be hot enough to cause burns. If the inlet is hot, wear heat-resistant gloves to protect your hands.

- 4 Remove the column and column hanger.
- 5 Remove the septum nut and septum.
- 6 Remove the top insert assembly.
- 7 Remove the glass liner and O-ring.
- 8 If used, remove the adapter.
- 9 Ultrasonically clean the septum nut, top insert assembly, and adapter (if used) in a suitable solvent.
- 10 Place a beaker in the oven under the inlet. Close the oven lid. Check the position of the beaker by looking through the inlet. The beaker should be in line with the inlet to catch the solvent.

CAUTION

Wear clean, lint-free gloves to prevent contamination of parts with dirt and skin oils.

- 11 Soak a cleaning brush with the solvent and vigorously scrub the interior walls of the inlet.
- 12 Blow the inside of the inlet dry with compressed air or nitrogen.
- 13 Install the adapter, if used. See **“To Install an Adapter on the Purged Packed Inlet”** on page 71.

6 Maintaining the Purged Packed Inlet

To Clean the Purged Packed Inlet

- 14 Install the glass liner and O-ring. See **“To Change the Glass Liner on the Purged Packed Inlet”** on page 73.
- 15 Install the top insert assembly and finger-tighten.

NOTE

Perform the installation procedures manually. Do not use the automated installation wizards.

- 16 Install the septum and septum nut. See **“To Change the Septum on the Purged Packed Inlet”** on page 67.
- 17 Attach the column. See **“To Install a Capillary Column with the Purged Packed Inlet”** on page 63.
- 18 Restore the analytical method.

To Bakeout Contaminants from the Purged Packed Inlet

- 1 Set the column flow to the normal operating value, or set the capillary column gas velocity to 30 cm/s.
- 2 Purge the column with carrier flow for at least 10 minutes before heating the oven.
- 3 If the column is attached to the detector, set the detector 25 °C above normal operating temperature.

If the column is not attached to the detector, cap the detector fitting.

WARNING

Be careful! The oven, inlet, and/or detector may be hot enough to cause burns. If they are hot, wear heat-resistant gloves to protect your hands.

- 4 Set the inlet temperature to 300 °C or 25 °C above the normal operating temperature.
- 5 Set the column oven 25 °C above the GC method final oven temperature to bake contaminants out of the inlet. Do not exceed the column manufacturer's maximum temperature limit.
- 6 Bakeout for 30 minutes or until the detector baseline is free of contamination peaks.

To Install a Packed Metal Column

- 1 Gather the following:
 - 7/16-inch and 1/2-inch wrenches
 - Lint-free gloves
- 2 Launch the GC maintenance wizard: **Maintenance > Column > Perform Maintenance > Install Column > Start Maintenance**. Wait for the GC to become ready. The wizard will guide you through the maintenance steps described below.
- 3 Prepare the packed metal column. See **“To Install Ferrules on a Packed Metal Column”** on page 84.

WARNING

Be careful! The oven, inlet, and/or detector may be hot enough to cause burns. If the oven, inlet, or detector is hot, wear heat-resistant gloves to protect your hands.

- 4 Install the 1/8-inch packed column inlet adapter, if necessary. See **“To Install an Adapter on the Purged Packed Inlet”** on page 71.

CAUTION

Wear clean, lint-free gloves to prevent contamination of parts with dirt and skin oils.

- 5 Attach the column to the inlet adapter.
- 6 Finger-tighten the nut.
- 7 Tighten the nut an additional 1/4 turn with a wrench (for a 1/8-inch column).
Use two wrenches, one on the column nut and the other on the adapter, to prevent the adapter from rotating.
- 8 The GC maintenance wizard will perform checks at the appropriate times, including **Leak & Restriction** tests, and will automatically reset the maintenance counters.
Select **Finished**, then select **OK** to exit the GC maintenance wizard.
- 9 On the GC touchscreen, press **Settings > Configuration > Columns**, then select **Columns 1** through **6**. Select **Column Type > Packed**, then choose your **Inlet** and **Outlet Connection** to identify the inlet and detector to which the column is attached.
Alternatively, Select **Method > Configuration > Columns**, then select the Packed column. Select **Column Type > Packed**, then choose your **Inlet** and **Outlet Connection** to identify the inlet and detector to which the column is attached.
- 10 On the GC touchscreen, **Scroll** down to manually set your column temperatures.
Alternatively, Double-click the column to manually set your column temperatures.
Configure the new packed column (make sure either column length or diameter is zero).

6 Maintaining the Purged Packed Inlet To Install a Packed Metal Column

WARNING

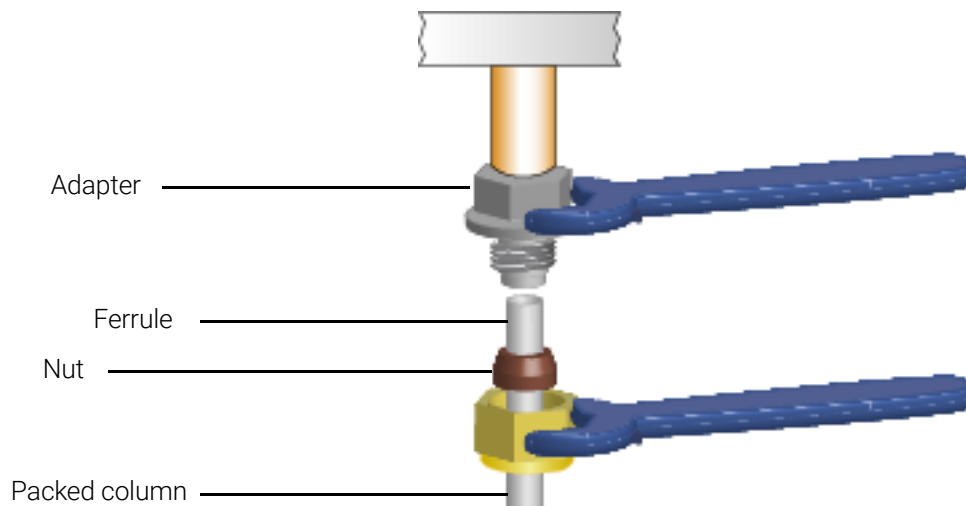
Do not use hydrogen as the carrier for conditioning! It could vent into the oven and present an explosion hazard.

- 11 Condition the column, if necessary. See **"To Condition a Packed Column"** on page 83.
- 12 Place GC in maintenance mode: **Maintenance > Instrument > Perform Maintenance > Maintenance Mode > Start Maintenance**. Wait for the GC to become ready.

WARNING

Be careful! The oven, inlet, and/or detector may be hot enough to cause burns. If the oven, inlet, or detector is hot, wear heat-resistant gloves to protect your hands.

- 13 If required, install a packed column adapter onto the detector column fitting. See **"To Install a Packed Column Adapter onto a Detector"** on page 81.
- 14 Place a nut and ferrule onto the packed column.
- 15 Attach the column to the detector or detector adapter. Finger-tighten the nut.



- 16 Using two wrenches, one on the adapter and one on the column nut, tighten the column nut an additional 1/4 turn (for a 1/8-inch column).
- 17 Exit maintenance mode. Select **Maintenance > Instrument > Perform Maintenance > Maintenance Mode > Finished**.
- 18 Establish a flow of carrier gas and purge as recommended by the packing manufacturer. Generally:
 - 20 to 30 mL/min for 2-mm id glass or 1/8-inch od metal columns
 - 50 to 60 mL/min for 4-mm id glass or 1/4-inch od metal columns
- 19 Heat the oven to 200 °C, cool it to a safe handling temperature, then re-tighten the column connection. (Re-tighten until snug, only about 15 degrees rotation.) Repeat two more times. This process will set the Vespel/graphite ferrule to help prevent leaks.
- 20 Restore the analytical method.

6 Maintaining the Purged Packed Inlet

To Install a Packed Metal Column

WARNING

Be careful! The oven, inlet, and/or detector may be hot enough to cause burns. If the oven, inlet, or detector is hot, wear heat-resistant gloves to protect your hands.

- 21 Allow the oven, inlet, and detector to equilibrate at operating temperature, then retighten the fittings.
- 22 Perform the inlet **Leak & Restriction** test and reset the maintenance counters.

To Install a Packed Column Adapter onto a Detector

This procedure applies to the FID, and TCD.

- 1 Gather the following:
 - Packed column adapter, see **“Consumables and Parts for the Purged Packed Inlet”** on page 60.
 - Ferrule, Vespel/graphite, 0.8-mm id
 - 7/16-inch wrench (for the packed column adapter and 1/8-inch packed column nuts)
 - 1/8-inch nut and ferrule for a 1/8-inch packed column
 - Lint-free gloves
- 2 Place GC in maintenance mode: **Maintenance > Instrument > Perform Maintenance > Maintenance Mode > Start Maintenance**. Wait for the GC to become ready.

WARNING

Be careful! The oven and/or detector may be hot enough to cause burns. If the detector is hot, wear gloves to protect your hands.

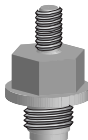
CAUTION

Wear clean, lint-free gloves to prevent contamination of parts with dirt and skin oils.

Handle the adapter carefully and install the packed column before installing the adapter into the detector base. The thin-walled capillary tube that carries the sample into the detector can be damaged by rough handling.

- 3 Place a ferrule onto the packed column adapter.

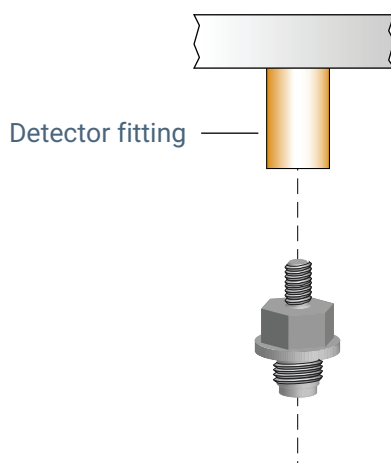
Detector fitting 

Packed column adapter 

- 4 Carefully install the adapter assembly into the detector fitting. Align the adapter so the it enters the detector fitting as vertically as possible. Avoid stressing the adapter capillary tube. Finger-tighten the adapter into the detector base, then tighten an additional 1/8 turn using a wrench.

6 Maintaining the Purged Packed Inlet

To Install a Packed Column Adapter onto a Detector



- 5 Exit maintenance mode. Select **Maintenance > Instrument > Perform Maintenance > Maintenance Mode > Finished.**

After installation, heat the oven to 200 °C, cool it to a safe handling temperature, then re-tighten the column connection. (Re-tighten until snug, only about 15 degrees rotation.) Repeat two more times. This process will set the Vespel/graphite ferrule to help prevent leaks.

To Condition a Packed Column

- 1 Gather the following:
 - Capillary adapter
 - Column nut and no-hole ferrule or blanking nut
 - Two 7/16-inch wrenches
 - 1/4-inch open-end wrench
 - Lint-free gloves

WARNING

Do not use hydrogen as the carrier for conditioning! It could vent into the oven and present an explosion hazard.

- 2 Place GC in maintenance mode: **Maintenance > Instrument > Perform Maintenance > Maintenance Mode > Start Maintenance.** Wait for the GC to become ready.

WARNING

Be careful! The oven, inlet, and/or detector may be hot enough to cause burns. If the oven, inlet, or detector is hot, wear heat-resistant gloves to protect your hands.

CAUTION

Wear clean, lint-free gloves to prevent contamination of parts with dirt and skin oils.

- 3 Install the proper liner in the inlet and attach the column. See **"To Install a Packed Metal Column"** on page 78.
- 4 If present, remove the packed column adapter from the detector base. (If it is installed to the column, it can be conditioned with the column.)
- 5 Cap the detector fitting with the no-hole ferrule and column nut, or with a blanking nut.
- 6 Enter a column flow as recommended by the packing manufacturer or an appropriate flow as follows:
 - 20 to 30 mL/min for 2-mm id glass or 1/8-inch od metal columns
- 7 Raise the oven temperature slowly to the conditioning temperature for the column. The conditioning temperature is never higher than the maximum temperature limit for the column; 30 °C less than the maximum is usually sufficient.
- 8 Continue conditioning overnight at the final temperature. Cool the oven to room temperature with carrier flow on.
- 9 Attach the column to the detector and maintain established flow. See **"To Install a Packed Metal Column"** on page 78.
- 10 Perform the inlet **Leak & Restriction** test and reset the maintenance counters.
- 11 Exit maintenance mode. Select **Maintenance > Instrument > Perform Maintenance > Maintenance Mode > Finished.**

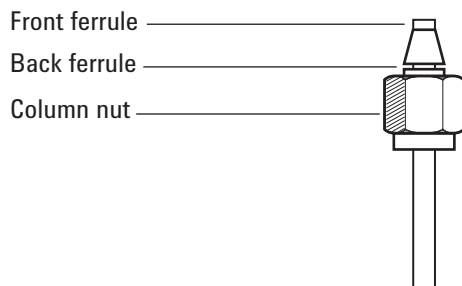
To Install Ferrules on a Packed Metal Column

- 1 Gather the following:
 - Wrenches
 - Stainless steel male Swagelok fitting, or 1/8-inch od
 - Brass Swagelok nut and ferrule set, see **“Consumables and Parts for the Purged Packed Inlet”** on page 60.
 - Lint-free gloves
- 2 Verify that the column end is cut square and is free of burns and deformation.
- 3 Secure the fitting in a bench vise.

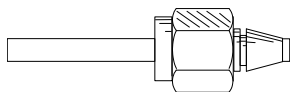
CAUTION

Wear clean, lint-free gloves to prevent contamination of parts with dirt and skin oils.

- 4 Assemble a Swagelok nut and ferrules onto the column.



- 5 Fully insert the column into the vise-held fitting, then withdraw 1–2 mm. Finger-tighten the nut.
- 6 Tighten the nut an additional 3/4 turn with a wrench (for a 1/8-inch column) .
- 7 Unscrew the column nut from the vise-held fitting and remove the column. Ferrules should now be set in place on the column with the column end correctly positioned.



7

Maintaining the COC Inlet

- Consumables and Parts for the Cool On-Column Inlet 86
- Exploded Parts View of the Cool On-Column Inlet 89
- To Install a Capillary Column with the Cool On-Column Inlet 90
- To Check the Needle-to-Column Size on the COC Inlet 93
- To Change a Septum on the COC Inlet 94
- To Install an Insert on the COC Inlet 96
- To Clean the COC Inlet 98
- To Replace the 7693A Injector Needle Support Guide 100
- To Replace a Needle in a Syringe 101
- To Replace the Fused Silica Needle in a Syringe for the COC Inlet 102
- To Bakeout Contaminants from the COC Inlet 103

Consumables and Parts for the Cool On-Column Inlet

See the Agilent catalog for consumables and supplies for a more complete listing, or visit the Agilent Web site for the latest information (www.agilent.com).

Table 11 Recommended parts for injections onto 0.53-mm fused silica columns

Column type	Part number
Insert, fused silica, 0.53 mm id	19245-20580 (no rings)
Septum nut, 530 μm	G1545-80530
Syringe barrel, removable needle, 5 μL	5182-0836
Needle, 530 μm (3/pk)	5182-0832
Plunger button, 10/pk, for manual injections using syringe barrel 5182-0836	5181-8866
On-column insert spring	19245-60760

Table 12 Recommended parts for injections onto 0.53-mm aluminum-clad columns

Column type	Part number
Insert, aluminum-clad, 0.53 mm id	19245-20780 (4 rings)
Septum nut, 530 μm	G1545-80530
Syringe barrel, removable needle, 5 μL	5182-0836
Needle, 530 μm (3/pk)	5182-0832
Plunger button, 10/pk, for manual injections using syringe barrel 5182-0836	5181-8866
On-column insert spring	19245-60760

Table 13 Recommended parts for injections onto 0.32-mm fused silica columns

Column type	Part number
Insert, fused silica, 0.32 mm id	19245-20525 (5 rings)
Septum nut, 250/320 μm	19245-80521
Syringe barrel, removable needle, 5 μL	5182-0836
Needle, 320 μm (3/pk)	5182-0831
Plunger button, 10/pk, for manual injections using syringe barrel 5182-0836	5181-8866
On-column insert spring	19245-60760

7 Maintaining the COC Inlet

Consumables and Parts for the Cool On-Column Inlet

Table 14 Recommended parts for injections onto 0.25-mm fused silica columns

Column type	Part number
Insert, 0.25 mm id	19245-20515 (6 rings)
Septum nut, 250/320 μ m	19245-80521
Syringe barrel, removable needle, 5 μ L	5182-0836
Needle, 250 μ m (3/pk)	5182-0833
Plunger button, 10/pk, for manual injections using syringe barrel 5182-0836	5181-8866
On-column insert spring	19245-60760

Table 15 Recommended parts for injections onto 0.2-mm fused silica columns

Description	Part number/quantity
Insert, fused silica, 0.20 mm id	19245-20510
Cooling tower assembly	19320-80625
Syringe barrel, for fused silica needle, 10 μ L	9301-0658
Replacement needles, fused silica, 0.18 mm	19091-63000 (6/pk)
Replacement PTFE ferrule for fused silica syringe	0100-1389
Removable stainless steel needle syringe, 10 μ L	5182-9633
Replacement stainless steel needles, 0.23 mm	5182-9645 (3/pk)
On-column insert spring	19245-60760

Table 16 Recommended septa for the COC inlet

Description	Part number/quantity
For 0.53-mm and 0.25/0.32-mm septum nuts	
5-mm solid septum for manual and automatic injection	5181-1261
5-mm long-life septum	5183-4762 (50/pk)
5-mm advanced green septum	5183-4760 (50/pk)
5-mm, high-temperature, low-bleed septum	5183-4758 (50/pk)
5-mm through-hole septum for automatic injection	5181-1260 (25/pk)
For the duckbill septum	
Duckbill septum for manual injection only (must use cooling tower with duckbill)	19245-40050 (10/pk)

7 Maintaining the COC Inlet

Consumables and Parts for the Cool On-Column Inlet

Table 17 Nuts, ferrules, and hardware for capillary columns

Column id (mm)	Description	Typical use	Part number/quantity
.530	Ferrule, Vespel/graphite, 0.8-mm id	0.45-mm and 0.53-mm capillary columns	5062-3512 (10/pk)
	Ferrule, graphite, 1.0-mm id	0.53-mm capillary columns	5080-8773 (10/pk)
	Ferrule, graphite, 0.8-mm id	0.53-mm capillary columns	500-2118 (10/pk)
	Column nut, finger-tight (for 0.53-mm columns)	Connect column to inlet or detector	5020-8293
.320	Ferrule, Vespel/graphite, 0.5-mm id	0.32-mm capillary columns	5062-3514 (10/pk)
	Ferrule, graphite, 0.5-mm id	0.1-mm, 0.2-mm, 0.25-mm, and 0.32-mm capillary columns	5080-8853 (10/pk)
	Column nut, finger-tight (for .100- to .320-mm columns)	Connect column to inlet or detector	5020-8292
.250	Ferrule, Vespel/graphite, 0.4-mm id	0.1-mm, 0.2-mm, and 0.25-mm capillary columns	5181-3323 (10/pk)
	Ferrule, graphite, 0.5-mm id	0.1-mm, 0.2-mm, 0.25-mm, and 0.32-mm capillary columns	5080-8853 (10/pk)
	Column nut, finger-tight (for .100- to .320-mm columns)	Connect column to inlet or detector	5020-8292
.100 and 200	Ferrule, Vespel/graphite, 0.37-mm id	0.1-mm and 0.2-mm capillary columns	5062-3516 (10/pk)
	Ferrule, Vespel/graphite, 0.4-mm id	0.1-mm, 0.2-mm, and 0.25-mm capillary columns	5181-3323 (10/pk)
	Ferrule, graphite, 0.5-mm id	0.1-mm, 0.2-mm, 0.25-mm, and 0.32-mm capillary columns	5080-8853 (10/pk)
	Ferrule, graphite, 0.4-mm id		500-2114 (10/pk)
	Column nut, finger-tight (for .100- to .320-mm columns)	Connect column to inlet or detector	5020-8292
All	Ferrule, no-hole	Testing	5181-3308 (10/pk)
	Capillary column blanking nut	Testing—use with any ferrule	5020-8294
	Column nut, universal	Connect column to inlet or detector	5181-8830 (2/pk)
	Column nut, collared, self-tightening	Connect column to inlet or detector	G3440-81011
	Collar for self-tightening nut	Connect column to inlet or detector	G3440-81012
	Column nut, collared, self-tightening MSD	Connect column to inlet or detector	G3440-81013
	Column cutter, ceramic wafer	Cutting capillary columns	5181-8836 (4/pk)
	Pencil, diamond tipped	Cutting capillary columns	420-1000
	Ferrule tool kit	Ferrule installation	440-1000

Exploded Parts View of the Cool On-Column Inlet

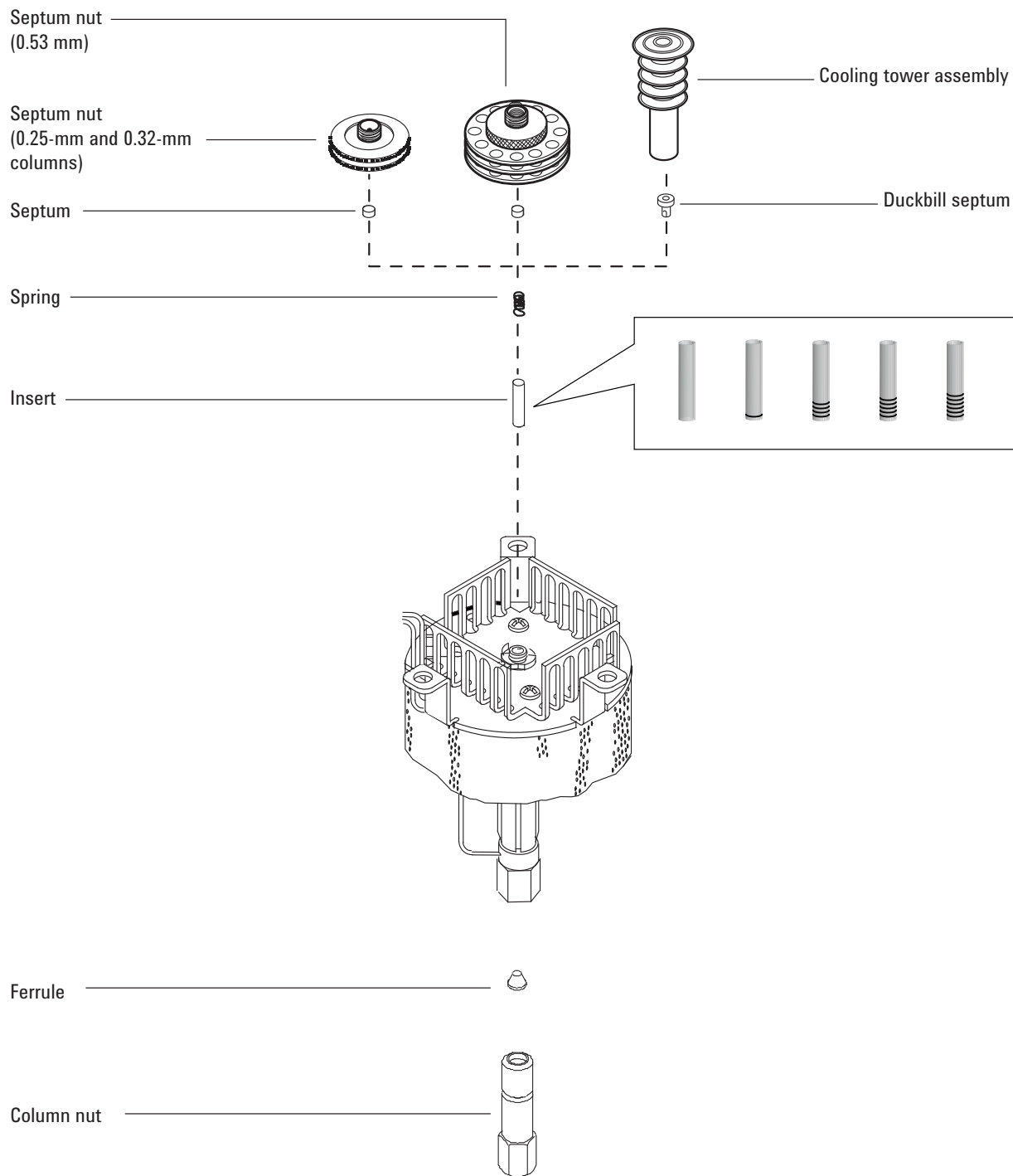


Figure 9. Cool on-column inlet exploded parts

To Install a Capillary Column with the Cool On-Column Inlet

- 1 Gather the following:
 - Column nut and ferrule, see “**Consumables and Parts for the Cool On-Column Inlet**” on page 86.
 - Column cutter
 - 1/4-inch and 5/16-inch wrenches
 - Lint-free gloves
- 2 Launch the GC maintenance wizard: **Maintenance > Column > Perform Maintenance > Install Column > Start Maintenance**. Wait for the GC to become ready. The wizard will guide you through the maintenance steps described below.

WARNING

Be careful! The oven and/or inlet may be hot enough to cause burns. If either is hot, wear heat-resistant gloves to protect your hands.

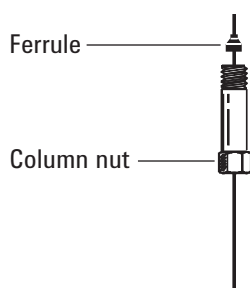
WARNING

Wear safety glasses to protect your eyes from flying particles while handling, cutting, or installing glass or fused silica capillary columns. Use care in handling these columns to prevent puncture wounds.

CAUTION

Wear clean, lint-free gloves to prevent contamination of parts with dirt and skin oils.

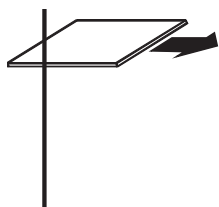
- 3 Before installing the column, be sure the correct insert is installed for the needle and column. See “**To Install an Insert on the COC Inlet**” on page 96.
- 4 Place a capillary column nut and ferrule on the column.



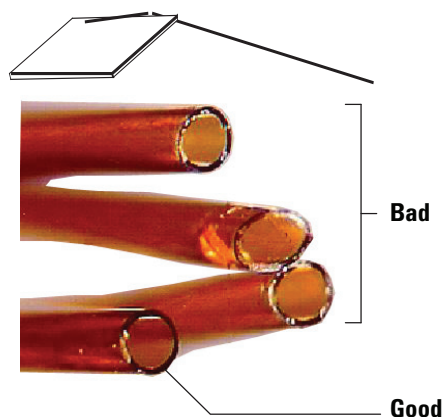
- 5 Score the column using a glass scribing tool. The score must be square to ensure a clean break.

7 Maintaining the COC Inlet

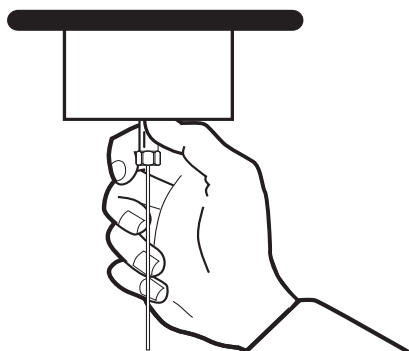
To Install a Capillary Column with the Cool On-Column Inlet



- 6 Break off the column end by supporting it against the column cutter opposite the scribe. Inspect the end with a magnifying loupe to make certain there are no burrs or jagged edges.



- 7 Wipe the column walls with a tissue dampened with isopropanol to remove fingerprints and dust.
- 8 Gently insert the column into the inlet until it bottoms. You should feel spring tension as you push up on the column. (Do not withdraw the column.)
- 9 Insert the column nut into the inlet fitting and finger-tighten.



WARNING

To avoid bending the inlet, always use two wrenches. Use a 5/16-inch wrench to support the inlet while tightening the column nut with a 1/4-inch wrench.

- 10 Tighten the column nut an additional 1/4 turn with a wrench or until the column does not move.
- 11 If using an automatic injection system with a 0.25-mm or 0.32-mm column, verify that the column installation by manually pushing the syringe into the inlet.

7 Maintaining the COC Inlet

To Install a Capillary Column with the Cool On-Column Inlet

12 If available, plug in the new column's Smart ID key. See [Figure 10](#).

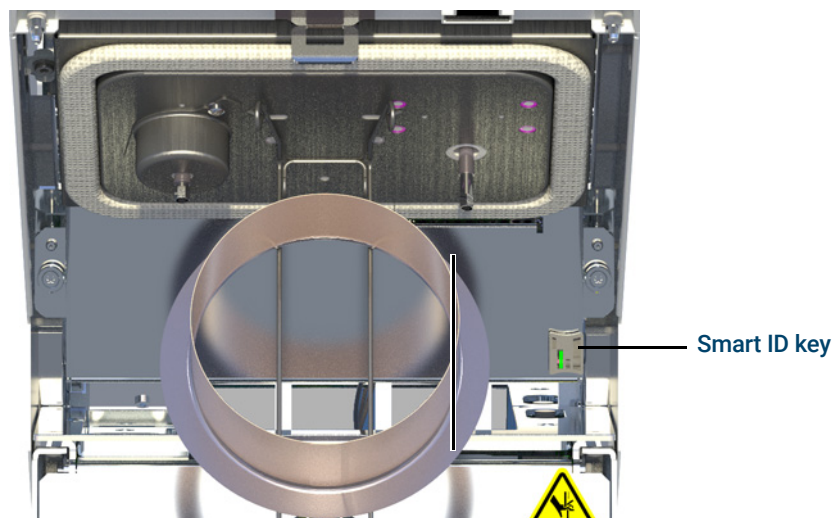


Figure 10. Insert Smart ID key (split/splitless inlet shown)

13 Configure the new column.

14 Condition the column per the manufacturer's recommendation. See [To Condition a Capillary Column](#).

15 Install the column into the detector.

NOTE

Execute the column installation procedure manually. Do not use the automated column installation wizard.

- [To Install a Capillary Column in the FID](#)
- [To Install a Capillary Column in the TCD](#)

16 The GC maintenance wizard will perform checks at the appropriate times, including **Leak & Restriction** tests, and will automatically reset the maintenance counters.

17 Select **Finished**, then select **OK** to exit the GC maintenance wizard.

18 After the column is installed at both inlet and detector, establish a flow of carrier gas and purge as recommended by the column manufacturer.

19 Restore the analytical method.

20 After the GC becomes ready, wait 10 minutes then ignite the detector flame.

WARNING

Be careful! The oven, inlet, and/or detector may be hot enough to cause burns. If they are hot, wear heat-resistant gloves to protect your hands.

21 Allow the oven, inlet, and detector to equilibrate at operating temperature, then retighten the fittings.

To Check the Needle-to-Column Size on the COC Inlet

- 1 Gather the following:
 - Insert, see **“Consumables and Parts for the Cool On-Column Inlet”** on page 86.
 - Syringe needle
- 2 Place GC in maintenance mode: **Maintenance > Instrument > Perform Maintenance > Maintenance Mode > Start Maintenance**. Wait for the GC to become ready.

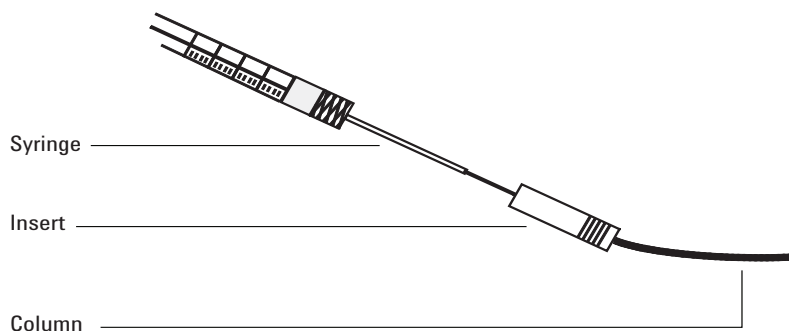
WARNING

Be careful! The oven and/or inlet may be hot enough to cause burns. If either is hot, wear heat-resistant gloves to protect your hands.

WARNING

Wear safety glasses to protect your eyes from flying particles while handling, cutting, or installing glass or fused silica capillary columns. Use care in handling these columns to prevent puncture wounds.

- 3 Check that the needle is the correct size for the desired column id. If needed, replaced the needle with one of the correct size. See **“Consumables and Parts for the Cool On-Column Inlet”** on page 86, and **“To Replace a Needle in a Syringe”** on page 101 or **“To Replace the Fused Silica Needle in a Syringe for the COC Inlet”** on page 102.
- 4 Identify the correct insert for the column size. See **“Consumables and Parts for the Cool On-Column Inlet”** on page 86. Use the insert that is the same size as the syringe needle to verify that the column you plan to use is the correct size.
- 5 Make a clean cut on the end of the column. See **“To Install a Capillary Column with the Cool On-Column Inlet”** on page 90.
- 6 Insert the column into one end of the insert.



- 7 Insert the syringe needle through the other end of the insert and into the column. The needle should visibly enter the column without any obstruction. If the needle cannot pass easily into the column, reverse the insert to try the needle and column in the other end.
- 8 Exit maintenance mode. Select **Maintenance > Instrument > Perform Maintenance > Maintenance Mode > Finished**.

To Change a Septum on the COC Inlet

- 1 Gather the following:
 - Replacement septum, see “**Consumables and Parts for the Cool On-Column Inlet**” on page 86.
 - Tweezers
 - A thin wire (0.2-inch diameter) for removing septum from inlet
 - Lint-free gloves
- 2 Launch the GC maintenance wizard: **Maintenance > Inlets**, select the inlet, then select **Perform Maintenance > Replace Septum > Start Maintenance**. The wizard will guide you through the maintenance steps described below.

WARNING

Be careful! The oven and/or inlet may be hot enough to cause burns. If either is hot, wear heat-resistant gloves to protect your hands.

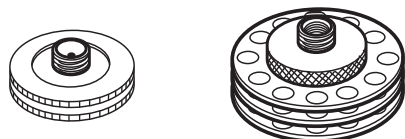
CAUTION

Wear clean, lint-free gloves to prevent contamination of parts with dirt and skin oils.

- 3 Replace the septum.
 - If you are using a septum nut, grasp the knurling and unscrew. Remove the old septum with tweezers.
 - Use tweezers to install a new septum. Push the septum into the septum nut until properly seated. Firmly tighten the nut.

For 250/320- μm
automated injections

For 530- μm automated
injections

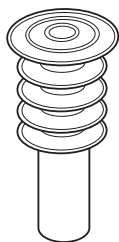


- If you are using a cooling tower, grasp the three rings and unscrew. The spring and duckbill septum may pop out of the inlet when you remove the cooling tower. Be careful not to lose them. If they do not pop out, use a thin wire to remove them from the inlet. Insert the replacement duckbill septum into the spring and place in the inlet. Reattach the cooling tower assembly, then finger-tighten.

7 Maintaining the COC Inlet

To Change a Septum on the COC Inlet

For manual 200- μm injections with fused silica needle



- 4 Before making an injection, check the alignment of the entire assembly using the proper size syringe.
- 5 The GC maintenance wizard will perform checks at the appropriate times, including **Leak & Restriction** tests, and will automatically reset the maintenance counters.
- 6 Select **Finished**, then select **OK** to exit the GC maintenance wizard.
- 7 Restore the analytical method.

To Install an Insert on the COC Inlet

- 1 Gather the following:
 - Lint-free gloves
 - Replacement insert, see **“Consumables and Parts for the Cool On-Column Inlet”** on page 86.
- 2 Place GC in maintenance mode: **Maintenance > Instrument > Perform Maintenance > Maintenance Mode > Start Maintenance**. Wait for the GC to become ready.

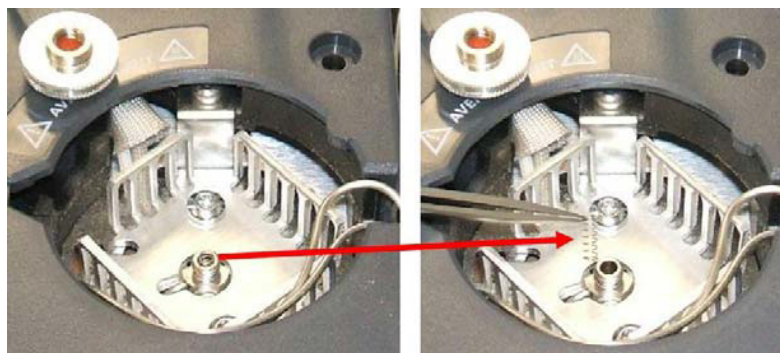
WARNING

Be careful! The oven and/or inlet may be hot enough to cause burns. If either is hot, wear heat-resistant gloves to protect your hands.

CAUTION

Wear clean, lint-free gloves to prevent contamination of parts with dirt and skin oils.

- 3 Remove the column from the inlet.
- 4 Locate the septum nut or cooling tower assembly at the top of the inlet and remove it. If the septum remains in the septum nut, do not remove it unless you want to change it. If necessary, replace the existing septum or duckbill with a new one. See **“To Change a Septum on the COC Inlet”** on page 94.
- 5 Remove the spring from the inlet with an extraction wire (or tweezers) and set it aside. Be careful not to lose or damage it because you will use the spring to keep the new insert in position.



- 6 Remove the existing insert from the inlet by gently pushing it out from below with a wire or piece of column. Store the insert for possible later use.

7 Maintaining the COC Inlet

To Install an Insert on the COC Inlet



- 7 Check that the insert is the correct size for both the needle and column. See **“To Check the Needle-to-Column Size on the COC Inlet”** on page 93.
- 8 Lower the new insert straight into the inlet from the top. The insert can be installed either end up.
- 9 Install the spring on top of the insert.
- 10 Install the septum and septum nut or duckbill septum and cooling tower assembly and finger-tighten.

NOTE

Execute the column installation procedure manually. Do not use the automated column installation wizard.

- 11 Install the column. See **“To Install a Capillary Column with the Cool On-Column Inlet”** on page 90.
- 12 Exit maintenance mode. Select **Maintenance > Instrument > Perform Maintenance > Maintenance Mode > Finished.**

To Clean the COC Inlet

- 1 Gather the following:
 - 1/4-inch and 5/16-inch wrenches
 - Cleansing bath
 - Aqueous detergent
 - Distilled water
 - Methanol
 - Compressed, filtered, dry air or nitrogen
 - Lint-free gloves
- 2 Manually set the inlet and oven temperature to $< 40\text{ }^{\circ}\text{C}$, and wait for the inlet, oven, and other parts you might come into contact with inside the oven, to cool before continuing. Alternately, place the GC in maintenance mode: **Maintenance > Instrument > Perform Maintenance > Maintenance Mode > Start Maintenance.**

WARNING

Be careful! The oven and/or inlet may be hot enough to cause burns. If either is hot, wear heat-resistant gloves to protect your hands.

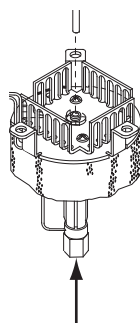
WARNING

Wear safety glasses to protect your eyes from flying particles while handling, cutting, or installing glass or fused silica capillary columns. Use care in handling these columns to prevent puncture wounds.

CAUTION

Wear clean, lint-free gloves to prevent contamination of parts with dirt and skin oils.

- 3 Remove the column.
- 4 Remove the septum nut or cooling tower and then remove the septum.
- 5 Remove the existing insert from the inlet by gently pushing it out from below with a wire or piece of column. Store the insert for possible later use.



- 6 Fill an ultrasonic cleansing bath with aqueous detergent and place the spring and insert into it. Sonicate for 1 minute.
- 7 Drain the aqueous detergent and fill the bath with distilled water. Sonicate for 1 minute.

7 Maintaining the COC Inlet

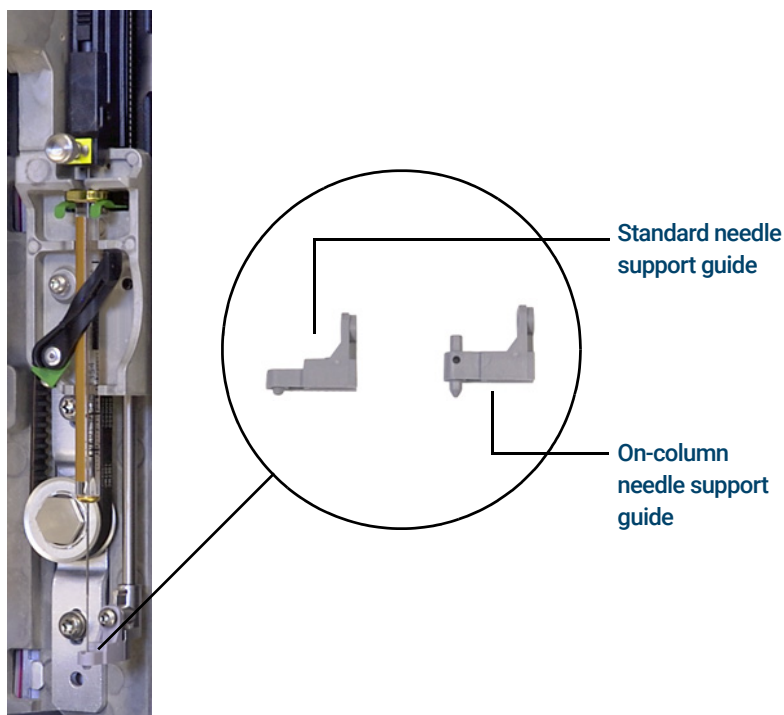
To Clean the COC Inlet

- 8 Remove the spring and insert from the bath and rinse thoroughly with water and methanol.
- 9 Dry the spring and insert with compressed air or nitrogen.
- 10 Install the insert. See **"To Install an Insert on the COC Inlet"** on page 96.
- 11 Install the column. See **"To Install a Capillary Column with the Cool On-Column Inlet"** on page 90.
- 12 Exit maintenance mode. Select **Maintenance > Instrument > Perform Maintenance > Maintenance Mode > Finished.**

To Replace the 7693A Injector Needle Support Guide

Before using a 7693A ALS to make injections onto the COC inlet, install the on-column needle support guide.

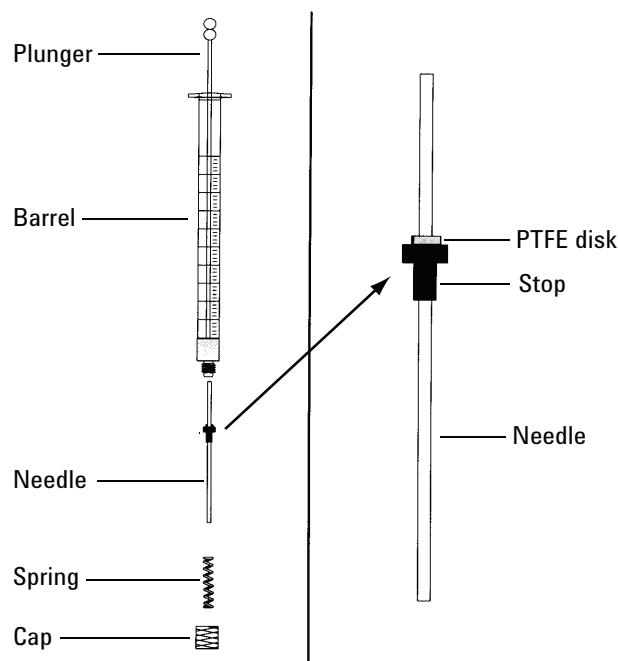
Refer to the 7693A ALS documentation for complete details.



- 1 Open the injector door.
- 2 Remove the syringe.
- 3 Slide the syringe carriage up to the top position.
- 4 Completely remove the T-10 Torx screw from the support foot. Be careful to not let the screw fall into the turret assembly.
- 5 Slide off the support foot.
- 6 Slide on the new support foot.
- 7 Replace the T-10 Torx screw and tighten.
- 8 Install the appropriate syringe.
- 9 Close the injector door.
- 10 Align the injector.

To Replace a Needle in a Syringe

- 1 Gather the following, see **Table 14**, "Recommended parts for injections onto 0.25-mm fused silica columns," on page 87:
 - Syringe barrel
 - Needle, 250- μm or 320- μm
- 2 Unscrew the syringe barrel cap and remove the spring.
- 3 Make sure that the needle has the PTFE disk as shown below. If the syringe barrel does not have the PTFE disk, use the instructions in the syringe box to wrap the needle.



- 4 Check the new needle for a small wire inserted for shipment. Remove the wire if present.
- 5 Slide the spring and the cap over the needle.
- 6 Insert the needle into the syringe barrel.
- 7 Screw the cap back on the syringe barrel.

To Replace the Fused Silica Needle in a Syringe for the COC Inlet

NOTE

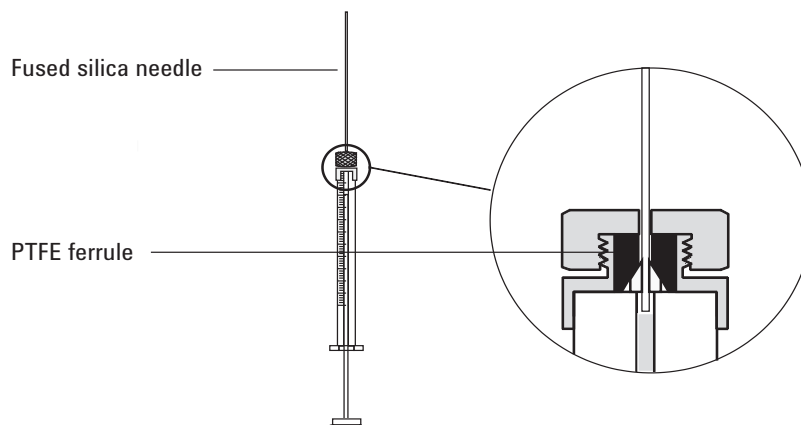
The fused silica needle and syringe are only used with the cooling tower and duckbill septum for manual, on-column injections onto 200- μm columns.

- Gather the following:
 - New fused silica syringe needle, see “Consumables and Parts for the Cool On-Column Inlet” on page 86.
 - Solvent

WARNING

Wear safety glasses to protect your eyes from flying particles while handling, cutting, or installing glass or fused silica capillary columns. Use care in handling these columns to prevent puncture wounds.

- Loosen the retaining nut and remove the old needle.
- Hold the syringe vertically and insert the new fused silica needle so it is visible inside the syringe barrel. If the needle cannot be inserted into the syringe barrel, the PTFE ferrule may be blocked. You may need to replace the ferrule.
- Push the plunger down until it bottoms. The needle will be flush with the plunger end.



- Finger-tighten the retaining nut. Pull the needle gently to be sure the PTFE ferrule has formed a tight seal with the needle. Tighten the retaining nut further, if necessary.
- Loosen the retaining nut just enough so the needle is again free.
- Depress the syringe plunger slowly until it pushes the needle to the end of the barrel, then finger-tighten the retaining nut.
- Use a solvent to rinse the syringe and check for leaks or blocks. Leaks may be fixed by further tightening the retaining nut. Blocks or serious leaks require repeating this procedure.

To Bakeout Contaminants from the COC Inlet

- 1 Set the column flow to the normal operating value, or set the capillary column gas velocity to 30 cm/s.
- 2 Purge the column with carrier flow for at least 10 minutes before heating the oven.
- 3 Set the inlet mode to **Oven Track**.
- 4 If the column is attached to the detector, set the detector 25 °C above normal operating temperature.

If the column is not attached to the detector, cap the detector fitting.

WARNING

Be careful! The oven, inlet, and/or detector may be hot enough to cause burns. If they are hot, wear heat-resistant gloves to protect your hands.

- 5 Set the column oven 25 °C above the GC method final oven temperature to bake contaminants out of the inlet. Do not exceed the column manufacturer's maximum temperature limit.
- 6 Bakeout for 30 minutes or until the detector baseline is free of contamination peaks.

7 Maintaining the COC Inlet
To Bakeout Contaminants from the COC Inlet

Maintaining the FID

Consumables and Parts for the FID	106
Exploded Parts Views of the Flame Ionization Detector	108
To Install a Capillary Column in the FID	110
To Replace an FID Jet	113
To Perform Maintenance on the FID Collector Assembly	116
To Check the FID Leakage Current	124
To Check the FID Baseline	125
To Install the Optional FID PTFE Chimney Insert	126
To Bakeout the FID	127

Consumables and Parts for the FID

See the Agilent catalog for consumables and supplies for a more complete listing, or visit the Agilent Web site for the latest information (www.agilent.com).

Table 18 Nuts, ferrules, and hardware for capillary columns

Column id (mm)	Description	Typical use	Part number/quantity
.530	Ferrule, Vespel/graphite, 0.8-mm id	0.45-mm and 0.53-mm capillary columns	5062-3512 (10/pk)
	Ferrule, graphite, 1.0-mm id	0.53-mm capillary columns	5080-8773 (10/pk)
	Ferrule, graphite, 0.8-mm id	0.53-mm capillary columns	500-2118 (10/pk)
	Column nut, finger-tight (for 0.53-mm columns)	Connect column to inlet or detector	5020-8293
.320	Ferrule, Vespel/graphite, 0.5-mm id	0.32-mm capillary columns	5062-3514 (10/pk)
	Ferrule, graphite, 0.5-mm id	0.1-mm, 0.2-mm, 0.25-mm, and 0.32-mm capillary columns	5080-8853 (10/pk)
	Column nut, finger-tight (for .100- to .320-mm columns)	Connect column to inlet or detector	5020-8292
.250	Ferrule, Vespel/graphite, 0.4-mm id	0.1-mm, 0.2-mm, and 0.25-mm capillary columns	5181-3323 (10/pk)
	Ferrule, graphite, 0.5-mm id	0.1-mm, 0.2-mm, 0.25-mm, and 0.32-mm capillary columns	5080-8853 (10/pk)
	Column nut, finger-tight (for .100- to .320-mm columns)	Connect column to inlet or detector	5020-8292
.100 and .200	Ferrule, Vespel/graphite, 0.37-mm id	0.1-mm and 0.2-mm capillary columns	5062-3516 (10/pk)
	Ferrule, Vespel/graphite, 0.4-mm id	0.1-mm, 0.2-mm, and 0.25-mm capillary columns	5181-3323 (10/pk)
	Ferrule, graphite, 0.5-mm id	0.1-mm, 0.2-mm, 0.25-mm, and 0.32-mm capillary columns	5080-8853 (10/pk)
	Ferrule, graphite, 0.4-mm id		500-2114 (10/pk)
	Column nut, finger-tight (for .100- to .320-mm columns)	Connect column to inlet or detector	5020-8292
All	Ferrule, no-hole	Testing	5181-3308 (10/pk)
	Capillary column blanking nut	Testing—use with any ferrule	5020-8294
	Column nut, universal	Connect column to inlet or detector	5181-8830 (2/pk)
	Column nut, collared, self-tightening	Connect column to inlet or detector	G3440-81011
	Collar for self-tightening nut	Connect column to inlet or detector	G3440-81012
	Column nut, collared, self-tightening MSD	Connect column to inlet or detector	G3440-81013
	Column cutter, ceramic wafer	Cutting capillary columns	5181-8836 (4/pk)
	Pencil, diamond tipped	Cutting capillary columns	420-1000
	Ferrule tool kit	Ferrule installation	440-1000

8 Maintaining the FID

Consumables and Parts for the FID

Table 19 FID parts and subassemblies

Description	Part number/quantity
Screw, M4 × 25 mm, Torx, T20	0515-2712 (3/pk)
PTFE chimney (optional)	19231-21050
Collector assembly	G4591-60691
1/8-inch packed column adapter	G3450-20342
Jet, FID, 0.011-inch id	G4591-20320
Jet, FID, universal fit, 0.011 inch id	5200-0176
Jet, FID, universal fit, 0.018 inch id	5200-0177
Jet, FID, universal fit, 0.030 inch id	5200-0178

Table 20 FID collector assembly parts

Description	Part number/quantity
Screw, M4 × 25 mm, Torx, T20	0515-2712 (3/pk)
Collector assembly	G4591-60691
Collector nut	19231-20940
Spring washer	3050-1246
Ignitor castle	19231-20910
Ignitor castle, Hastelloy	19231-21060
Upper/lower collector insulator	G1531-20700
Collector body	G1531-20690
Collector body, Hastelloy	G1531-21090
Spanner nut, base	19231-20990
Collector mount	G4591-20690
Collector housing	19231-21010
Gasket	5180-4165 (12/pk)
Ignitor (glow plug) assembly with O-ring	19231-60680

Exploded Parts Views of the Flame Ionization Detector

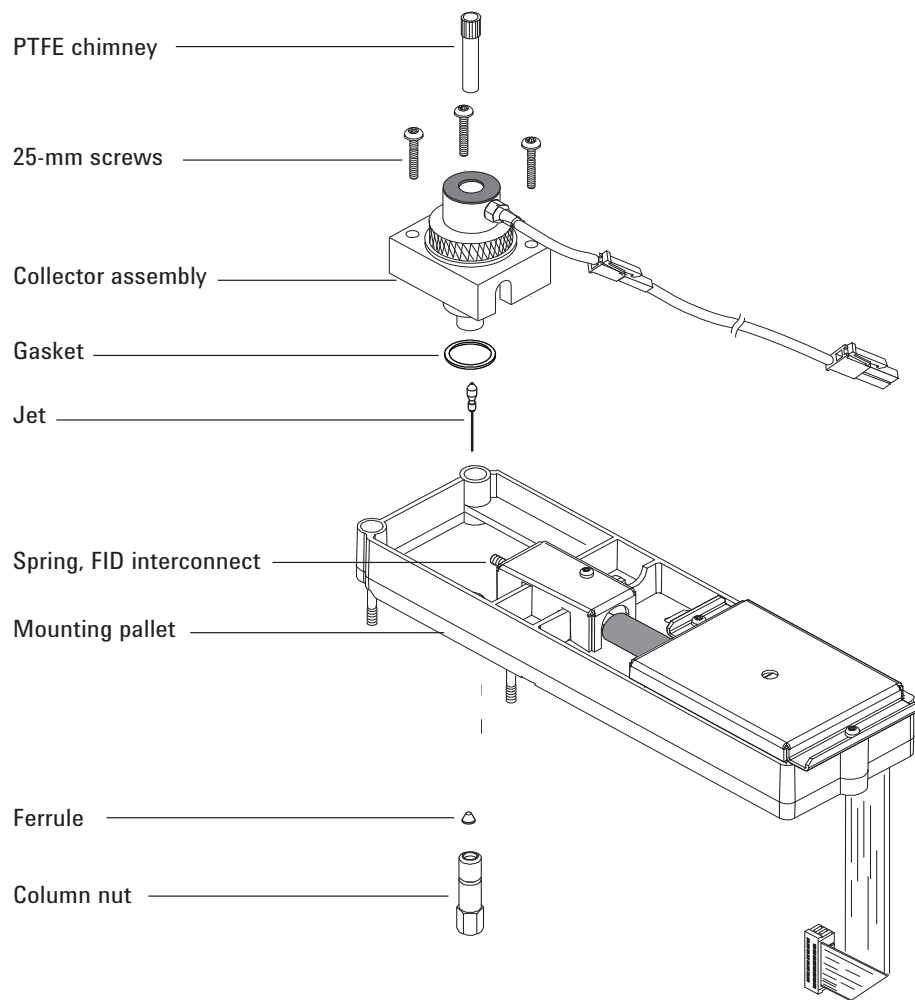


Figure 11. Flame ionization detector (FID) assembly exploded parts

8 Maintaining the FID
 Exploded Parts Views of the Flame Ionization Detector

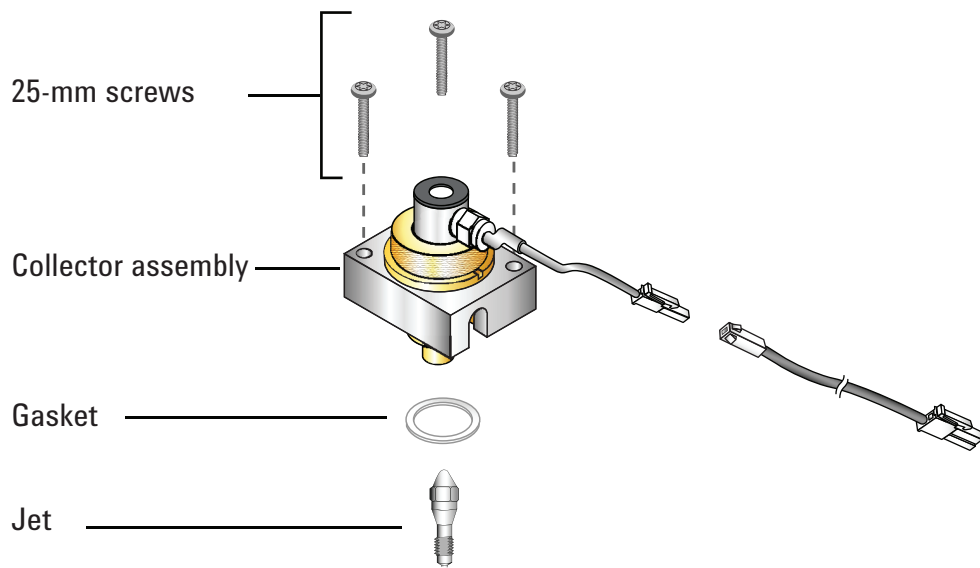


Figure 12. FID exploded parts view

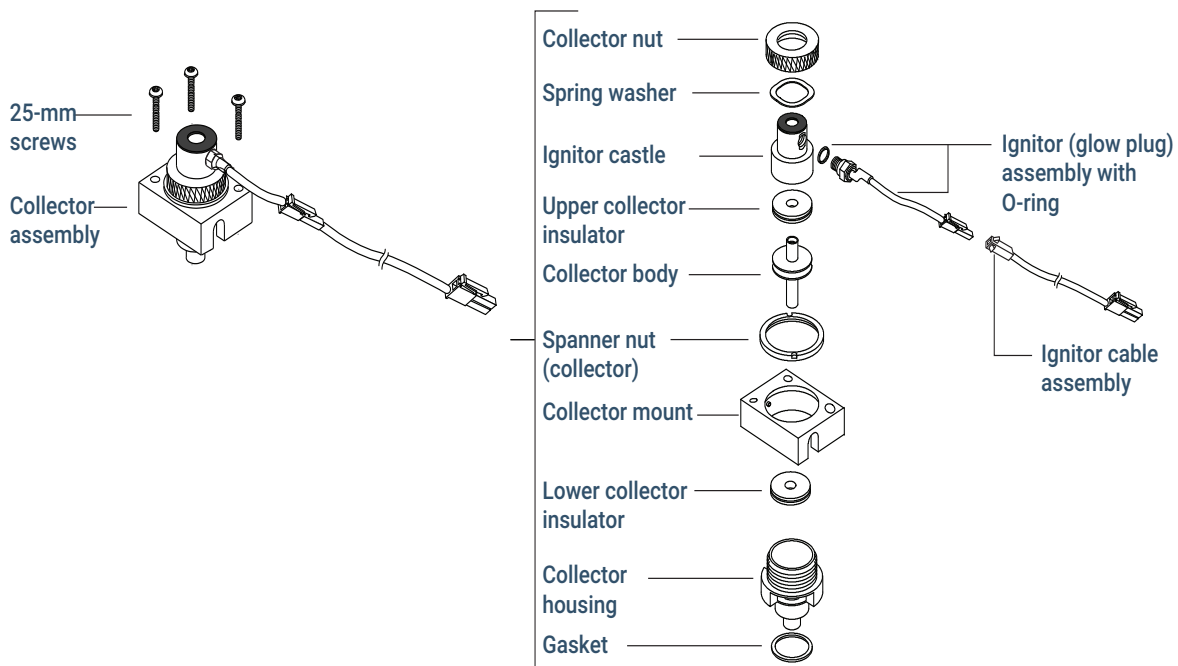


Figure 13. FID collector assembly exploded parts view

To Install a Capillary Column in the FID

- 1 Gather the following materials, see “**Consumables and Parts for the FID**” on page 106:
 - Column
 - Ferrule(s)
 - Column nut
 - Column cutter
 - 1/4-inch open-end wrench
 - Septum
 - Isopropanol
 - Lab tissue
 - Lint-free gloves
- 2 Launch the GC maintenance wizard: **Maintenance > Column > Perform Maintenance > Install Column > Start Maintenance**. Wait for the GC to become ready.
The wizard will guide you through the maintenance steps described below.

WARNING

Be careful! The oven, inlet, and/or detector may be hot enough to cause burns. If the oven, inlet, or detector is hot, wear heat-resistant gloves to protect your hands.

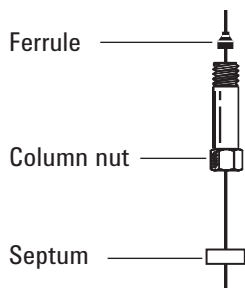
WARNING

Wear safety glasses to protect your eyes from flying particles while handling, cutting, or installing glass or fused silica capillary columns. Use care in handling these columns to prevent puncture wounds.

CAUTION

Wear clean, lint-free gloves to prevent contamination of parts with dirt and skin oils.

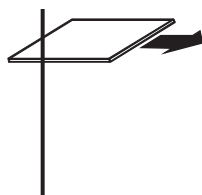
- 3 Place a septum (if the column id is ≤ 0.1 mm), capillary column nut, and ferrule on the column.



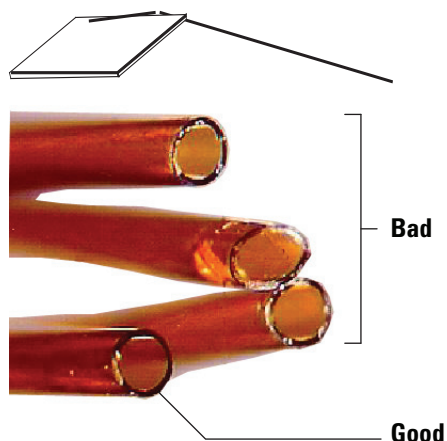
- 4 Score the column using a glass scribing tool. The score must be square to ensure a clean break.

8 Maintaining the FID

To Install a Capillary Column in the FID



- 5 Break off the column end by supporting it against the column cutter opposite the scribe. Inspect the end with a magnifying loupe to make certain there are no burrs or jagged edges.

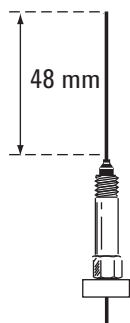


- 6 Wipe the column walls with a tissue dampened with isopropanol to remove fingerprints and dust.
- 7 Install the capillary column.
 - a Gently insert the column into the detector until it bottoms; do not attempt to force it further.
 - b Finger-tighten the column nut, then withdraw the column about 2 mm. Tighten the nut an additional 1/4 turn with a wrench.

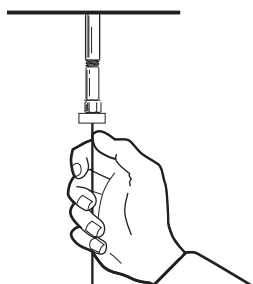
8 Maintaining the FID

To Install a Capillary Column in the FID

If the column id is 0.1 mm or less position the column so it extends above the ferrule by 48 mm. Slide the septum up to hold the column nut and ferrule at this fixed position.



- c Insert the column into the detector. Slide the nut and ferrule up the column to the detector base. Finger-tighten the column nut until it grips the column.
- d Adjust the column (*not* the septum) position so that the septum is even with the bottom of the column nut. Tighten the nut an additional 1/4 turn with a wrench.



- 8 The GC maintenance wizard will perform checks at the appropriate times, including **Leak & Restriction** tests, and will automatically reset the maintenance counters.
- 9 Select **Finished**, then select **OK** to exit the GC maintenance wizard.

To Replace an FID Jet

- 1 Gather the following:
 - Replacement jet
 - T-20 Torx screwdriver
 - 1/4-inch nut driver
 - Tweezers
 - Compressed, filtered, dry air or nitrogen
 - Solvent that will clean the type of deposits in your detector
 - Clean cloth
 - Cotton swab
 - Lint-free gloves
- 2 Launch the GC maintenance wizard: **Maintenance > Detectors**, select the detector, then select **Perform Maintenance > Replace FID Jet > Start Maintenance**. The wizard will guide you through the maintenance steps described below.

WARNING

Be careful! The oven and/or detector may be hot enough to cause burns. If the detector is hot, wear gloves to protect your hands.

WARNING

Wear safety glasses to protect your eyes from flying particles while handling, cutting, or installing glass or fused silica capillary columns. Use care in handling these columns to prevent puncture wounds.

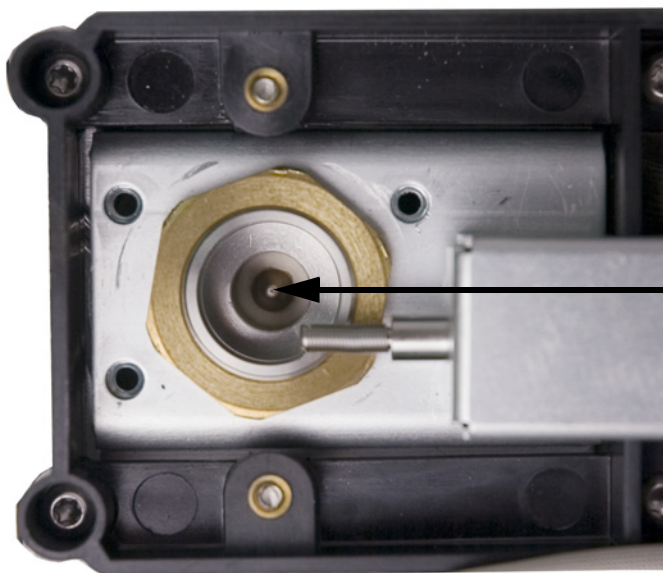
- 3 Remove the detector cover.
- 4 If installed, remove the capillary column from the detector.

CAUTION

Wear clean, lint-free gloves to prevent contamination of parts with dirt and skin oils.

- 5 Remove the FID castle assembly and place it on a clean cloth.
- 6 Locate the jet inside the housing.

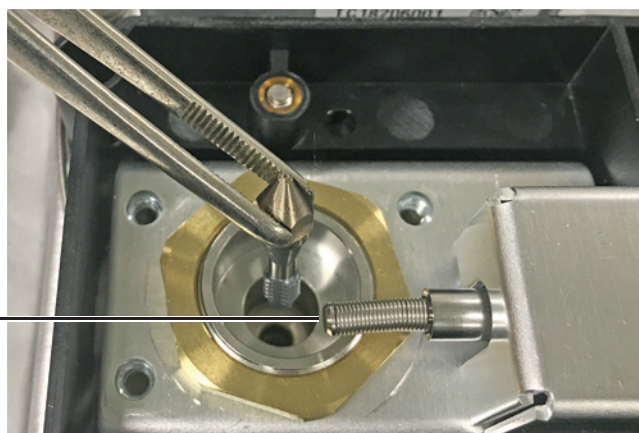
8 Maintaining the FID
To Replace an FID Jet



CAUTION

Handle the clean or new jet only with tweezers, or wear gloves.

- 7 Loosen the jet, then lift it out of the housing with tweezers.



Interconnector
spring

- 8 Clean the detector base cavity using solvent, a swab, and compressed air or nitrogen.
- 9 Use tweezers to lower the new jet into the housing.

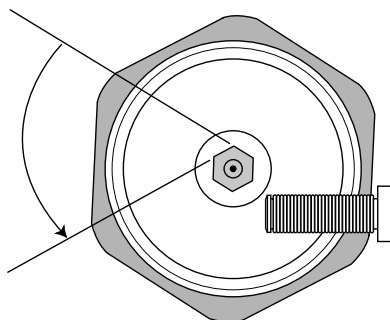
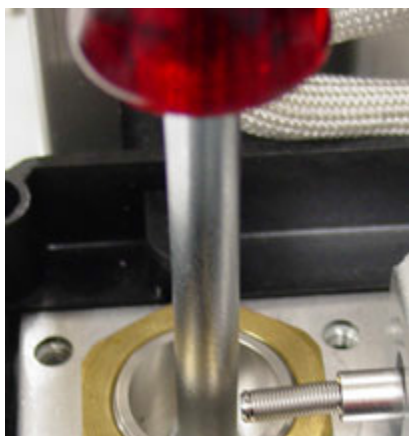
CAUTION

Do not overtighten the jet! Overtightening may permanently deform and damage the jet, the detector base, or both. The torque specification is 10 inch-pounds.

- 10 Carefully screw the jet into the housing. Tighten 1/6-turn past finger-tight (1/6-turn is one "flat" on a typical screwdriver handle, or the jet head).

8 Maintaining the FID

To Replace an FID Jet



- 11 Install the castle assembly.
- 12 The GC maintenance wizard will perform checks at the appropriate times, including **Leak & Restriction** tests, and will automatically reset the maintenance counters.
- 13 Select **Finished**, then select **OK** to exit the GC maintenance wizard.
- 14 Attach the capillary column to the detector.
 - a Install the column in the detector. See **"To Install a Capillary Column in the FID"** on page 110.
 - b After the column is installed at both inlet and detector, establish a flow of carrier gas and purge as recommended by the column manufacturer.
 - c Check the FID leakage current. See **"To Check the FID Leakage Current"** on page 124.
 - d Bakeout the detector. See **"To Bakeout the FID"** on page 127.
 - e Restore the analytical method.

WARNING

Be careful! The oven, inlet, and/or detector may be hot enough to cause burns. If the oven, inlet, or detector is hot, wear heat-resistant gloves to protect your hands.

- f Allow the oven, inlet, and detector to equilibrate at operating temperature, then retighten the fittings.
- 15 Check the FID baseline. See **"To Check the FID Baseline"** on page 125.

To Perform Maintenance on the FID Collector Assembly

NOTE

Perform only the steps and gather only the parts that apply to the desired maintenance task(s).

- 1 Gather the following:
 - Replacement ignitor assembly, see “Consumables and Parts for the FID” on page 106.
 - Replacement ignitor castle
 - Two collector insulators
 - Collector
 - Spring washer
 - Gasket
 - T-20 Torx screwdriver
 - 1/4-inch nut driver
 - Tweezers
 - 5/16-inch wrench
 - Lint-free gloves
 - Clean cloth

CAUTION

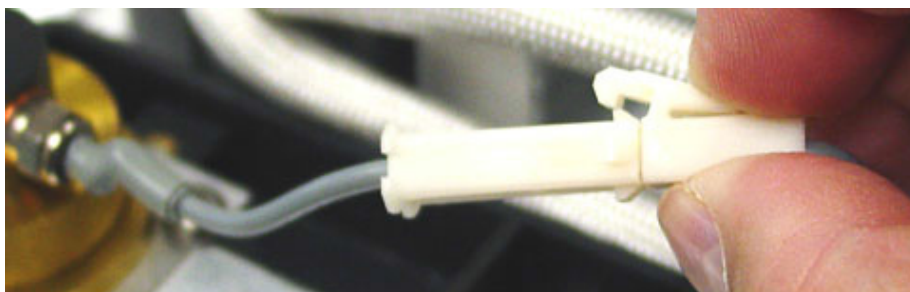
To avoid contaminating the FID, wear clean, lint-free gloves when handling the collector assembly.

- 2 Launch the GC maintenance wizard: **Maintenance > Detectors**, select the detector, then select **Perform Maintenance > Maintain FID Collector > Start Maintenance**. The wizard will guide you through the maintenance steps described below.

WARNING

Be careful! The oven and/or detector may be hot enough to cause burns. If the detector is hot, wear gloves to protect your hands.

- 3 Remove the FID ignitor. If you are not replacing the ignitor, skip to **step 5**.
 - a Disconnect the ignitor cable assembly.



8 Maintaining the FID

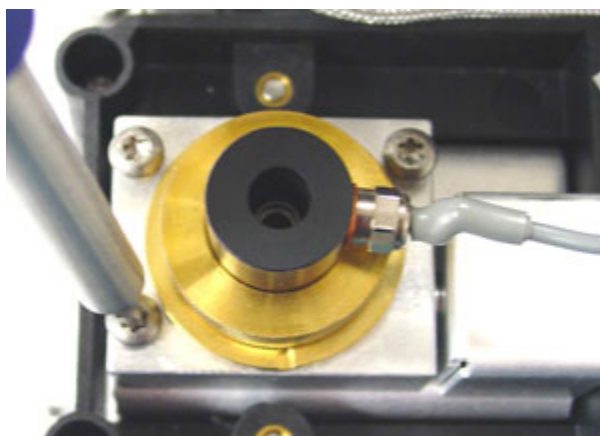
To Perform Maintenance on the FID Collector Assembly

- b** Loosen the ignitor with a wrench.



- c** Turn the nut counterclockwise by hand. Remove the ignitor and copper washer.

- 4** If replacing only the FID ignitor assembly with copper washer, skip to **step 16** for assembly.
5 Remove the three screws that secure the collector assembly to the FID mounting pallet.



CAUTION

This step exposes the interconnect spring. Be careful not to touch or disfigure the spring while working on the FID. Any dirt or bending will reduce the sensitivity of your detector.

- 6** Remove the collector assembly. Place it on a clean cloth for additional disassembly.

8 Maintaining the FID

To Perform Maintenance on the FID Collector Assembly



- 7 Remove the gasket from the bottom of the assembly, if necessary.
- 8 Remove the FID ignitor castle.
 - a Loosen the collector nut.
 - b Remove the collector nut and the spring washer.



- c Lift the castle out of the collector housing. When removing the castle, some of the collector parts may be attached. Set these on a clean cloth to protect from scratches or dirt.



- 9 If only replacing the FID castle, skip to **step 15** for reassembly.

8 Maintaining the FID

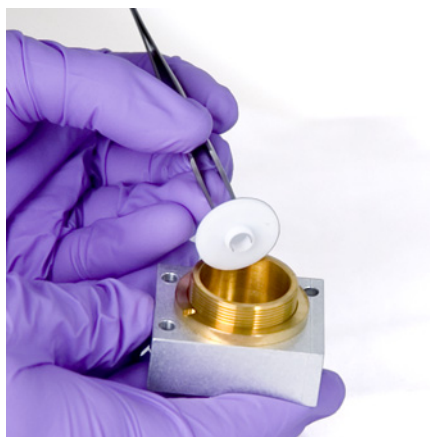
To Perform Maintenance on the FID Collector Assembly

10 Remove the collector and insulators.

- a** If needed, remove the collector and upper insulator from the FID housing. The lower insulator may come out with the collector, but often remains in the FID housing. Place the parts on a clean cloth.



- b** Remove the lower insulator with tweezers and place the parts on a clean cloth.



11 Remove the collector housing from the mount, if necessary.

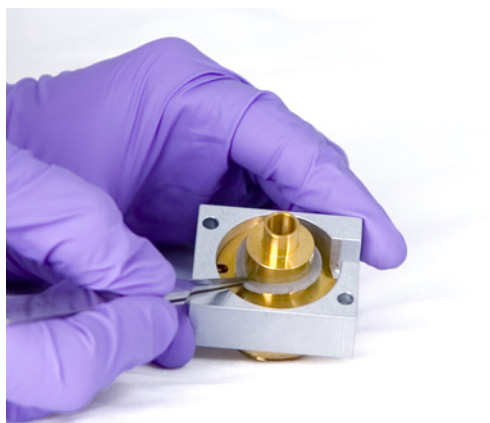
12 Use tweezers to remove the gasket from the bottom of the housing.

The collector assembly is now completely disassembled. Reassemble as follows:

13 Use tweezers to install a new gasket onto the housing, being sure that it lays flat on the brass surface.

8 Maintaining the FID

To Perform Maintenance on the FID Collector Assembly

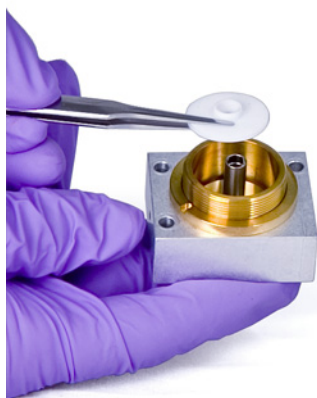


14 Install the collector insulators.

- a** Insert one of the insulators into the base of the housing. Seat the insulator with the flat surface facing out of the housing.
- b** Insert the long end of collector into the housing and lower insulator.



- c** Insert the other insulator onto the top of the collector, with the flat surface facing towards the housing.



15 Install the FID ignitor castle.

- a** Orient the castle so that the threaded hole for the ignitor faces toward the electronics.

8 Maintaining the FID

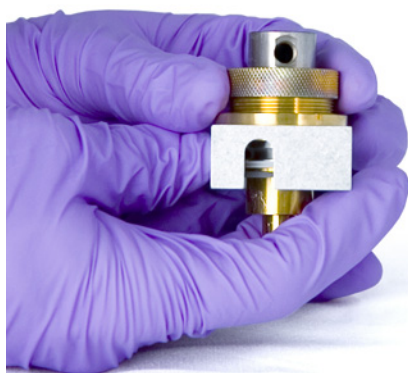
To Perform Maintenance on the FID Collector Assembly



- b** Insert the FID castle into the collector housing.
- c** Install the spring washer over the castle.



- d** Install the collector nut over the castle and tighten firmly. The seal should be airtight. Maintain the orientation of the ignitor hole with the base as shown below.



16 Install the FID ignitor.

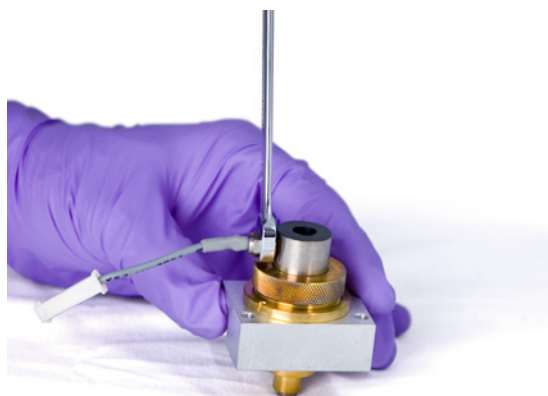
- a** Insert the ignitor and copper seal into the threaded hole of the castle. Keep the mating threads clean.

8 Maintaining the FID

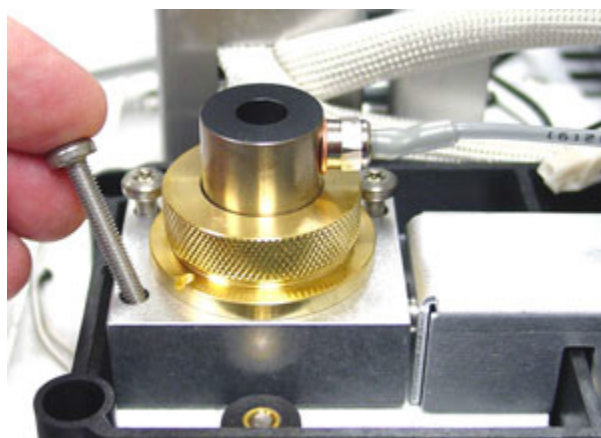
To Perform Maintenance on the FID Collector Assembly



- b** Tighten the ignitor with a wrench. Ignition requires a good electrical contact that is free of any dirt.



- 17** Lower the collector assembly into the housing.
18 Insert the three screws and tighten (to 18-inch-pounds).



- 19** Connect the ignitor extension cable.
20 Verify assembly:
a Check the FID leakage current. See **"To Check the FID Leakage Current"** on page 124.

8 Maintaining the FID

To Perform Maintenance on the FID Collector Assembly

- b** Bakeout the detector. See **"To Bakeout the FID"** on page 127.
- c** Check the FID baseline. See **"To Check the FID Baseline"** on page 125.
- 21** The GC maintenance wizard will perform checks at the appropriate times, including **Leak & Restriction** tests, and will automatically reset the maintenance counters.
- 22** Select **Finished**, then select **OK** to exit the GC maintenance wizard.

To Check the FID Leakage Current

- 1 Load the analytical method.
 - Make sure flows are acceptable for ignition.
 - Heat the detector to operating temperature or 300 °C.
- 2 Perform a Leakage Current Test: **Diagnostics > Diagnostics Tests > select Leakage Current Test** for the detector. Read the **Test Details** screen then press **Start Test**.
- 3 Turn off the FID flame.
- 4 Show the detector output signal in **Status**. Go to **Home > Status listing > +Add**. Select the detector's output from the drop-down list, then touch **Add**.
- 5 Verify that the output is stable and < 1.0 pA.
If the output is unstable or > 1.0 pA, turn off the GC and check for proper assembly of the upper FID parts and contamination. If this contamination is confined to the detector, bakeout the FID. See "**To Bakeout the FID**" on page 127.
- 6 Turn on the flame.

To Check the FID Baseline

- 1 With the column installed, load your checkout method.
- 2 Set the oven temperature to 35 °C.
- 3 Show the detector output signal in **Status**. Go to **Home > Status listing > +Add**. Select the detector's output from the drop-down list, then touch **Add**.
- 4 When the flame is lit and the GC is ready, verify that the output is stable and < 20 pA.

If the output is not stable or > 20 pA, the system or gas may be contaminated. If this contamination is isolated to the detector, then bakeout the FID. See **"To Bakeout the FID"** on page 127.

8 Maintaining the FID

To Install the Optional FID PTFE Chimney Insert

To Install the Optional FID PTFE Chimney Insert

WARNING

Be careful! The detector may be hot enough to cause burns. If the detector is hot, wear heat-resistant gloves to protect your hands.

- 1 Light the FID flame.
- 2 Insert the PTFE chimney into the FID castle.

NOTE

When installed, the PTFE chimney insert prevents ignition.

To Bakeout the FID

- 1 Bakeout the FID with the column installed or uninstalled. If uninstalled, gather the following, see **“Consumables and Parts for the FID”** on page 106:
 - Capillary adapter (adaptable FID only)
 - Column nut
 - No-hole ferrule

WARNING

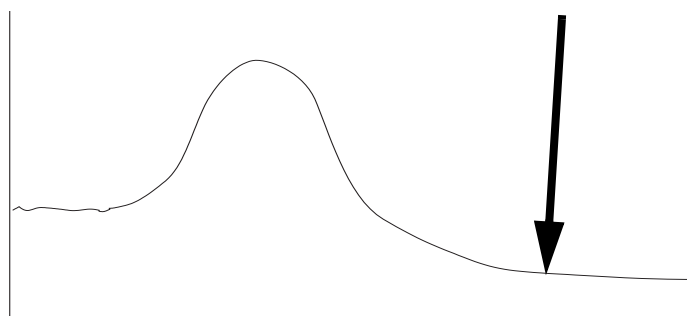
Be careful! The detector may be hot enough to cause burns. If the detector is hot, wear heat-resistant gloves to protect your hands.

- 2 If the column is uninstalled:
 - a Cool the GC oven and detector
 - b Plug the detector connection with the capillary adapter, column nut, and no-hole ferrule

WARNING

If using hydrogen as a carrier gas, turn off the hydrogen supply and cap the end of the column to prevent an oven explosion.

- 3 Maintain inert carrier gas flow through the column, or remove the column from the GC.
- 4 Set the detector temperature at 350 to 375 °C.
- 5 Set normal operating flows.
- 6 Light the FID flame.
- 7 Set the oven temperature to 250 °C or 25 °C above the normal maximum operating temperature. Do not exceed the column’s temperature limit.
- 8 Hold at temperature for 30 minutes or until the baseline settles at a lower value. The baseline will typically rise, then fall to a final value lower than the initial baseline.



- 9 Restore the analytical method and allow the FID to equilibrate.
- 10 Check the FID output value. It should be lower than the first reading. If it is not, contact your Agilent service representative.

Without a column installed, a clean system baseline should be < 20 pA.
- 11 If the column is not installed in the FID, install it. See **“To Install a Capillary Column in the FID”** on page 110.

8 Maintaining the FID
To Bakeout the FID

Maintaining the TCD

Consumables and Parts for the Thermal Conductivity Detector 130

To Install a Capillary Column in the TCD 132

To Bakeout Contaminants from the TCD 135

Consumables and Parts for the Thermal Conductivity Detector

See the Agilent catalog for consumables and supplies for a more complete listing, or visit the Agilent Web site for the latest information (www.agilent.com).

Standard TCD column hardware

Table 21 Nuts, ferrules, and hardware for capillary columns

Column id (mm)	Description	Typical use	Part number/quantity
.530	Ferrule, Vespel/graphite, 0.8-mm id	0.45-mm and 0.53-mm capillary columns	5062-3512 (10/pk)
	Ferrule, graphite, 1.0-mm id	0.53-mm capillary columns	5080-8773 (10/pk)
	Ferrule, graphite, 0.8-mm id	0.53-mm capillary columns	500-2118 (10/pk)
	Column nut, finger-tight (for 0.53-mm columns)	Connect column to inlet or detector	5020-8293
.320	Ferrule, Vespel/graphite, 0.5-mm id	0.32-mm capillary columns	5062-3514 (10/pk)
	Ferrule, graphite, 0.5-mm id	0.1-mm, 0.2-mm, 0.25-mm, and 0.32-mm capillary columns	5080-8853 (10/pk)
	Column nut, finger-tight (for .100- to .320-mm columns)	Connect column to inlet or detector	5020-8292
.250	Ferrule, Vespel/graphite, 0.4-mm id	0.1-mm, 0.2-mm, and 0.25-mm capillary columns	5181-3323 (10/pk)
	Ferrule, graphite, 0.5-mm id	0.1-mm, 0.2-mm, 0.25-mm, and 0.32-mm capillary columns	5080-8853 (10/pk)
	Column nut, finger-tight (for .100- to .320-mm columns)	Connect column to inlet or detector	5020-8292
.100 and .200	Ferrule, Vespel/graphite, 0.37-mm id	0.1-mm and 0.2-mm capillary columns	5062-3516 (10/pk)
	Ferrule, Vespel/graphite, 0.4-mm id	0.1-mm, 0.2-mm, and 0.25-mm capillary columns	5181-3323 (10/pk)
	Ferrule, graphite, 0.5-mm id	0.1-mm, 0.2-mm, 0.25-mm, and 0.32-mm capillary columns	5080-8853 (10/pk)
	Ferrule, graphite, 0.4-mm id		500-2114 (10/pk)
	Column nut, finger-tight (for .100- to .320-mm columns)	Connect column to inlet or detector	5020-8292
All	Ferrule, no-hole	Testing	5181-3308 (10/pk)
	Capillary column blanking nut	Testing—use with any ferrule	5020-8294
	Column nut, universal	Connect column to inlet or detector	5181-8830 (2/pk)
	Column nut, collared, self-tightening	Connect column to inlet or detector	G3440-81011
	Collar for self-tightening nut	Connect column to inlet or detector	G3440-81012

9 Maintaining the TCD

Standard TCD column hardware

Table 21 Nuts, ferrules, and hardware for capillary columns (continued)

Column id (mm)	Description	Typical use	Part number/quantity
	Column nut, collared, self-tightening MSD	Connect column to inlet or detector	G3440-81013
	Column cutter, ceramic wafer	Cutting capillary columns	5181-8836 (4/pk)
	Pencil, diamond tipped	Cutting capillary columns	420-1000
	Ferrule tool kit	Ferrule installation	440-1000

Table 22 Packed column adapters

Description	Part number/quantity
1/8-inch packed column adapter	G3450-20342

To Install a Capillary Column in the TCD

- 1 Gather the following materials, see “**Consumables and Parts for the Thermal Conductivity Detector**” on page 130:
 - Column
 - Ferrule(s)
 - Column nut
 - Column cutter
 - 1/4-inch open-end wrench
 - Septum
 - Isopropanol
 - Lab tissue
 - Lint-free gloves
- 2 Launch the GC maintenance wizard: **Maintenance > Column > Perform Maintenance > Install Column > Start Maintenance**. Wait for the GC to become ready. The wizard will guide you through the maintenance steps described below.

WARNING

Be careful! The oven, inlet, and/or detector may be hot enough to cause burns. If the oven, inlet, or detector is hot, wear heat-resistant gloves to protect your hands.

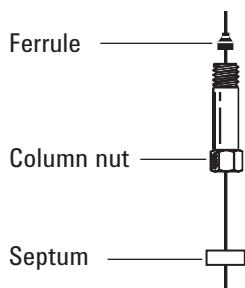
WARNING

Wear safety glasses to protect your eyes from flying particles while handling, cutting, or installing glass or fused silica capillary columns. Use care in handling these columns to prevent puncture wounds.

CAUTION

Wear clean, lint-free gloves to prevent contamination of parts with dirt and skin oils.

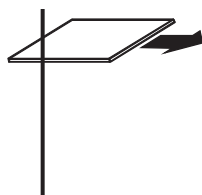
- 3 Place a septum (if the column id is ≤ 0.1 mm), capillary column nut, and ferrule on the column.



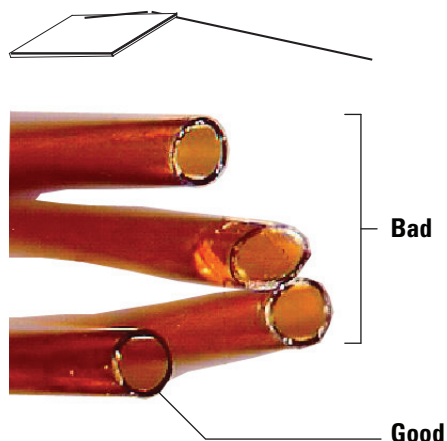
- 4 Score the column using a glass scribing tool. The score must be square to ensure a clean break.

9 Maintaining the TCD

To Install a Capillary Column in the TCD



- 5 Break off the column end by supporting it against the column cutter opposite the scribe. Inspect the end with a magnifying loupe to make certain there are no burrs or jagged edges.

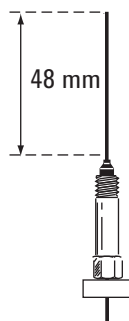


- 6 Wipe the column walls with a tissue dampened with isopropanol to remove fingerprints and dust.
- 7 Install the capillary column.
- If the column id is greater than 0.1 mm:
- Gently insert the column into the detector until it bottoms; do not attempt to force it further.
 - Finger-tighten the column nut, then withdraw the column about 2 mm. Tighten the nut an additional 1/4 turn with a wrench.

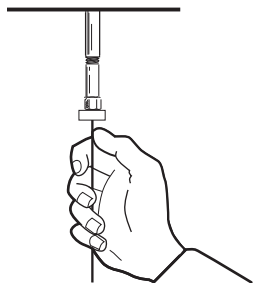
9 Maintaining the TCD

To Install a Capillary Column in the TCD

If the column id is 0.1 mm or less position the column so it extends above the ferrule by 48 mm (capillary optimized fitting). Slide the septum up to hold the column nut and ferrule at this fixed position.



- c Insert the column into the detector. Slide the nut and ferrule up the column to the detector base. Finger-tighten the column nut until it grips the column.
- d Adjust the column (*not* the septum) position so that the septum is even with the bottom of the column nut. Tighten the nut an additional 1/4 turn with a wrench.



- 8 The GC maintenance wizard will perform checks at the appropriate times, including **Leak & Restriction** tests, and will automatically reset the maintenance counters.
- 9 Select **Finished**, then select **OK** to exit the GC maintenance wizard.

To Bakeout Contaminants from the TCD

The bakeout can be performed with the column installed or the detector capped.

CAUTION

If the column is not installed, you must turn off the TCD filament and cap the detector column fitting to prevent irreparable damage to the filament caused by oxygen entering the detector.

- 1 If the column is not installed, cap the detector.

WARNING

Be careful! The detector may be hot enough to cause burns. If the detector is hot, wear heat-resistant gloves to protect your hands.

- 2 Turn off the TCD filament.
- 3 If the column is attached to the inlet, maintain inert carrier gas flow through the column.

WARNING

If using hydrogen as a carrier gas, turn off the hydrogen supply and cap the end of the column to prevent an oven explosion.

- 4 Set the reference gas flow rate between 20 and 30 mL/min.
- 5 Set the detector temperature to 375 °C.
- 6 Hold at 375 °C for several hours.
- 7 If the column is uninstalled, install it. See **"To Install a Capillary Column in the TCD"** on page 132.
- 8 Load the analytical method.

WARNING

Be careful! The oven or detector fittings may be hot enough to cause burns.

- 9 Allow the oven, inlet, and detector to equilibrate at operating temperature, then re-tighten the fittings.

9 Maintaining the TCD
To Bakeout Contaminants from the TCD

Maintaining EPC Modules

Consumables and Parts for the Aux EPC	138
Installing or Replacing Frits in the Aux EPC	140
Consumables and Parts for the PCM	142
Calibrating the PCM Interface	143
Installing or Replacing Frits in the PCM	144

This chapter describes the maintenance procedures for Auxiliary EPC (Aux) and Pneumatics Control Module (PCM). Pneumatic Switching Devices (PSD) do not have any required routine maintenance.

Consumables and Parts for the Aux EPC

See the Agilent catalog for consumables and supplies for a more complete listing, or visit the Agilent Web site for the latest information (www.agilent.com).

Table 23 Aux EPC consumables

Description	Part number
O-rings, package of 6	5181-3344
Blue dot frit, high flow resistance	G3430-80063
Red dot frit, medium flow resistance	G3430-80062
Brown dot frit, low flow resistance	G3430-80061
No frit (brass tube), zero flow resistance	G3430-20011


Table 24 Auxiliary channel frits

Frit marking		Flow resistance	Flow characteristic	Often used with
Three rings Blue		High	3.33 ± 0.3 SCCM @ 15 PSIG	NPD Hydrogen
Two rings Red		Medium	30 ± 1.5 SCCM H2 @ 15 PSIG	FID Hydrogen
One ring Brown		Low	400 ± 30 SCCM AIR @ 40 PSIG	FID Air, QuickSwap, Purged splitters, Deans Switch

10 Maintaining EPC Modules

Consumables and Parts for the Aux EPC

Table 24 Auxiliary channel frits (continued)

Frit marking		Flow resistance	Flow characteristic	Often used with
None (brass tube)		Zero	No restriction	Headspace vial pressurization, purged splitter and Deans Switch when using backflush

Installing or Replacing Frits in the Aux EPC

To install or replace a frit in the Aux EPC block:

- 1 Gather the following:
 - T-10 Torx screwdriver
 - Appropriate O-ring and frit
 - Tweezers

WARNING

When hydrogen is used, dangerously high flows are possible if insufficient flow resistance is provided downstream of the supply tube. Always use either the High (Blue dot) or Medium (Red dot) frit with hydrogen.

- 2 Turn off the gas supply to the channel.
- 3 To select the appropriate auxiliary channel frit. See **Table 24**.
- 4 Identify which frit needs to be changed. Trace the tubing as needed to confirm. Markings on top of the partner fitting identify positioning of the flow channels.
- 5 Remove the screw to the partner fitting.
- 6 Lift the partner fitting away from the Aux EPC module. This exposes the frits and O-rings.
- 7 Gently remove the frit and O-ring using the tweezers. Be careful to avoid scratching the metal surfaces.
- 8 Place a new O-ring onto the end of the new frit, and insert the frit into the EPC module.

10 Maintaining EPC Modules

Installing or Replacing Frits in the Aux EPC

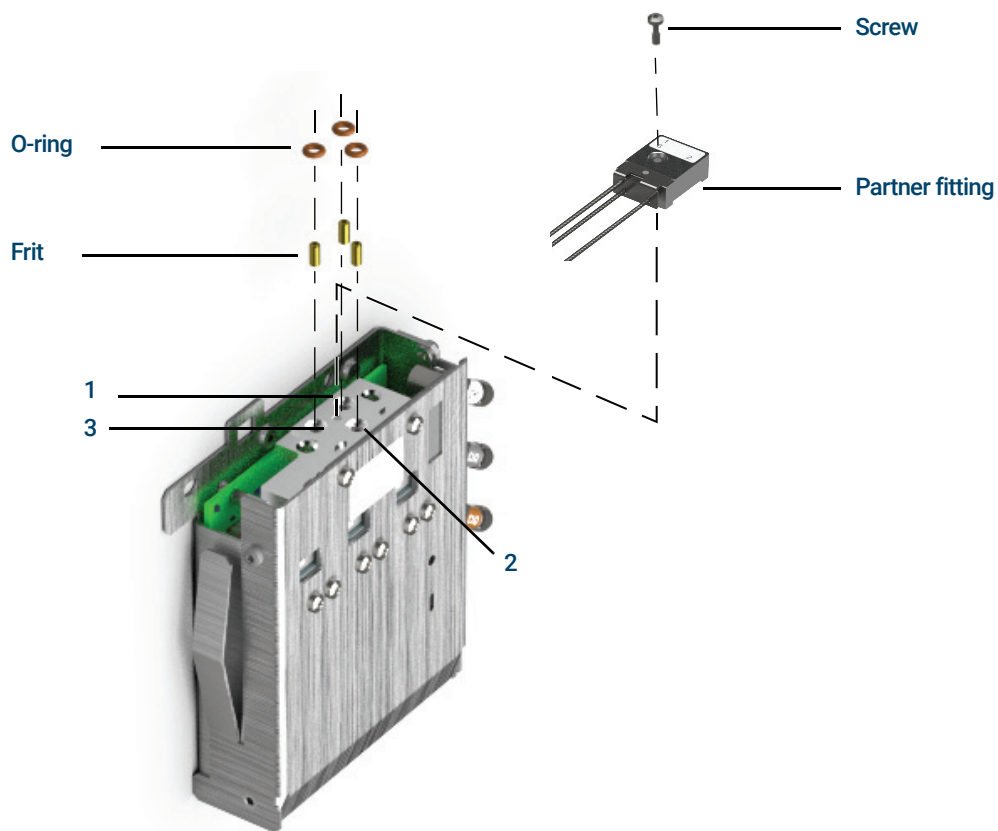


Figure 14. Replace an Aux EPC frit

9 Place the partner fitting onto the Aux EPC module, and secure in place using the screw.

10 Restore gas flows and check for leaks at the fitting.

After installing or replacing a frit, be sure to update the Aux EPC module PIDs used with your module. If needed, update the Aux EPC module PIDs using the GC Firmware Update Tool available on www.agilent.com. To download the GC Firmware Update Tool, open a web browser, navigate to www.agilent.com, then in the search box type in "GC Firmware Update" to search for the tool.

Consumables and Parts for the PCM

See the Agilent catalog for consumables and supplies for a more complete listing, or visit the Agilent Web site for the latest information (www.agilent.com).

Table 25 PCM consumables

Description	Part number
O-rings, package of 12	5180-4181
Proportional valve, Carrier	G3430-67013
Proportional valve, AUX	G3430-67016

Calibrating the PCM Interface

The interface's flow module contains a pressure sensor that must be zeroed after it is installed on the GC. Calibration ensures an accurate interface pressure display.

Do not connect the carrier gas to the flow module until you have zeroed the interface's pressure sensor.

Complete the following steps:

- 1 If the gas supply is connected to the GC, turn off the supply at the source, then disconnect the supply line from the PCM inlet fitting.
- 2 Turn on the GC and wait 15 minutes to allow it to reach thermal equilibrium.
- 3 When the GC has reached thermal equilibrium, press **Options**, scroll to Calibration and press **Enter**.
- 4 Scroll to the module to be zeroed and press **Enter**.
- 5 Scroll to a zero line and press **Info**. The GC will remind you of the conditions necessary for zeroing that specific sensor.

Flow sensors. Verify that the gas is connected and flowing (turned on).

Pressure sensors. Disconnect the gas supply line at the back of the GC. Turning it off is not adequate; the valve may leak.

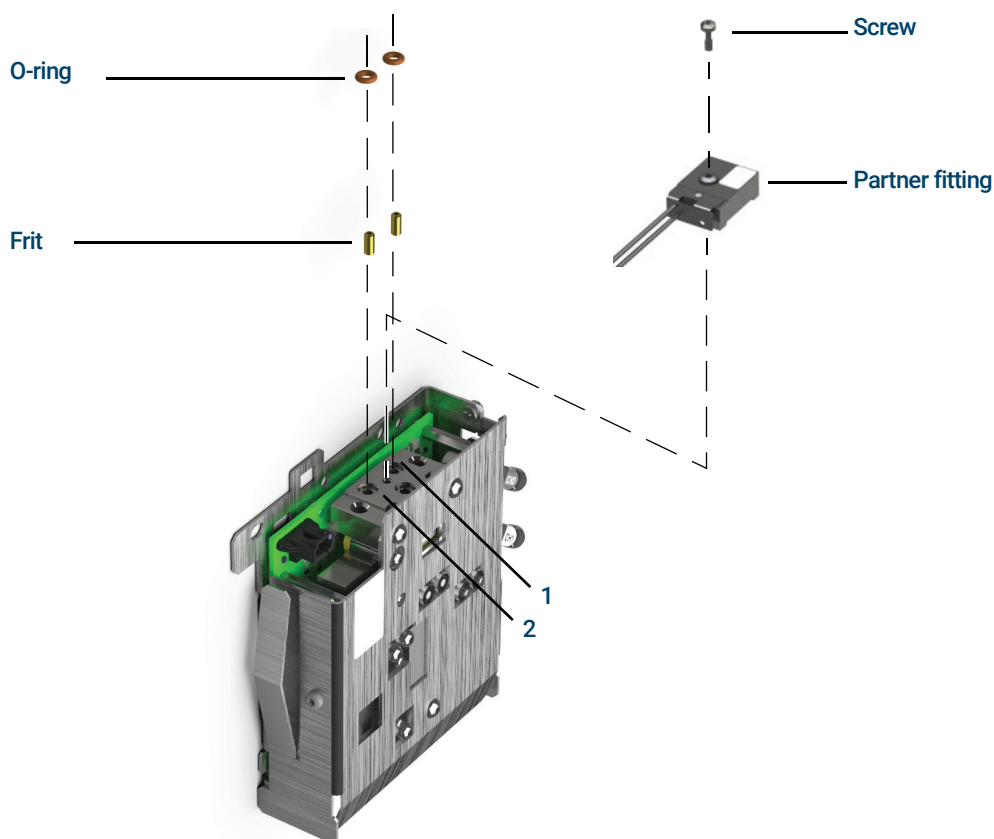
- 6 Press **On/Yes** to zero or **Clear** to cancel.
- 7 Turn off the GC.
- 8 Plumb the carrier gas to the flow module.
- 9 Turn on the GC.

If you were calibrating the flow sensor after replacing the PCM, check for leaks.

Installing or Replacing Frits in the PCM

To install or replace a frit:

- 1 Gather the following:
 - O-rings, package of 12, p/n 5180-4181
 - Frit
 - Tweezers
- 2 Turn off the gas supply to the channel.
- 3 Select the appropriate frit. Markings on top of the EPC module identify positioning of the flow channels.
- 4 Remove the screw holding the partner fitting onto the EPC module.
- 5 Remove the frit and O-ring using the tweezers. Be careful to avoid scratching the metal surfaces.
- 6 Remove the other O-ring as well. Replace it with a new O-ring.



- 7 Place a new O-ring on the new frit and press it down into the block.
- 8 Place the partner fitting on the module and tighten the screw firmly.

10 Maintaining EPC Modules

Installing or Replacing Frits in the PCM

- 9 Restore the gas supply.

WARNING

When hydrogen is used, dangerously high flows are possible if insufficient flow resistance is provided downstream of the supply tube. Always use either the High (Blue dot) or Medium (Red dot) frit with hydrogen.

After installing or replacing a frit, be sure to update the PIDs used with your PCM. If needed, update the module PIDs using the GC Firmware Update Tool available on www.agilent.com. To download the GC Firmware Update Tool, open a web browser, navigate to www.agilent.com, then in the search box type in "GC Firmware Update" to search for the tool.

10 Maintaining EPC Modules

Installing or Replacing Frits in the PCM

A

Swagelok Connections

Making Swagelok Connections 148

Using a Swagelok Tee 151

The gas supply tubing is attached with Swagelok fittings. If you are not familiar with Swagelok connections, review the following procedures.

Making Swagelok Connections

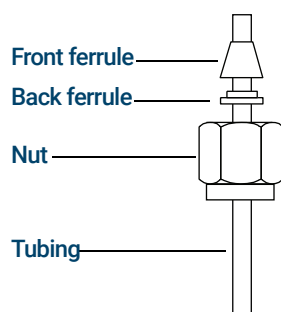
Objective

To make a tubing connection that does not leak and that can be taken apart without damaging the fitting.

Materials needed:

- 1/8-inch (or 1/4-inch, if used) preconditioned copper tubing
- 1/8-inch (or 1/4-inch, if used) Swagelok nuts
- Front and back ferrules
- Two 7/16-inch (for 1/8-inch nuts) or 9/16-inch (for 1/4-inch nuts) wrenches

1 Place a Swagelok nut, back ferrule, and front ferrule to the tubing as shown in **Figure 15**.



IMPORTANT!
The narrow end of the back ferrule fits into the rear of the front ferrule.

Figure 15. Swagelok nuts and ferrules

2 Clamp a stainless steel plug or similar fitting in a bench vise.

CAUTION

Use a separate stainless steel fitting in a vise for initial tightening of the nut. Do not use an inlet or detector fitting. Strong forces are required to properly set the ferrules, and damage to an inlet or detector fitting is very costly to repair.

3 Push the tubing into the stainless steel plug. See **Figure 16**.

4 Make sure that the front ferrule is touching the plug. Slide the Swagelok nut over the ferrule and thread it onto the plug.

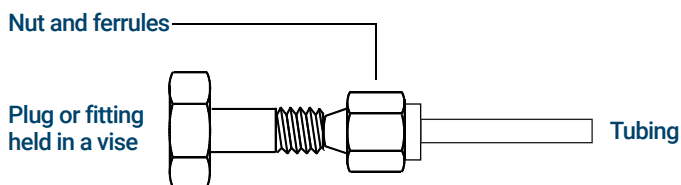


Figure 16. Assemble the fitting

A Swagelok Connections

Making Swagelok Connections

- 5 Push the tube fully into the plug, then withdraw it approximately 1 to 2 mm as shown in **Figure 17**.

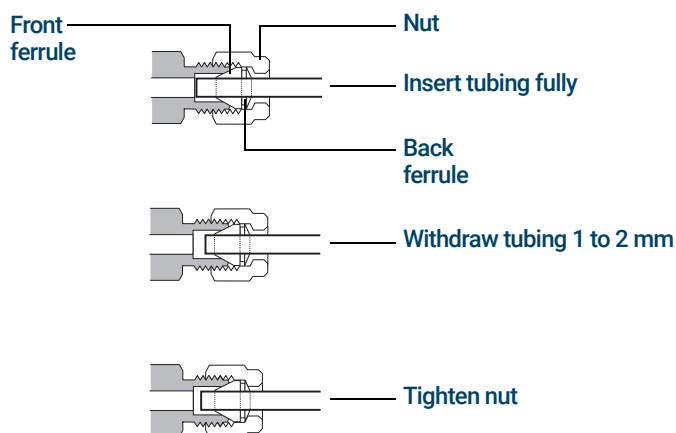


Figure 17. Insert the tubing

- 6 Finger-tighten the nut.
- 7 Mark the nut with a pencil line. See **Figure 18**.

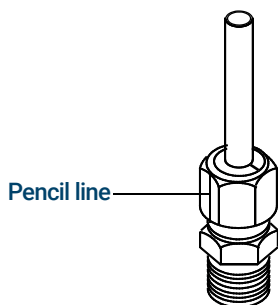


Figure 18. Mark the fitting

- 8 For 1/8-inch Swagelok fittings, use a pair of 7/16-inch wrenches to tighten the fitting 3/4 of a turn. See **Figure 19**.

For 1/4-inch fittings, use a pair of 9/16-inch wrenches to tighten them 1-1/4 turn, as shown in **Figure 19**.

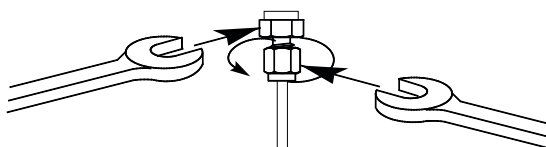


Figure 19. Final tightening

A Swagelok Connections

Making Swagelok Connections

- 9 Remove the plug from the fitting. To connect the tubing, with nut and ferrules, to another fitting, finger-tighten the nut, then use a wrench to tighten it $3/4$ (1/8-inch fittings) or $1-1/4$ (1/4-inch fittings) of a turn.
- 10 Both correctly- and incorrectly-swaged connections are shown in **Figure 20**. Note that the end of the tubing in a correctly-swaged fitting is not crushed and does not interfere with the action of the ferrules.

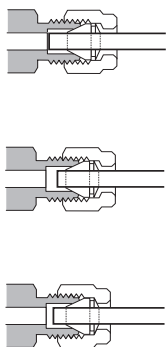


Figure 20. Completed fitting

Using a Swagelok Tee

To supply gas from a single source to more than one input, use a Swagelok Tee.

NOTE

Do not combine valve actuator air with flame ionization air. The valve action will cause major upsets in the detector signal.

Materials needed:

- 1/8-inch preconditioned copper tubing
 - Tubing cutter
 - 1/8-inch Swagelok nuts and front and back ferrules
 - 1/8-inch Swagelok Tee
 - Two 7/16-inch wrenches
 - 1/8-inch Swagelok cap (optional)
- 1 Cut the tubing where you want to install the Tee. Connect the tubing and Tee with a Swagelok fitting. See [Figure 21](#).

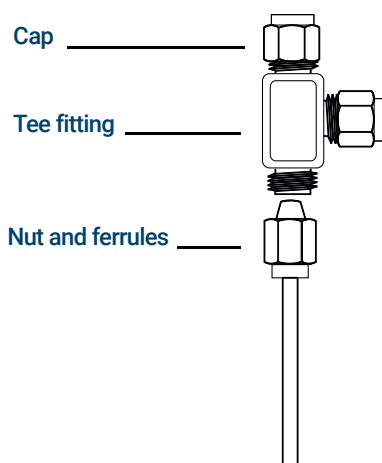


Figure 21. Swagelok tee

- 2 Measure the distance from the Tee to the GC inlets. Attach copper tubing to the open Tee ends with Swagelok fittings.

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First edition, September 2024

