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Dual Detector Microfluidics

Installation Guide

For TRACE 1600/1610 Gas Chromatographs

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General Lab Equipment. Not for Clinical, Patient, or Diagnostic Use.

Dual Detector Microfluidics Installation Guide

This quick-start guide provides instructions for installing the Dual Detector Microfluidics on your Thermo Scientific™ TRACE ™1600 or TRACE™ 1610 Gas Chromatograph and your ISQ™ Series or TSQ™ Series Mass Spectrometer.

Contents

Kit Description

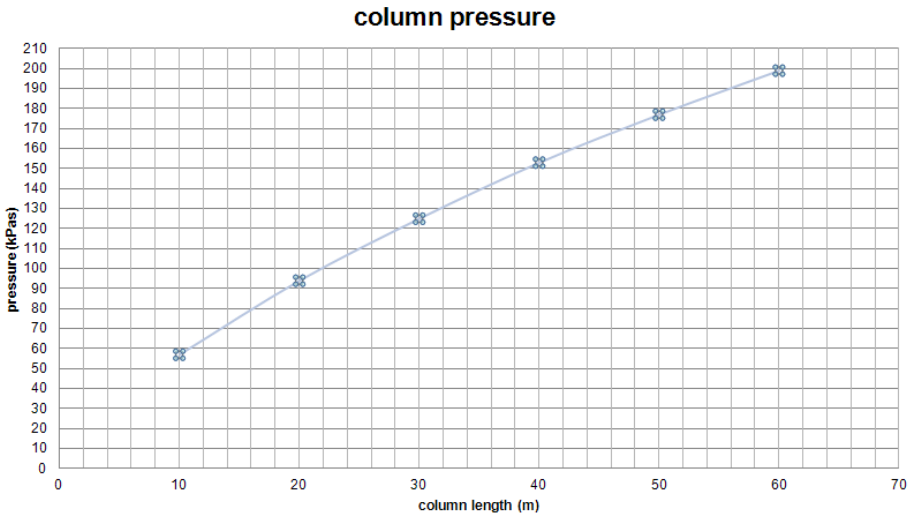
The Dual Detector Microfluidics is a solution for splitting the eluent flow from the analytical column to the mass spectrometer and to a standard GC detector.

This kit (**P/N 19071030**) has been designed in order to keep the **split ratio** between the mass spectrometer and the GC detector **1:1** working in **constant pressure** mode.

Note In **constant flow** mode, the **split ratio** changes during analysis, so only **constant pressure** mode is compatible. The instrument configuration post column parameters and the vacuum compensation parameters in the GC method are not relevant.

The kit is optimized for 0.25 mm i.d. columns, and allows a flow of about 0.75 mL/min on both the mass spectrometer and the GC detector (and corresponding to a total column flow of 1.50 mL/min) with an oven temperature of 50 °C and the inlet pressure indicated by the graph in Figure 1. At an oven temperature of 250 °C the flow will be reduced to about 0.35 mL/min at both sides (corresponding to a total column flow of 0.70 mL/min).

Figure 1. Graph of the Injector Pressure

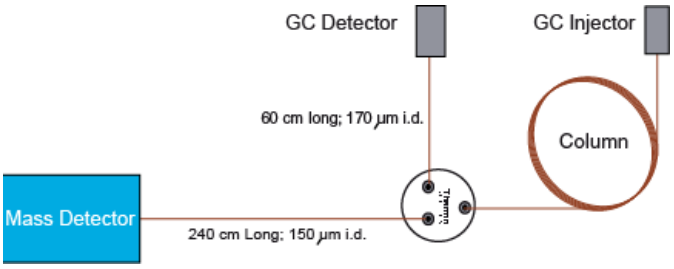


The kit consists of a microfluidics device and two different transfer tubings.

- 170 µm i.d., 60 cm long for the GC detector.
- 150 µm i.d., 240 cm long for the mass spectrometer.

Figure 2 shows the schematic diagram of the kit.

Figure 2. Kit Schematic Diagram



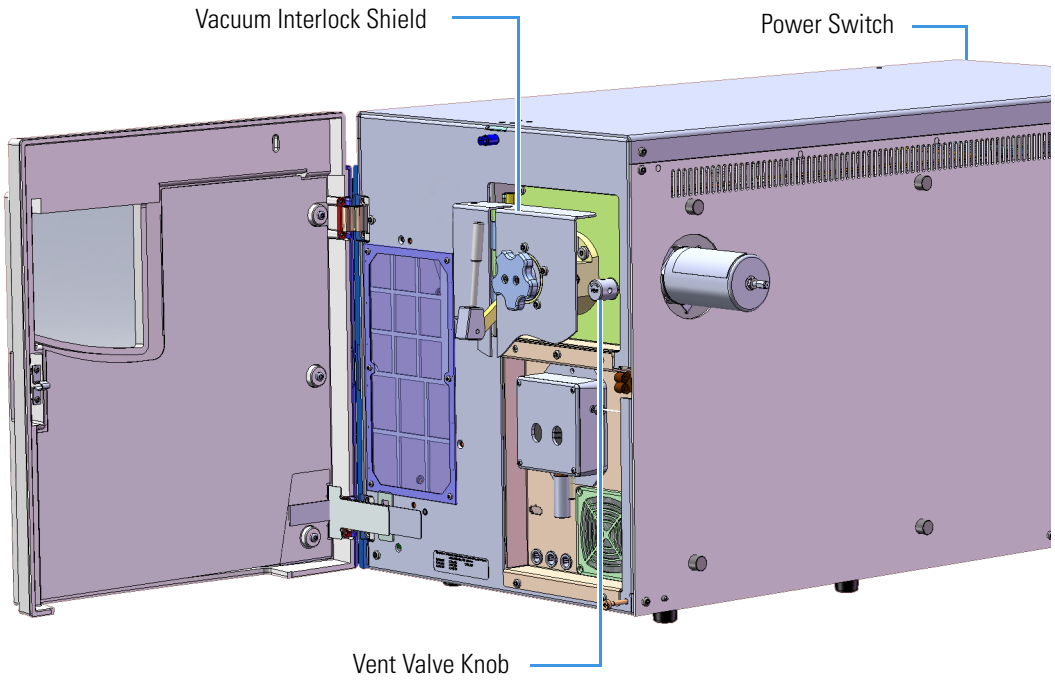
❖ To connect the dual detector microfluidics to the TRACE 1600/1610 GC

1. Cool the oven, injector or injectors, transfer line, ion source, and any installed GC detectors to room temperature and shut down the GC.

WARNING - BURN HAZARD: The injectors, detectors, oven, and transfer line may be hot. Allow them to cool to room temperature before touching them.

2. Push down on the power switch to power off the GC.
3. Shut down the TSQ Series or ISQ mass spectrometer using the software. See your mass spectrometer's user guide for more information. The heaters and the turbomolecular pump power off.

Figure 3. Finding the Vent Valve on the Mass Spectrometer



4. Open the front door of the mass spectrometer.
5. Look behind the right side of the vacuum interlock shield and twist the vent valve knob one and a half times in a counter-clockwise direction to open the vent valve.
6. Wait five minutes for the mass spectrometer to vent.
7. Open the front door of the GC and loosen the transfer line nut. Then pull the column back (into the oven) about 5 cm to ensure the column is no longer in the ion source.

Installing the Mounting Bracket

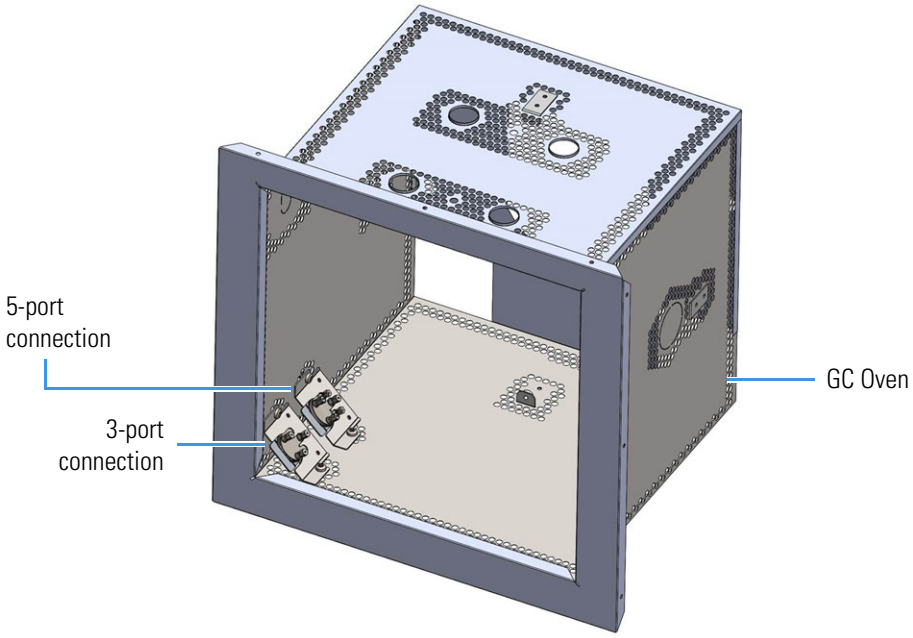
Install the mounting bracket near the front of the GC oven on the left-hand side. This will keep the mounting bracket out of the way of the column.

Note If you already have a mounting bracket installed in your GC with either the SSL or PTV backflush kit, skip this step.

❖ To install the bracket in the GC oven

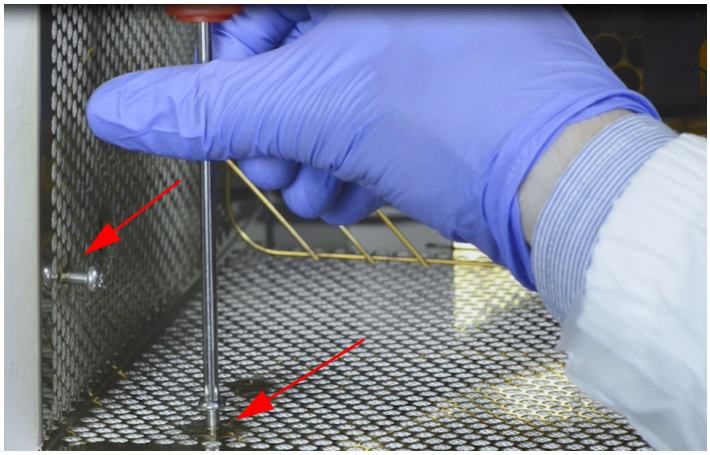
1. Attach the bracket to the oven in one of the following areas. See the following figure for the mounting bracket locations.

Figure 4. Brackets Attached to the Pre-Drilled Holes in the GC Oven



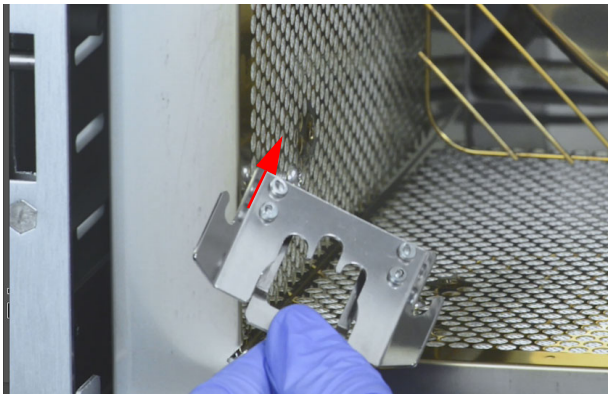
2. Using a T20 Torxhead screwdriver, insert both of the fixing screws halfway into the pre-drilled holes.

Figure 5. Attaching Fixing Screws to the Oven Wall and Floor



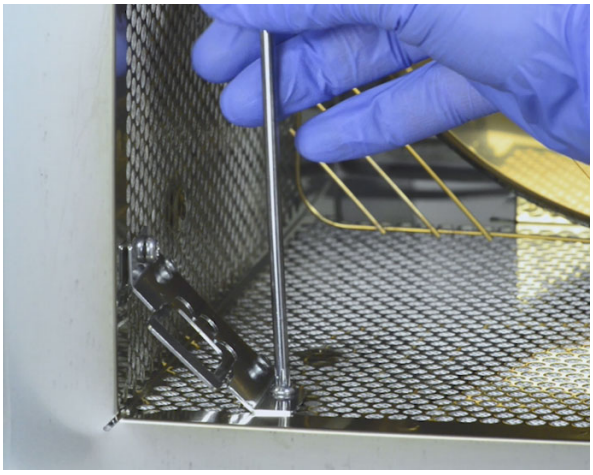
3. Slide the bracket until the screws snap into place.

Figure 6. Inserting the Bracket



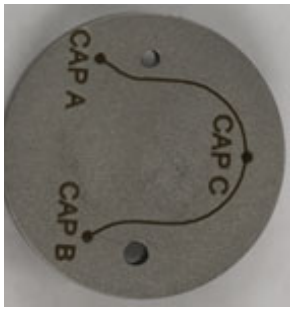
4. Tighten the two fixing screws to mount the bracket in place. See Figure 7.

Figure 7. Tightening the Fixing Screws



5. Attach the Thermo Scientific™ Microfluidics splitter to the mounting bracket. The microfluidics splitter snaps into place.

Figure 8. Microfluidics Splitter



Preparing the Dual Detector Microfluidics Restrictor Tubing

You will need the following materials to connect the tubing to new ferrule and nut. They are all included in the complete kit.

- SilFlow™ pre-swage tool and SilFlow FingerTite tool—to pre-swage the SilFlow ferrule to the microfluidics splitter
- SilFlow nut—to connect the tubing to the microfluidics splitter
- SilFlow ferrules

1. Use a scoring wafer to cut the end off the tubing.
2. You must prepare the end of the tubing to connect to the microfluidics 3-port splitter. This operation needs to be performed on the two transfer tubings provided as well as to the terminal of the analytical column.
3. Position a SilFlow nut and SilFlow ferrule onto the tubing as shown in Figure 9.

Note For a 0.25 mm i.d. column, use the narrowest SilFlow ferrule fitting (typically 0.35 mm, or 0.4 mm) and a 0.4 mm Silflow FingerTite jig.

For a 0.32 mm i.d. column, use a 0.5 mm SilFlow ferrule and a 0.5 mm SilFlow FingerTite jig.

Figure 9. Positioning the SilFlow Nut and SilFlow Ferrule Correctly on the Tubing

4. Use a scoring wafer to cut the tubing after inserting it through the ferrule. See Figure 10.

Figure 10. Cutting the Tubing with the Scoring Wafer

5. Use the SilFlow pre-swage tool to secure the ferrule into position. Place the column and ferrule into the SilFlow pre-swage tool until the tubing reaches the bottom of the tool. When done properly, the tubing will extend slightly past the tip of the ferrule. It is

important to use the pre-swage tool in order to prevent crushing the tip of the fused silica. See Figure 11.

Figure 11. Inserting the Column and Ferrule into the SilFlow Pre-Swage Tool

6. Use the SilFlow FingerTite tool to swage the ferrule to the tubing. Be sure to keep the tip of the fused silica bottomed out in the pre-swage tool. See Figure 12.

Figure 12. Swaging the Ferrule Using the SilFlow FingerTite Tool

7. Remove the jig, and lay the tubing carefully on the bottom of the GC until you are ready to connect it to the microfluidics splitter.

Attaching the New Tubing to the Transfer Line

Your kit comes with a 240 cm deactivated segment of fused silica tubing having an internal diameter of 0.15 mm. This tubing has fused ends. You must cut these ends off the tubing and attach a SilFlow ferrule before connecting it. Use this tubing to connect the microfluidics splitter to the transfer line.

When connecting the column to the transfer line, you may use either the regular transfer line nut or the spring loaded transfer line nut with the graphite Vespel™ ferrule.

Note Some of the cleaning procedures in this section require the use of methanol. If methanol is unavailable or prohibited, substitute LCMS-grade or GC-grade ethanol or isopropyl alcohol. Do not use denatured ethanol as it may contain impurities that contaminate the GC-MS system.

❖ To connect the column using the regular transfer line nut

1. Lower the oven temperature and allow it to cool.
2. Confirm that the MS is vented and remove the current transfer line nut and ferrule.
3. Unwind about one turn of the column from the column outlet end.

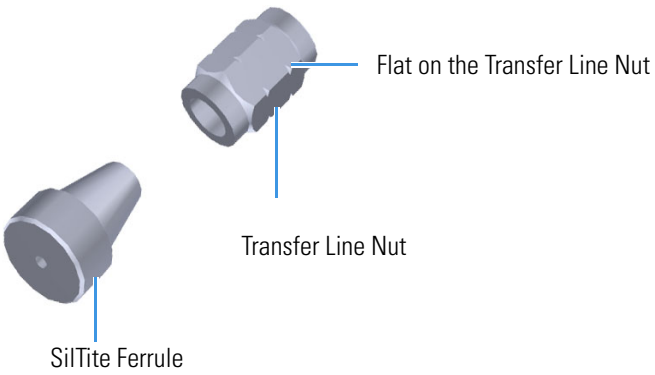
   Note Wear clean, lint- and powder-free gloves when you handle the column and transfer line ferrule.

4. Wipe approximately 300 mm (12 in.) of the column with a tissue soaked in methanol.
5. Choose an appropriate ferrule for the outer diameter of your column.

   Note If the maximum oven temperature in your method is ≥ 290 °C (554 °F), Thermo Fisher Scientific recommends using a spring loaded transfer line nut with a graphite Vespel ferrule or a SilTite™ nut and ferrule. By cycling the oven at and above this temperature, expansion and contraction of the graphite Vespel material can cause leaks in the transfer line.

6. Insert the column through the transfer line nut and ferrule, entering through the tapered end of the ferrule. Wipe the column again with a tissue soaked in methanol.

   Figure 13. Transfer Line Nut and SilTite Ferrule Orientation



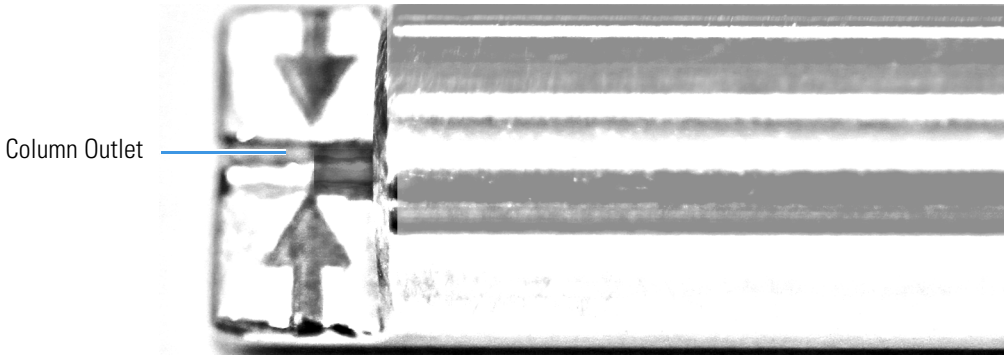
7. Insert the column into the column measuring tool (see Figure 14), which is in the ISQ Toolkit, so that it is even with the lines at the end of the column. Figure 15 indicates proper positioning of the column in the tool for accurate measuring.

8. Use a scoring wafer to score and break the column. Use a magnifying glass to check for an even, flat cut. Repeat if necessary.
9. Use a 5/16 in. wrench to hold the column measuring tool steady.

Figure 14. Column Measuring Tool

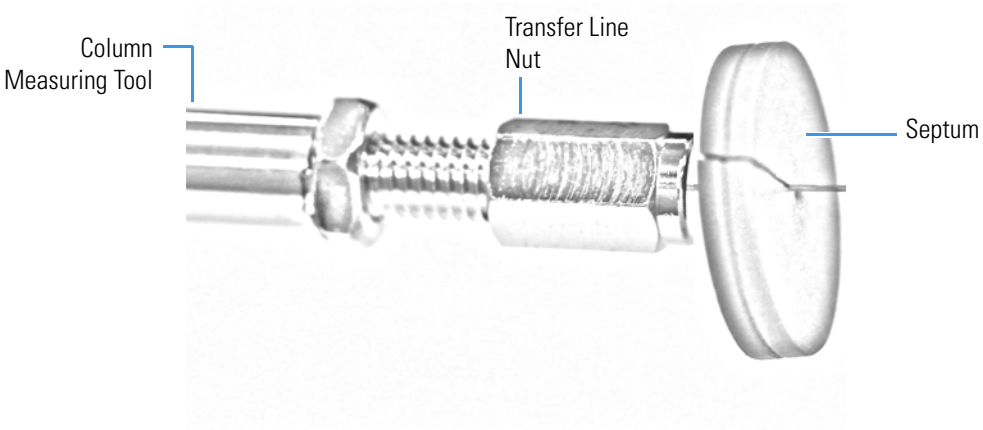
10. While holding the column measuring tool steady, tighten the transfer line nut with a 1/4 in. wrench until the column just stops moving in the ferrule.
11. Turn the transfer line nut 1 flat backward so the column is able to move in the ferrule with slight resistance.
12. Line up the outlet of the column with the arrows on the end of the column measuring tool.

Figure 15. Lining Up the Column in the Column Measuring Tool



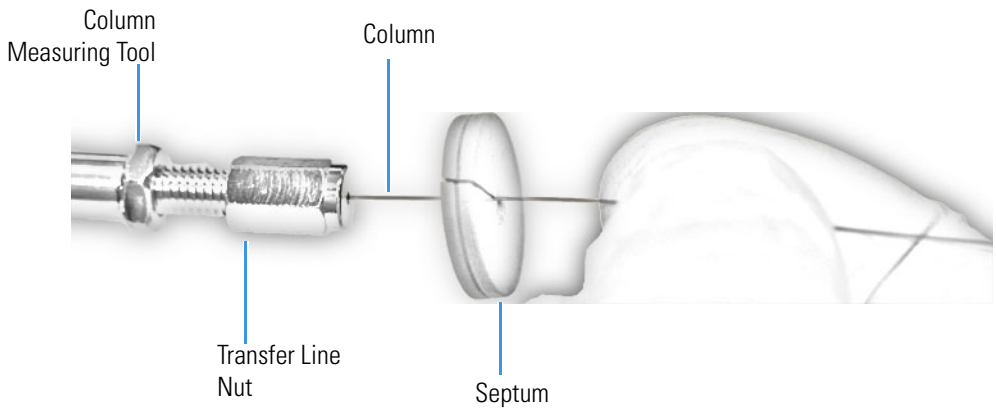
13. Place a septum with a notch cut into it behind the transfer line nut. The septum marks the place on the column where it should exit the nut.

Figure 16. Positioning the Septum



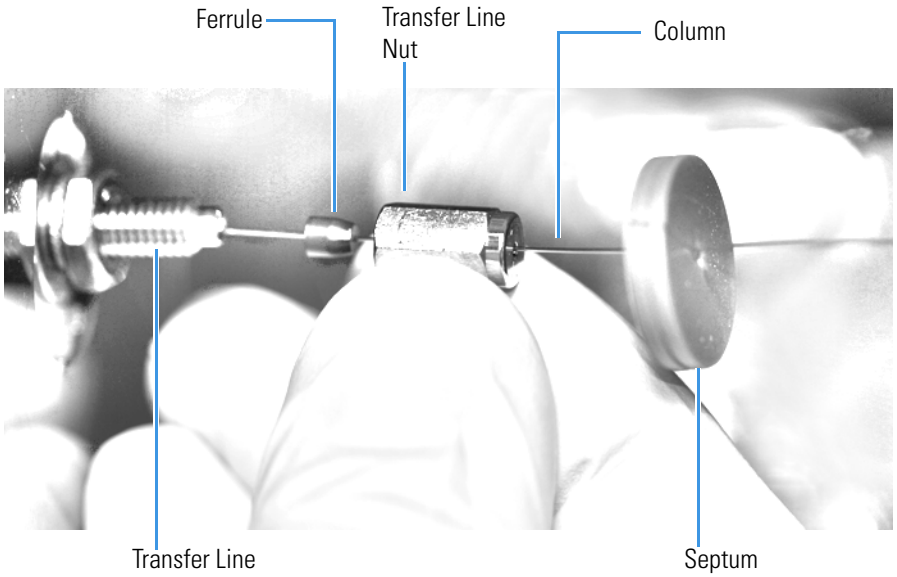
14. Pull the column back from the transfer line nut. Do not move the septum from its position on the column.

Figure 17. Pulling the Column Back from the Transfer Line Nut



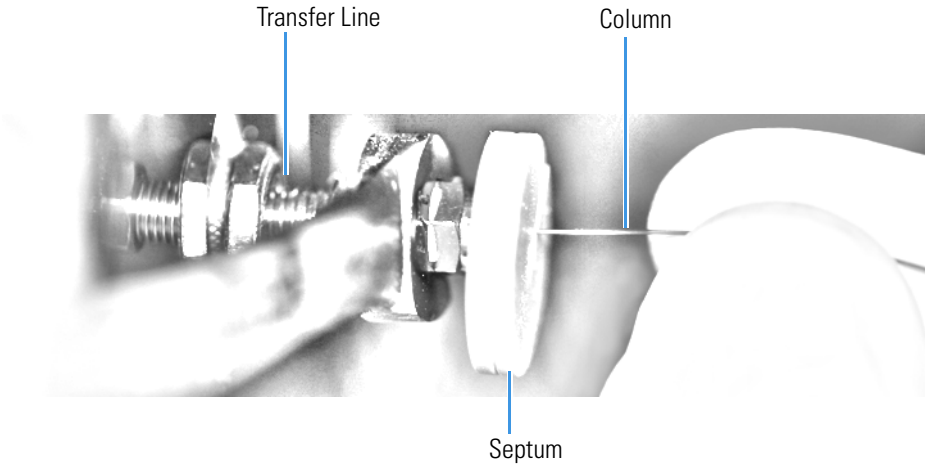
15. Loosen the transfer line nut from the column measuring tool.
16. Remove the column, transfer line nut and ferrule from the column measuring tool, making sure not to move the septum from its location on the column.
17. Insert the column into the transfer line.

Figure 18. Inserting the Column into the Transfer Line



18. Tighten the transfer line nut until it is just secure enough so that you cannot move it.
19. Loosen the nut by turning it exactly 1 flat backward.
20. Position the column in the transfer line. Use the septum as a guide to measure the correct length you should insert the column. Be careful not to change the location of the septum on the column.

Figure 19. Positioning the Column in the Transfer Line



21. Tighten the nut 1 flat forward—back to where it is secure enough in the transfer line that you cannot move it.
22. Tighten the nut 1 additional quarter turn.
23. Remove the cut septum.
24. Close the front door of the GC.

> **Note** If you are using a SilTite ferrule, follow the instructions that come with SilTite ferrules. If you are using a graphite Vespel ferrule, they require conditioning to ensure a leak-tight seal. See the *ISQ Spare Parts Guide* for information about ordering these ferrules.

25. Once the instrument is pumped down and able to scan, click **Air & Water / Tune** on the Dashboard view air water spectra and look for evidence of leaks with a large *m/z* 28 signal. If you observe a leak, stop scanning and gently tighten the nut in small increments until no leaks appear when scanning.

Attaching the New Tubing to the GC Detector

To attach the new tubing to the GC detector refer to the relevant section in the **TRACE 1600/1610 Hardware Manual**.

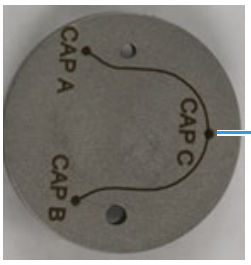
Connecting the Capillaries to the Microfluidics Splitter

You can attach now attach all the capillaries to the microfluidics splitter.

❖ **To connect the capillaries to the microfluidics splitter**

1. Place the ferrule connected to the original GC column into capillary C location on the microfluidics splitter. See Figure 20.

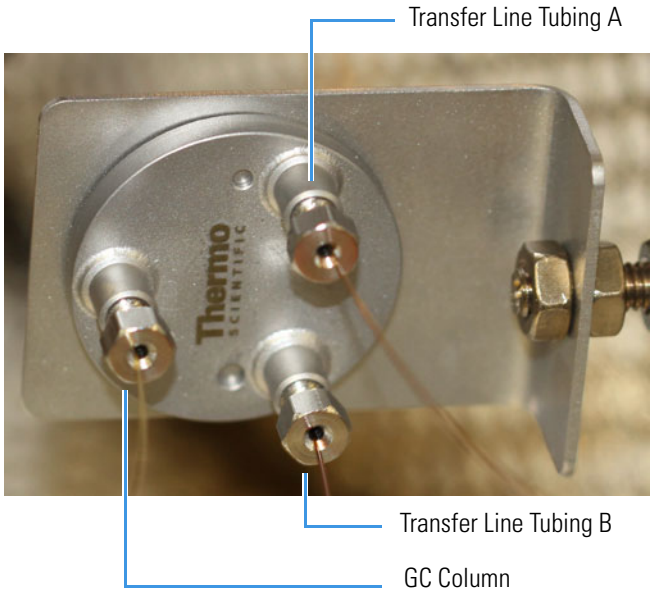
Figure 20. Correct Orientation for the Microfluidics Splitter



Tip If a ferrule gets stuck in the microfluidics splitter, use a thumbtack or similar pointed tool for removal. Insert the point of the tool between the ferrule and threads and press so that the ferrule is forced off center. This will dislodge the ferrule.

2. Use the FingerTite tool to secure the nut you previously attached to the column to top of the three holes on the microfluidics splitter.
3. Orient the capillary connected to the mass spectrometer and to the GC detector as shown in Figure 21.

Figure 21. Correct Orientation of Columns to Microfluidics Splitter



Note The two positions A and B on the microfluidics splitter are equivalent for the transfer line tubings.

4. Close the GC door.
5. Close the vent valve knob.
6. Power on the GC, and set the inlet pressure as indicated in Figure 1 on page 2.
7. Power on the mass spectrometer.

8. Let the mass spectrometer pump down for a minimum of one hour and then check the air-water spectrum for gross leaks. Assuming the convection gauge and ion gauge
9. (if present) indicate appropriate pressures, small leaks can be located by spraying with Freon, argon, or another suitable gas near the tubing connections.

Ordering Parts

Use Table 1 below to order new kits or spare parts for your Dual Detector Microfluidics system.

Table 1. Ordering information for new kits and spare parts

Description	Part Number
SilFlow FingerTite Tool	60201-401
Pre Swage Tool 0.4 (1/pk)	60201-415
Pre Swage Tool 0.5 (1/pk)	60201-416
SilFlow Nuts (10/pk)	290SF302
SilFlow FingerTite Ferrules 0.35 mm i.d. (10/pk)	29063465
SilFlow FingerTite Ferrules 0.4 mm i.d. (10/pk)	29063466
SilFlow FingerTite Ferrules 0.5 mm i.d. (10/pk)	29063467
Blanking Ferrule for NoVent (5/pk)	290ST414
3-Port SilFlow Replacement MCD (0.25/0.32 mm ID)	60201-398
170 µm Deactivated Tubing 0.363 mm OD, 60 cm length	60201-390
150 µm Deactivated Tubing 0.363 mm OD, 240 cm length	60201-399