

# 230 Cool On-Column Inlet

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Programmable Cool On-Column (PCOC) inlets are designed to allow the injection syringe to deposit the liquid sample directly into the capillary column. This is accomplished by the use of an insert which serves to align the syringe with the capillary column and the syringe needle.

## Theory of operation

At injection, liquid sample is introduced directly into the column.

- For manual injections, a duckbill valve (isolation valve) uses inlet pressure to create a pneumatic seal around the needle.
- For automatic injections, the duckbill valve is replaced with a septum and nut and the septum maintains the pressure seal.

For both manual and EPC inlets, the flow paths are the same; the flow is divided into two streams. The carrier gas enters the inlet and flows into the column and additionally provides for a constant septum purge flow regardless of the column flow rate you use.

### EPC inlet

An EPC controlled PCOC inlet is a forward pressure regulated system that provides flow to the column. A pressure sensor is located just ahead of the inlet and with the proportional valve forms a closed loop electronically controlled system. In addition, a flow limiting frit (750 mL/min at 50 psi) is located at the pneumatics entrance. A septum purge regulator (SPR) maintains septum purge flow between 7 and 15 mL/min.

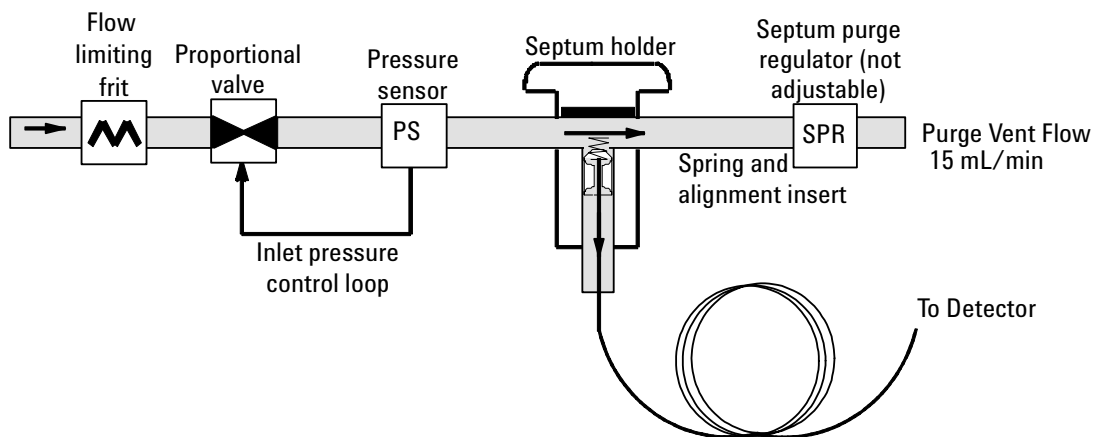
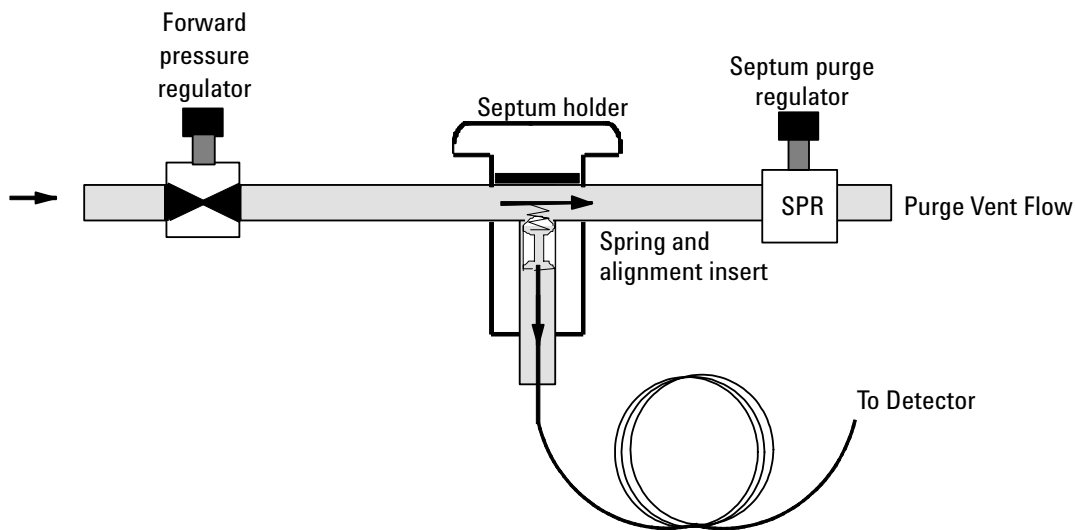


Figure 230-1 EPC control

### Manually controlled inlet

The manually controlled PCOC inlet has a forward pressure regulator (FPR) that controls the column flow rate. In addition, a forward pressure regulator with a fixed restrictor (SPR) is used to provide a nominal septum purge flow rate of 15.0 mL/min. The sample is deposited directly into a capillary column for analysis.



**Figure 230-2 Manual control**

## Replacement procedures

### Replacing the inlet

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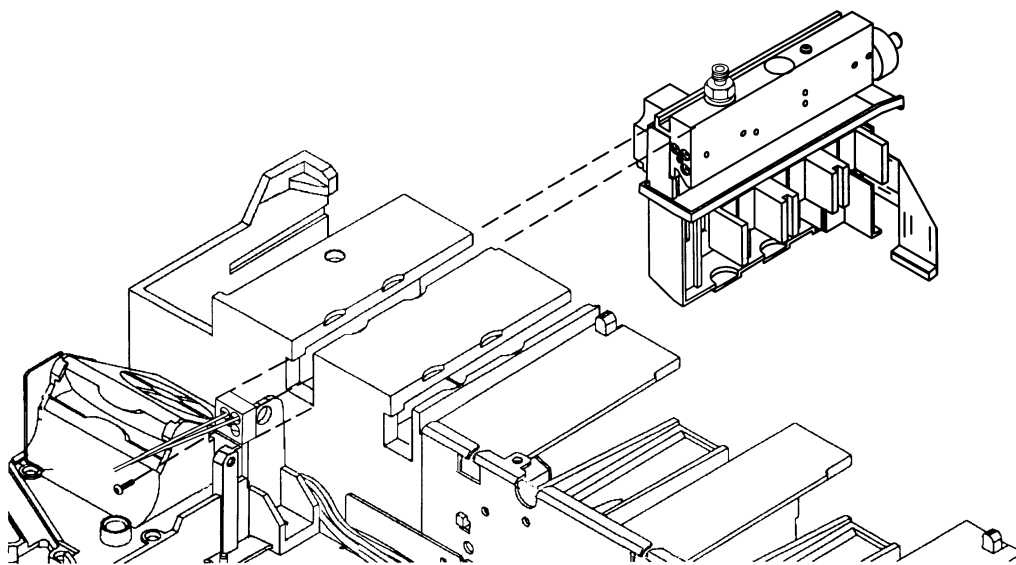
**WARNING** Turn off the oven and turn off the inlet you are replacing and let them cool down. Turn off the carrier gas supply pressure, then turn off the main power switch and unplug the power cord.

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1. From inside the oven, remove the column from the inlet fitting.
2. From the top of the 6890 GC, remove the blue inlet carrier cover (or the tray bracket, if installed) and the left side cover.
3. Unclip the heater/sensor leads from the connector to the left of the inlet carrier.
4. Disconnect the inlet plumbing and reroute the plumbing from underneath the tabs on the left side of the instrument.

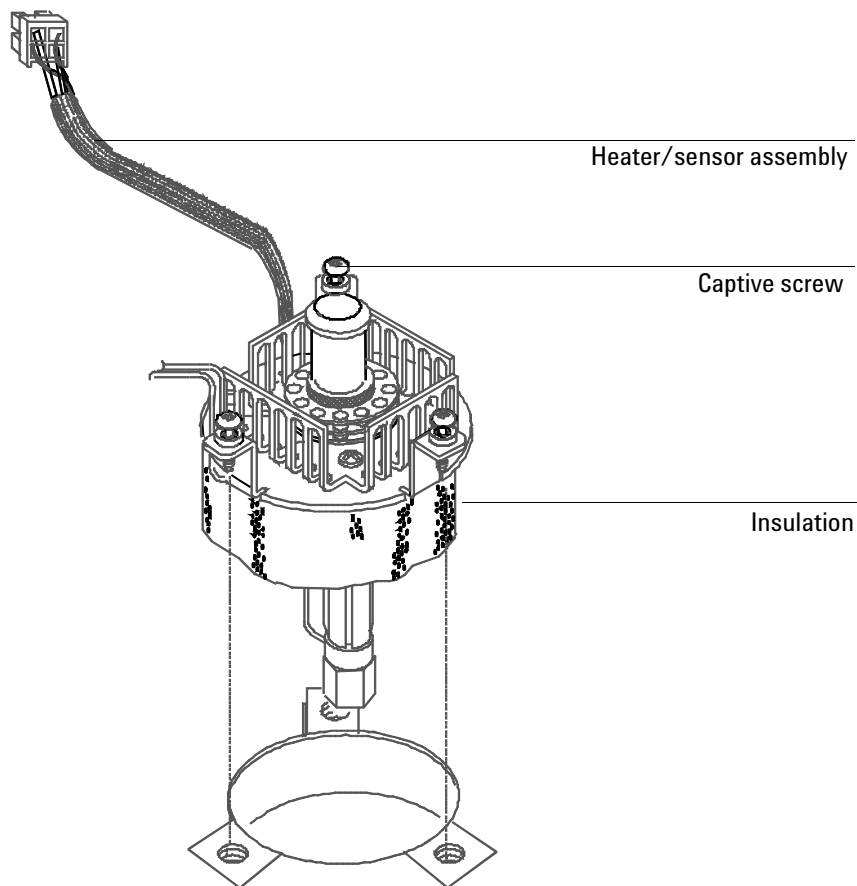
**EPC inlets:** The inlet plumbing terminates in a pneumatics block connected to the EPC flow manifold with one Torx T-10 screw.

**Non-EPC inlets:** The inlet plumbing is located in the manual inlet side carrier. The tubing labelled “C” is connected to the Forward Pressure Regulator. The line labelled “P” is connected to the septum purge regulator.



**Figure 230-3 Disconnecting the inlet plumbing block (EPC inlets)**

5. Use a Torx T-20 screwdriver to loosen the three captive screws that attach the inlet weldment to the top of the inlet carrier.



**Figure 230-4 Removing the inlet from the top of the GC**

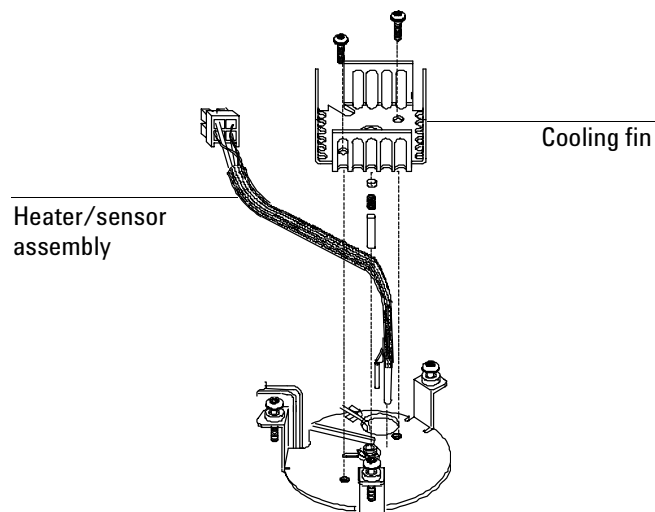
6. Slide the inlet up out of the inlet carrier. If necessary, you can also slide the insulation sleeve off of the bottom of the inlet.
7. Reinstallation is the reverse of removal.

## Replacing the heater/sensor assembly

**WARNING** Turn off the oven and turn off the inlet you are working on and let them cool down. Turn off the carrier gas supply pressure, then turn off the main power switch and unplug the power cord.

1. If necessary, remove the septum nut, cooling tower and/or needle guide to provide access to the two screws in the top of the cooling fin.

*Note* If desired, you can remove the entire inlet for better access.



**Figure 230-5 Removing the heater/sensor assembly from the top of the GC**

2. Remove the two Torx T-20 screws securing the cooling fin to the inlet weldment and remove the fin.

3. Lift the heater/sensor leads out of the weldment channel and lift the assembly out of the inlet.
4. Install the new heater/sensor assembly and reassemble the inlet. You may need to use tweezers to seat the cable back in the channel and fully seat the heater/sensor in the weldment.

### **Replacing the inlet EPC flow manifold**

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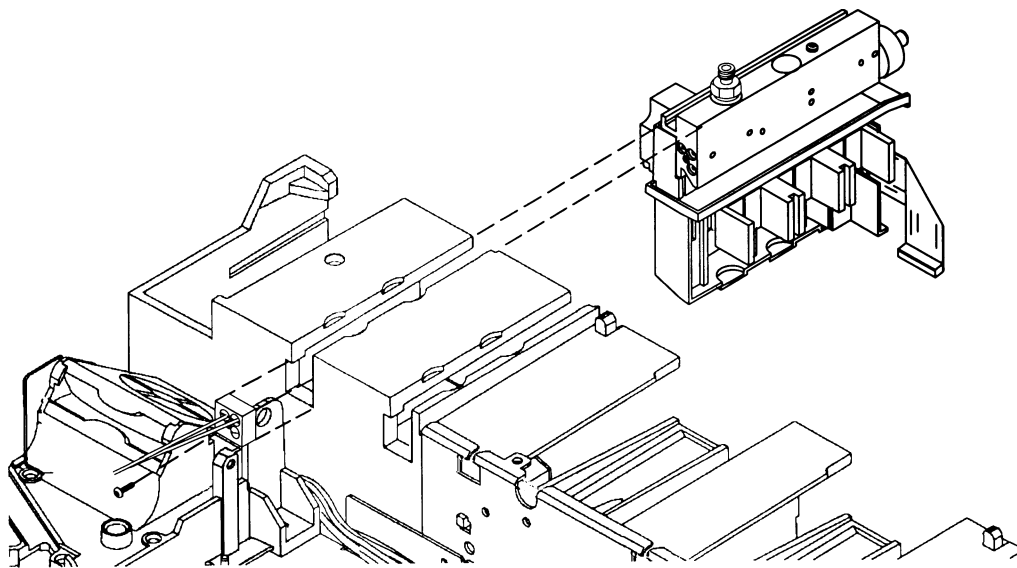
**WARNING** Turn off the oven and turn off the inlet you are replacing and let them cool down. Turn off the carrier gas supply pressure, then turn off the main power switch and unplug the power cord.

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All EPC inlets and the ECD detector in the 6890 GC use Type 1 flow manifolds.

1. Remove the plastic detector cover and the plastic pneumatics cover.
2. Remove the metal RFI shield and the rear top cover on the back of the GC.
3. Disconnect the ribbon cable for the manifold from the EPC board. You may have to remove the adjacent ribbon cable also.





**Figure 230-6 Removing the EPC flow manifold**

4. Remove the 1/8-inch Swagelok fitting for the gas supply.
5. Remove the plumbing block from the front of the manifold (one Torx T-10 screw).
6. Remove the long screw (Torx T-20) from the top of the manifold and slide the manifold out of the back of the GC.
7. Reinstallation is the reverse of removal.

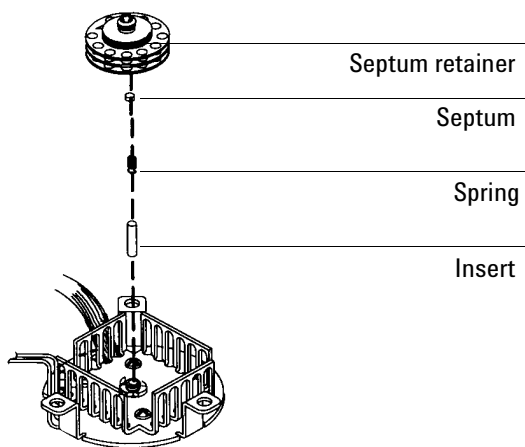
**Replacing the supply fitting on a Type 1 EPC flow manifold**

See Split/Splitless Inlet for the detailed procedure.

## Leak testing EPC and manual inlets

### Preparation

1. Cool the column to ambient.
2. Remove the column from the inlet fitting on the inside of the oven.
3. If the quality of the septum is unknown, replace it now.



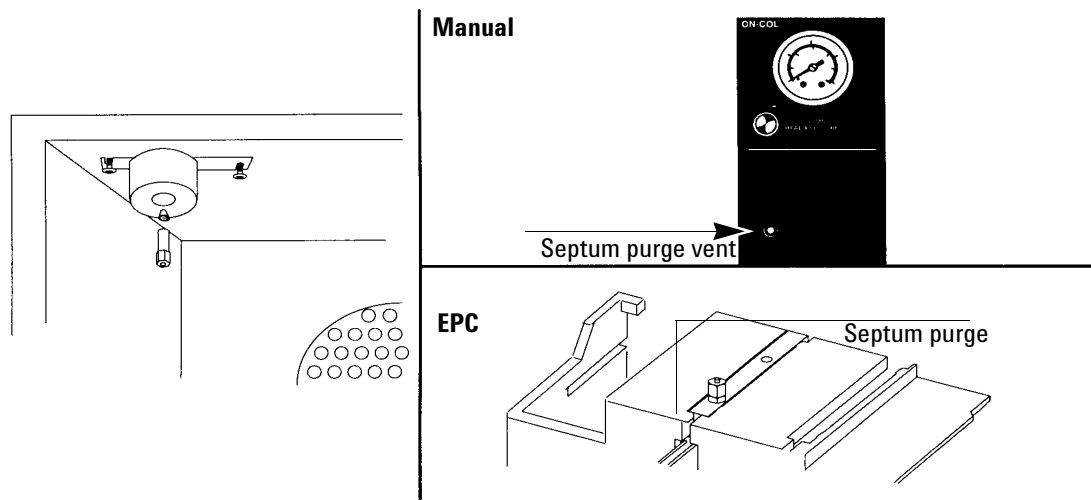
**Figure 230-7** Location of septum

4. Cap the septum purge vent and the inlet's column fitting. Use solid (no-hole) Vespel type ferrules 1/8-inch (part no. 0100-1372) and 1/16-inch (part no. 5181-7458) with a 1/8-inch Swagelok nut (part no. 5180-4103) and a capillary column nut.

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*Note* As alternate capping devices, a 1/8-inch Swagelok cap can be used for the septum purge vent and a capillary column nut with a solid piece of wire the size of a paper clip and a 0.5 mm ID graphite ferrule may be used for the inlet column fitting.

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**Figure 230-8 Capping the bottom of the inlet and septum purge vent**

*Note*

Make sure that the carrier gas source pressure is at least 35 psi. Carrier source pressure should always be at least 10 psi greater than the desired inlet pressure.

### Performing the leak test—EPC inlets

*Note* Be sure that the preparation steps on pages 10 and 11 are complete before proceeding with this test.

1. Set the inlet pressure to 25 psi on the keypad.

Press [Front Inlet] or [Back Inlet]. Move to the "Pressure" field and enter "25".

```
FRONT INLET (coc)
Mode:      Track oven
Temp       150  150
Pressure   25.0  25.0<
```

2. Wait approximately 15 seconds for equilibration.

If pressure cannot be achieved, either a very large leak is present in the system, or the supply pressure is not high enough.

3. Turn the inlet pressure "Off."

Press [Front Inlet] or [Back Inlet], scroll to the "Pressure" field, and press [OFF]

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FRONT INLET (coc)
Mode:      Track oven
Temp       150  150
Pressure   24.6  Off<
```

4. Note the "Actual" reading on the display and monitor the pressure for 10 minutes.

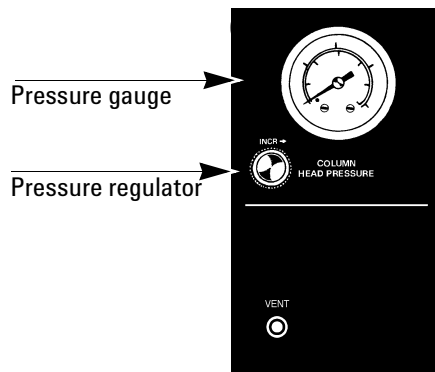
You can use the stopwatch feature of the 6890 GC to monitor the time. Press [Time] and then [Enter] to start timing, then toggle between the time and the pressure reading with the [Time] and the [Front Inlet]/[Back Inlet] keys.

- If there is less than 1.0 psi pressure loss (approximately 0.1 psi/min.), consider the system leak tight.
  - If pressure loss is much greater than 1.0 psi, there is a leak that must be found and corrected. See Correcting leaks later in this section.
5. When the system is considered leak tight, the caps may be removed, the column reinstalled, its dimensions configured at keyboard, and the desired pressure set.

### Performing the leak test—manual inlets

*Note* Be sure that the preparation steps on pages 10 and 11 are complete before proceeding with this test.

1. Turn the pressure controller clockwise until the column head pressure reaches 25 psi.
2. Wait 10 minutes for pressure equilibration. The gauge on the front panel should be stable.
3. After 10 minutes, shut off the column head pressure by turning the pressure controller full counter-clockwise.



**Figure 230-9** Inlet manifold

4. Monitor the pressure gauge for 5 minutes.
  - If there is less than 0.5 psi pressure loss (approximately 0.1 psi/min.), consider the system leak tight.
  - If pressure loss is much greater than 0.5 psi, there is a leak that must be found and corrected. See Correcting leaks later in this section.
5. When the system is considered leak tight, the caps may be removed, the column reinstalled, and the desired pressure set.

### **Leak testing the EPC module only**

Occasionally, to track down small leaks, you will need to isolate the EPC module from the inlet weldment and leak test the EPC module separately.

1. On the keyboard, turn off pressure to the inlet being tested.

Press [Front Inlet] or [Back Inlet], scroll to the Pressure field and press [Off].

2. Use a Torx T-10 screwdriver to remove the screw in the plumbing block on the front of the module. Remove the plumbing block from the EPC module, being careful not to lose the O-rings between the block and the module.
3. Replace the inlet's plumbing block with the leak test block (part no. G1530-20660) from the leak test kit (part no. G1530-60960). Make sure you install O-rings between the block and the EPC module to create a seal.

The leak test block is a special fitting that plumbs the carrier gas coming out of the module directly back into the septum purge flow path on the module. It allows the carrier gas and septum purge to function normally as if an inlet were present.

4. Perform the normal leak test for the EPC inlet as described previously in this section. With the inlet removed, the internal volume is smaller and a pressure loss of 1.0 psi in 10 minutes is considered leak-free.

### **Forward pressure valve leaks**

Occasionally an increase in pressure, rather than a decrease may be observed. This is usually due to slight leakage into the module across the forward pressure control proportional valve. Although slight leaks of this nature do not create chromatographic problems, they may obscure other small leaks that do cause problems by allowing air into the system.

To check for internal valve leakage:

1. Remove the supply pressure at the carrier inlet fitting, and quickly cap the fitting with a Solid 1/8-inch Vespel plug and a Swagelok nut.

2. Check the actual pressure on the display and monitor it for 10 minutes. Pressure loss should not be greater than 0.5 psi.

### **Locating leaks**

If the EPC module appears to have a leak, you can remove it to locate the leaky component. The leak test kit (part no. G1530-60960) contains a longer ribbon cable to allow you to lay the EPC module on the benchtop for testing.

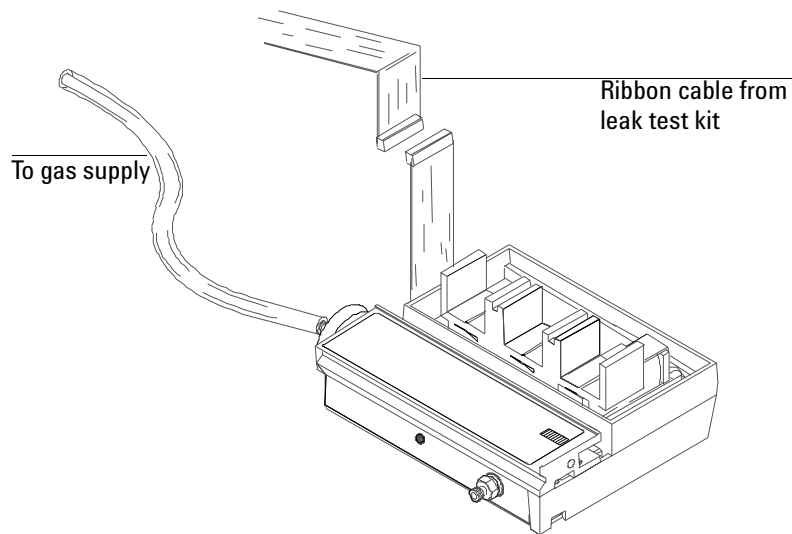
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**Caution** Be sure to wear an ESD strap grounded to the 6890 GC chassis while performing this procedure.

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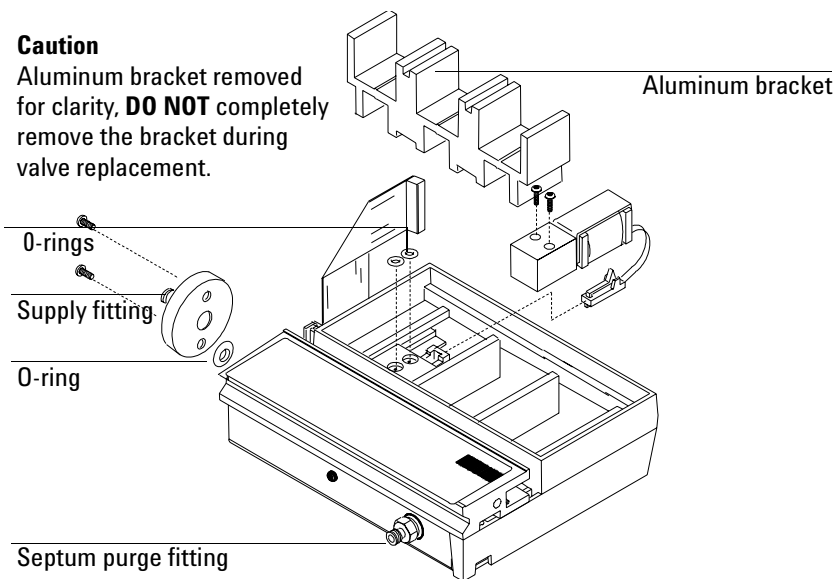
1. Turn off the main power switch.
2. Disconnect the carrier supply tubing on the inlet fitting.
3. Remove the top plastic pneumatics cover and the detector cover.
4. Remove the RFI shield and the top rear cover on the GC.
5. Disconnect the ribbon cable for the module from the main EPC board. You may have to remove the adjacent ribbon cable also.
6. Use a Torx T-20 screwdriver to remove the screw from the top of the module and slide the module out of the back of the GC.
7. Connect one end of the leak test ribbon cable (G1530-61370) to the ribbon cable connector on the EPC module and connect the other end to the appropriate connector on the EPC board.
8. Reconnect the carrier supply fitting and set pressures as used in the leak test.
9. Lay the EPC module on the lab bench and use an electronic leak detector to locate the leaky component on the module.





**Figure 230-10 Leak testing the EPC module on the lab bench**

10. If the leaky component is serviceable, such as vent/inlet fittings (see the following diagram of serviceable parts, Figure 230-11), replace them. Otherwise, replace the EPC module.



**Figure 230-11 EPC module serviceable parts**

### Correcting leaks

1. Use an electronic leak detector to check all areas of the inlet that are potential sources of a leak.
2. Tighten loose connections to correct leaks, if necessary. You may need to repeat the leak test.
3. If the pressure drop is now 0.5 psi or less, you can consider the inlet system leak-free. If the pressure drops faster than the acceptable rate, continue to search for leaks and repeat the pressure test.

**Potential leak points**

Check the following areas when checking an inlet system for leaks.

**In the oven**

Make sure the bottom of the inlet is correctly capped.

**On the inlet**

- Septum

**At EPC module**

- Three O-rings behind block where pneumatic lines enter module
- Two O-rings for each valve
- Septum purge cap
- Inlet fitting

