

# 270 Pneumatics Control Module

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## Theory of operation

The PCM provides one channel of flow or pressure control, replacing the standard electronic flow control module (ECM) for that channel. It does not need to be connected to any particular type of inlet.

The PCM can control gas flows and pressures for a number of applications including:

- Non-Agilent standard inlets. For example, the SIMDIS application which uses a proprietary PTV inlet by one of Agilent's channel partners.
- Any valve application where no inlet is required. For example, the PCM can provide flow or pressure to a column connected to a gas sampling valve. Other valving applications may involve providing auxiliary gas flow; especially when using packed columns.
- Sample preparation devices such as the Headspace Sampler and the Purge and Trap, which often require a controlled source of purge gas.
- Catalyst tubes or other conversion devices, which often require a controlled source of makeup or reagent gas. The nickel catalyst tube is an example of such a device.

## Replacement procedures

### Replacing the PCM

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**WARNING** Hazardous voltages are present in the mainframe when the GC power cord is plugged in. Avoid a potentially dangerous shock hazard by unplugging the power cord before removing the side panels.

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**Caution** Prevent electrostatic voltages from damaging the GC by using precautions such as an ESD wrist strap.

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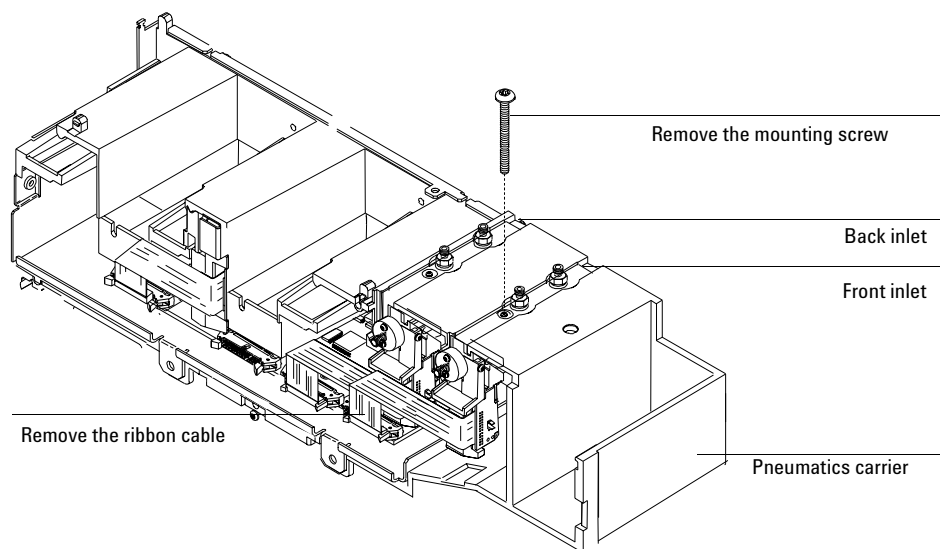
1. Turn off the GC and unplug the power cord. Allow time for all heated zones to cool and then turn off supply gases at their sources.
2. Remove the gas supply line to the manifold.
3. Remove the injector, tray, and bracket (if present).
4. Remove the top cover, the pneumatics top cover, the RFI cover, the inlet fan cover, the inlet cover (or tray mounting bracket, as applicable), the left side panel, and the top rear panel.

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**Caution** Board components can be damaged by static electricity; use a properly grounded static control wrist strap when installing the flow module.

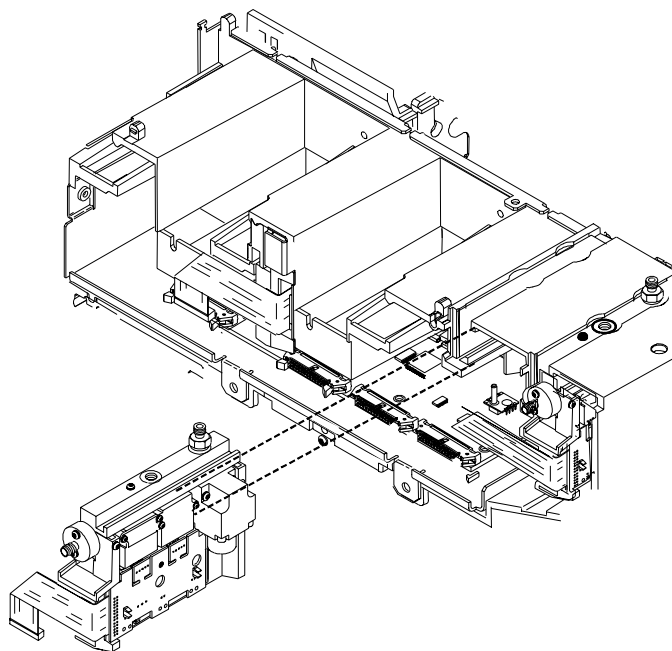
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5. Remove the PCM ribbon cable from the pneumatics control board. If the PCM is in the back position and there is an inlet in the front position, also unplug the front inlet's ribbon cable from the pneumatic control board.



**Figure 270-1 Removing the ribbon cable and mounting screw**

6. Remove the screw at the top of the module as shown using a T-20 Torx screw driver.
7. Remove the gang fitting on the front of the manifold. Check the O-rings in the plumbing block for damage and replace them if necessary.
8. Slide the PCM out of the carrier.



**Figure 270-2 Removing the PCM**

9. Install the replacement PCM. Remember to fold the module ribbon cable and reconnect the ribbon cable from the front inlet, if applicable.
10. Reinstall the pneumatics block gang fitting onto the flow module.
11. Calibrate the interface as described in Calibrating the PCM interface below.

### **Replacing the PCM gang weldment**

1. Turn off the oven and inlet and allow them to cool.

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**WARNING** Turn off the oven and the inlet and allow them to cool. Turn off all flows at the initial gas supply. Then turn off the main power switch and unplug the power cord.

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2. Remove the detector cover, the pneumatics cover, the inlet fan cover, the inlet cover (or tray mounting bracket), and the left side cover.
3. Starting at the PCM, trace each line of the gang weldment from the pneumatics block to the end connector. Disconnect each line.
4. Remove the screw in the plumbing block and remove the gang weldment from the PCM.
5. Replace the gang weldment and O-rings. Reassemble in reverse order.
6. Check for leaks.

### **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.

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 Front inlet or Back inlet and press [Enter].
5. Scroll to Pressure Zero.
6. Press [On] to zero the pressure sensor.
7. Turn off the GC.
8. Plumb the carrier gas to the flow module.
9. Turn on the GC.

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

## Leak testing the PCM

Use an electronic leak detector capable of detecting the gas being used. Liquid leak detectors are not recommended, especially in areas where cleanliness is very important. If using leak detection fluid, immediately rinse the fluid off to remove the soapy film.

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**WARNING** To avoid a potential shock hazard when using liquid detection fluid, be careful not to spill leak solution on electrical leads, especially the detector heater leads.

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**WARNING** Be careful! The oven and interface may be hot enough to cause burns.

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Occasionally, to locate small leaks, you will need to isolate the PCM module from the inlet weldment and leak test the PCM 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 PCM. Remove the plumbing block from the PCM, 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 (if needed) between the block and the PCM 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 and split vent flow paths on the module. It allows the carrier gas and septum purge line to function normally as if an inlet were present.

4. Perform the normal leak test as described previously in this section. With the inlet removed, the internal volume is quite small and a pressure loss

of 0.5 psi or less in 5 minutes time (approximately 0.1 psi/minute) is considered to be leak free.

5. If there is a leak, remove the PCM from the GC and isolate the leak as described in Locating leaks on the flow manifold.
6. If there is an *increase* in pressure, see Forward pressure valve leaks.

### **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. The valves can leak at about 0.2 mL/min and be within specification.

To check for internal valve leakage (when leak testing the PCM only):

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 5 minutes. Pressure loss should not be greater than 0.5 psi.

### **Locating leaks on the flow manifold**

If the PCM appears to have a leak, 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 PCM on the benchtop for testing.

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**Caution**

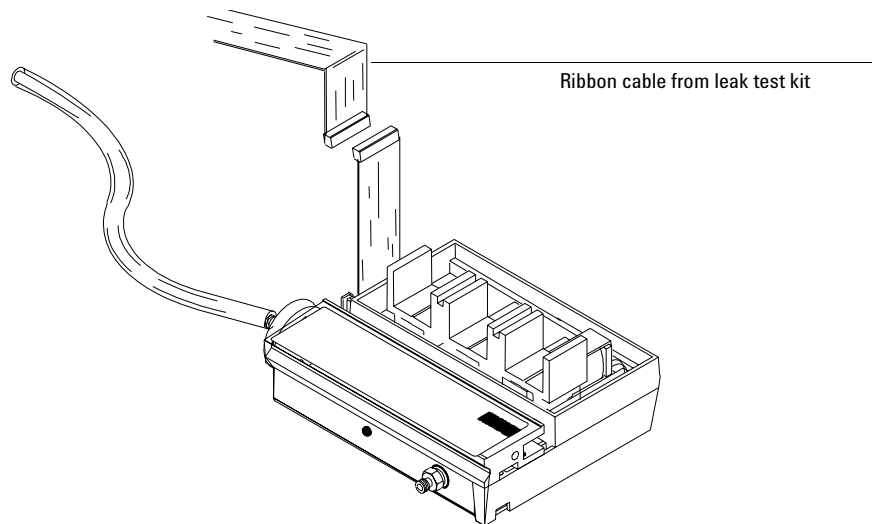
Be sure to wear an ESD strap grounded to the 6890 GC chassis while performing this procedure.

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1. Turn off the main power switch.
2. Remove the top plastic pneumatics cover and the detector cover.
3. Remove the top rear panel on the GC.

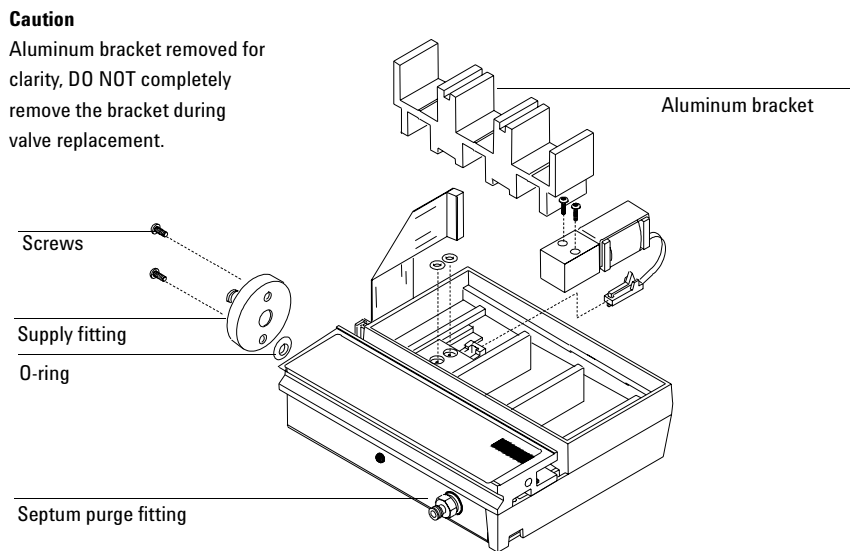


4. Disconnect the ribbon cable for the module from the pneumatics board. You may also have to remove the adjacent ribbon cable.
5. Use a Torx T-20 screwdriver to remove the screw from the top of the module and slide the module out of the back of the GC.
6. Connect one end of the leak test ribbon cable (G1530-61370) to the ribbon cable connector on the PCM and connect the other end to the appropriate connector on the pneumatics board. Reconnect the gas supply and turn on the main power switch. Set the pressure to 25 psi and the flow to 60 mL/min.
7. Lay the PCM on the lab bench and use an electronic leak detector to locate the leaky component on the module.



**Figure 270-3 Leak testing the PCM on the lab bench**

8. If the leaky component is serviceable, such as a vent/inlet fitting (see the diagram of serviceable parts, Figure 270-4), replace it. Otherwise, replace the PCM.



**Figure 270-4 PCM serviceable parts**

### Correcting leaks

1. Use the electronic leak detector to check all areas of the PCM that are potential sources of a leak.
2. Tighten any connections which are leaking and re-test.

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*Note*

If the pressure drop is now 0.05 psi/min or less, you can consider the interface system leak-free.

3. If the interface still leaks, continue to check for and correct leaks.

### Potential leak areas

Check the following areas when checking for leaks in the PCM.

- The capped purge vent
- Three O-rings behind the block where the pneumatic lines enter the PCM
- Two O-rings for each valve in the PCM