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Programmable Helium Conservation Module for the Agilent 7890-0623 SP1 GC

Operation and Installation

Agilent Technologies

Notices

Manual Part Number

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CAUTION

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WARNING

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

Contents

Installation

The Programmable Helium Conservation module has been installed at the factory. However, it must be plumbed to gases and properly configured before use.

Parts Supplied

The Agilent 7890-0623 SP1 Gas Chromatograph (GC) includes the parts listed in Table 1, in addition to the normal ship kits and parts delivered with the GC.

Table 1 Parts supplied

Part	Part number	Quantity
Programmable Helium Conservation Module (installed in the GC at the factory)		1
Nut, 1/8-in, brass, 10/pk	5180-4103	1
Ferrule, 1/8-inch, Vespel 10/pk	0100-1328	2
Copper tubing, 1/8-inch, 12 ft	5021-7107	1
Tee, 1/8-inch, brass	0100-0090	2
Cross, union, 1/8-inch brass	0100-0161	2
Nut, 1/8-inch, stainless steel	0100-0057	1

Other Useful Parts (Not Supplied)

In addition to the parts provided, in some cases you may also need additional parts to make the plumbing connections between the Helium Conservation Module and the GC inlet and other EPC modules. See Table 2 for selected additional parts.

Table 2 Common GC gas plumbing hardware, not supplied

Part	Part number
Tee, 1/8-inch brass, 2/pk	5180-4160
Union, 1/8-inch brass, 2/pk	5180-4127
Tubing cutter	8710-1709
Cap, 1/8-inch Swagelok, brass, 6/pk	5180-4121

Tools Required

Two 7/16-inch open-end wrenches

Installation Procedure

This procedure explains how to connect gas supplies to the Programmable Helium Conservation Module and from the conservation module to the GC.

WARNING **Refer to the Safety Manual that came with your Agilent 7890B Gas Chromatograph for hazards that may exist when maintaining your instrument.**

1 Note the location of the Helium Conservation Module in the pneumatics area. Facing the back of the GC, bays are numbered 1–6 as in Figure 1. The module can be installed in bay 4, 5, or 6.

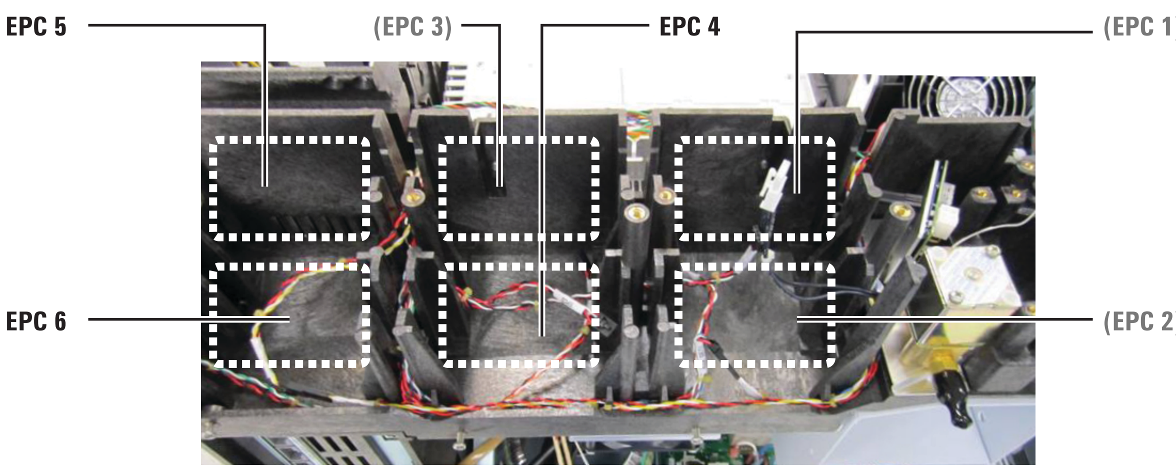


Figure 1 EPC module bay identification

The bay determines the communications cable used to control the module, which in turn determines the Aux EPC channel designations used by the GC and Agilent data system software. See Table 3.

Table 3 Aux EPC designations for EPC module locations

EPC Bay	Aux EPC channel designation for GC and data system
EPC 6	Aux EPC 4, 5, 6
EPC 5	Aux EPC 1, 2, 3
EPC 4 (cable **Aux Det 1**)	Aux EPC 7, 8, 9

2 Remove the pneumatics cover and route the purge tubing so that it will pass through the matching slot in the top back cover and out the back of the GC. Bend the tubing as needed so the pneumatics cover will fit, but bend the tubing no closer to the flow block than 1 cm. Make the bend with a radius of approximately 1 cm. Do not kink the tubing. See Figure 2.

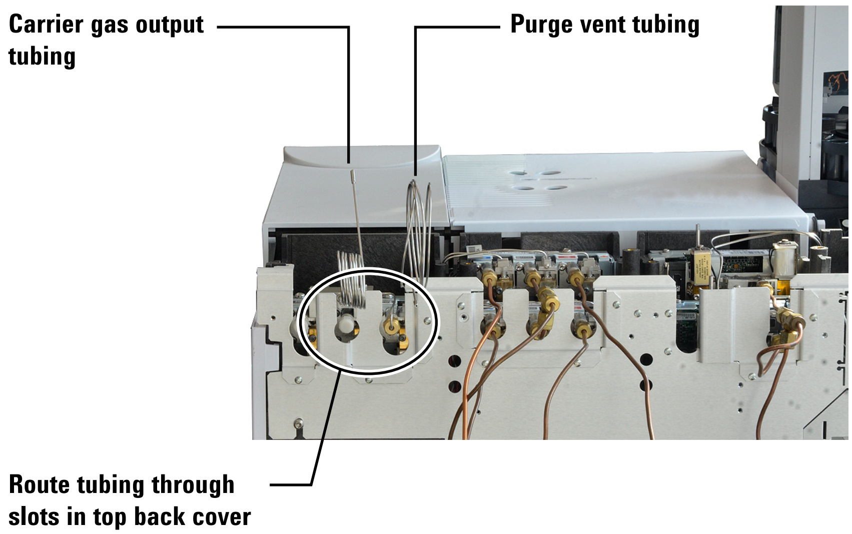


Figure 2 Routing the tubing

3 Remove the protective caps from the Helium Conservation Module source gas connections.

4 Connect the Helium Conservation Module's carrier output to the GC. The output from the module will become the input to the GC inlets and other devices, as desired. This connection will require additional fittings and tubing not supplied in the accessory. Figure 3 and Figure 4 below show a simple and a more complex example of plumbing diagrams.

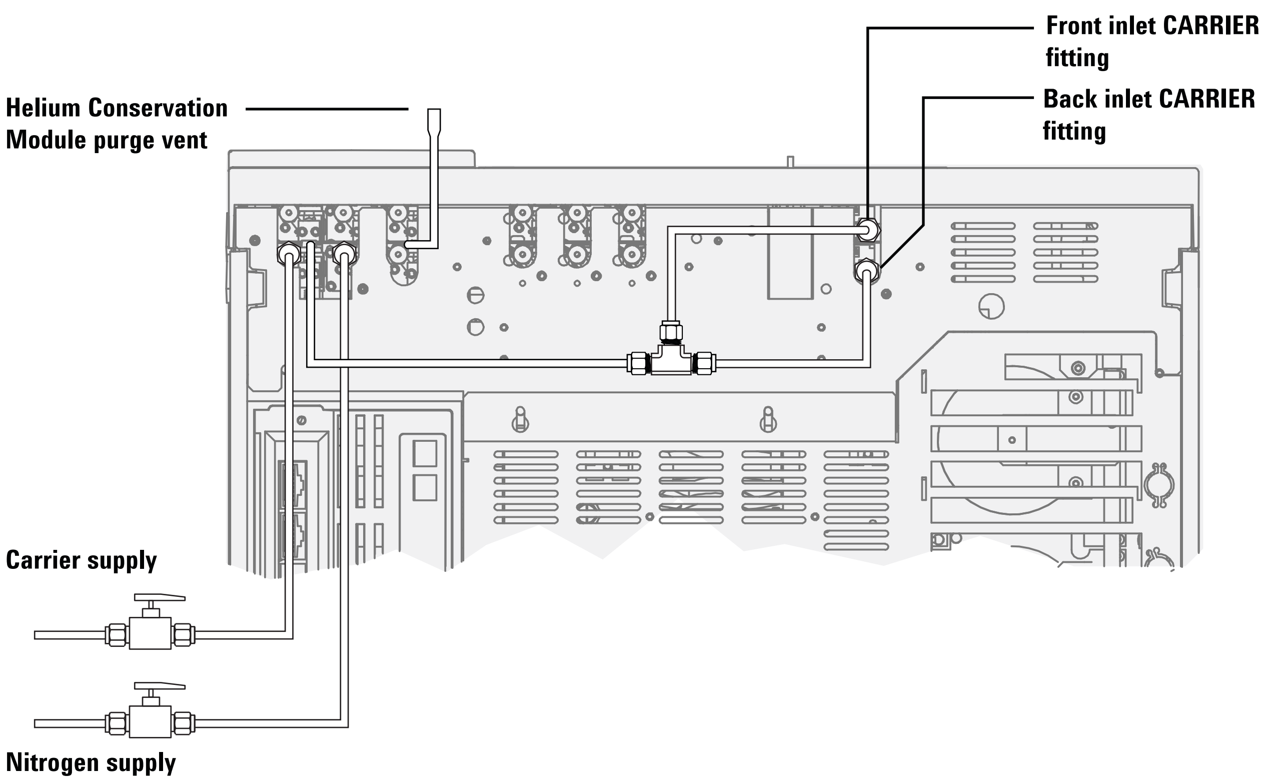


Figure 3 Plumbing example using two inlets

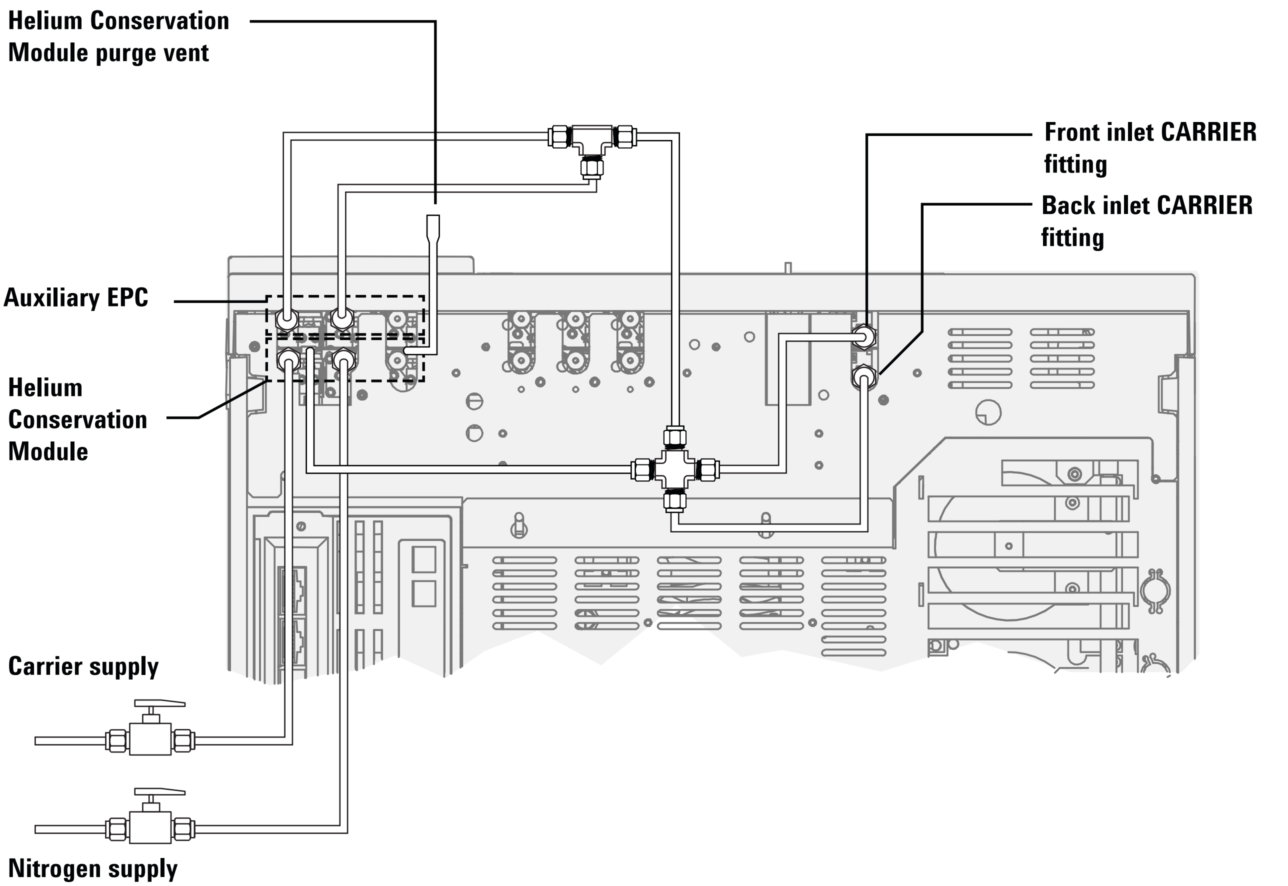


Figure 4 Plumbing example using two inlets and two auxiliary EPC channels

5 Connect the helium supply to the Aux EPC 1 (left) fitting on the Helium Conservation Module. See Figure 3 and Figure 4.

6 Connect the nitrogen supply to the Aux EPC 2 (middle) fitting on the Helium Conservation Module.

7 Turn on gas source(s) to pressurize the system and to leak check all fittings. Set the source pressure to between 620 kPa (90 psi) and 690 kPa (100 psi). The maximum allowable source pressure is 827 kPa or 120 psi. Make sure the source pressure is at least 138 kPa (20 psi) higher than the maximum pressure needed during a run. (For a flow mode, the highest pressure typically occurs at the end of the hottest oven temperature ramp.)

   See also Table 4 on page 18.

8 Turn on the Aux EPC pressure channel that controls helium pressure and set to 552 kPa (80 psi). Turn **On** this pressure.

9 Turn on the Aux EPC pressure channel that controls nitrogen pressure and set to 552 kPa (80 psi). Keep this pressure turned off for now.

10 Turn on the Aux EPC pressure channel that controls the purge flow pressure and set to 69 kPa (10 psi). Turn **On** this pressure.

Configure the GC

Configure the gas types.

1 Press [**Config**], then scroll to the correct Aux EPC entry (**Aux EPC 1,2,3**, **Aux EPC 4,5,6**, or **Aux EPC 7,8,9**). See Table 3 on page 7.

2 Scroll to select the gas type for the first Aux EPC channel number installed (**Chan 1 Gas type**, **Chan 4 Gas type**, or **Chan 7 Gas type**) and use the [**Mode/Type**] key to set the gas type connected to the first Aux EPC input fitting to **Helium**.

3 Scroll to select the gas type for the second Aux EPC channel number installed (**Chan 2 Gas type**, **Chan 5 Gas type**, or **Chan 8 Gas type**) and use the [**Mode/Type**] key to set the gas type connected to the second Aux EPC fitting to **Nitrogen**.

4 Scroll to select the gas type for the third Aux EPC channel number installed (**Chan 3 Gas type**, **Chan 6 Gas type**, or **Chan 9 Gas type**) and use the [**Mode/Type**] key to set the final gas type to **Helium**. (Configure the purge gas to match the gas type currently being provided to the GC inlets.)

This completes the installation and configuration of the Helium Conservation Module.

Operating the Programmable Helium Conservation Module

This chapter describes how to use the Programmable Helium Conservation Module on your Agilent 7890B GC.

Overview

The Agilent Programmable Helium Conservation Module provides a fast, efficient way to switch the carrier gas type used by the Agilent 7890B GC Switching the gas type allows you to conserve expensive gases by using a cheaper gas, typically chromatographic grade nitrogen, during GC idle times.

The Helium Conservation Module is intended to deliver carrier gases to the GC on which it is installed.

The 7890B and 7890A+ Sleep/Wake feature

The 7890B and 7890A^{+} GCs provide an instrument schedule to help you conserve resources. Using the instrument schedule, you can create sleep, wake, and conditioning methods that allow you to program resource usage. See the *7890B GC Operation Manual*.

How the Helium Conservation Module works

The Helium Conservation Module is plumbed to both the alternate gas supply and the supply of the normal GC inlet carrier gas, typically helium. The output from the conservation module connects to the inlet carrier gas input (and possibly to the inputs for other devices, such as the EPC module for a purged union). See Figure 5.

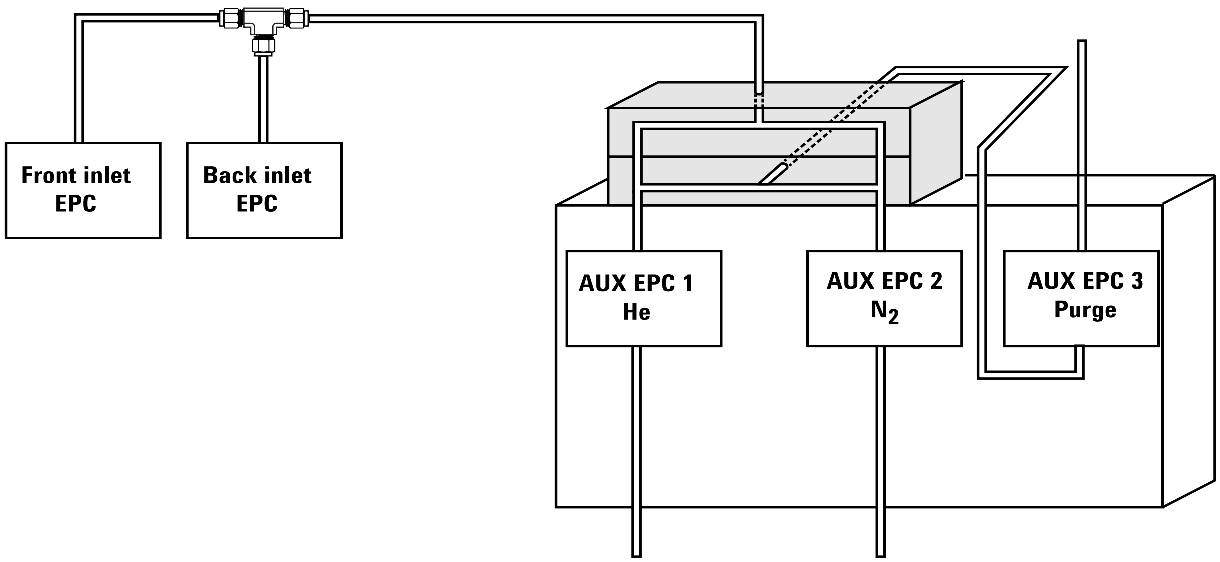


Figure 5 The Programmable Helium Conservation Module

During normal operation, your methods set the conservation module flows to turn off the alternate gas supply. The normal carrier gas supply flows to the inlets and connected devices. See Figure 6.

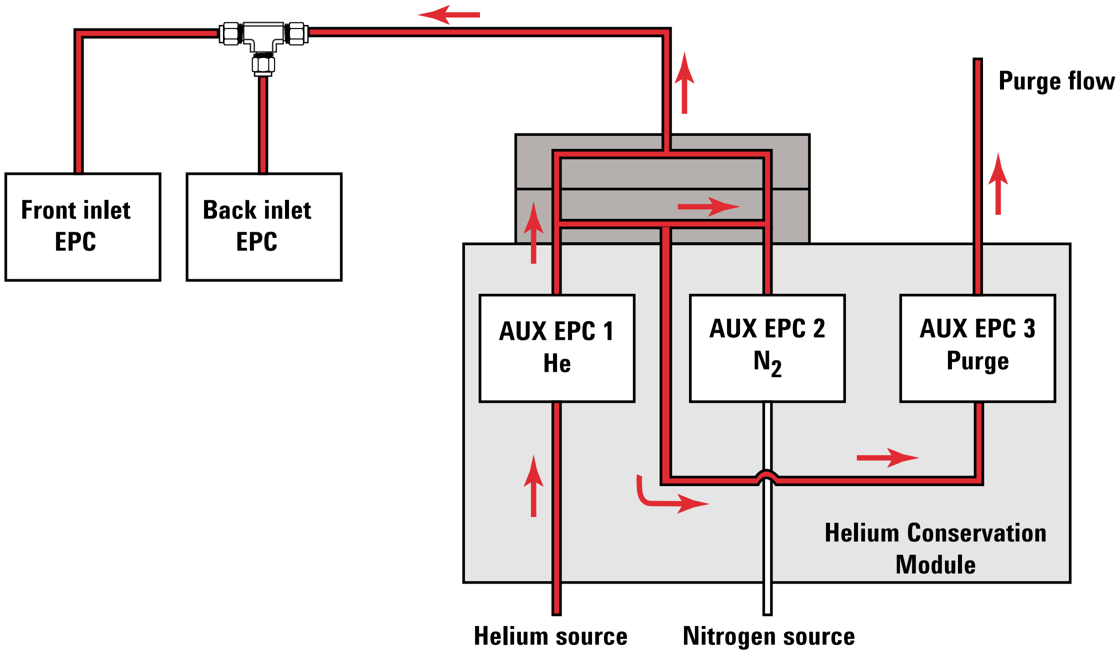


Figure 6 Flows during normal operation

During idle times, use the 7890B GC instrument schedule to put the GC into **Sleep** mode. Program the sleep mode to turn on the alternate carrier gas supply and to switch off the normal (helium) gas supply. During **Sleep** mode, the GC will purge with the alternate carrier gas. See Figure 7.

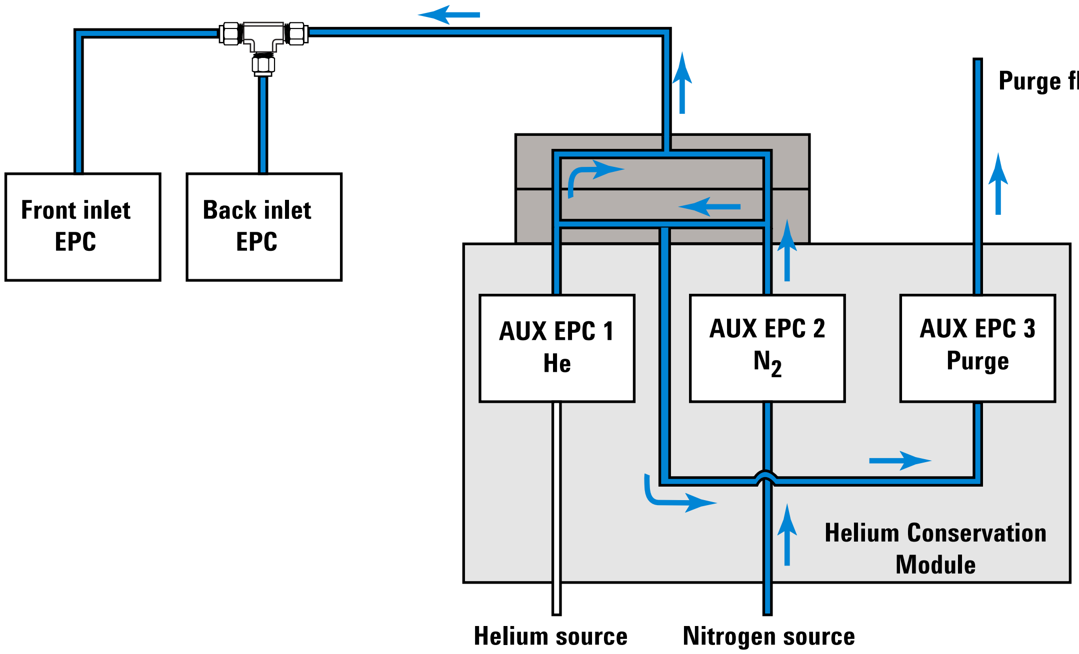


Figure 7 Flows during Sleep

Before the next planned GC usage, awaken the GC to operating normal temperatures, gas types, and flows so it purges residual nitrogen and becomes ready for use. See Figure 6.

How does carrier gas switching differ from the GC Gas Saver feature?

The GC Gas Saver feature reduces split vent flow after the sample has moved onto the column, during and between runs. Because Gas Saver is run-based, it works when the GC is in active use. The GC remains in Gas Saver mode while idle.

The conservation module changes the type of gas flowing through the GC columns when the GC is idle, such as overnight and during weekends.

Both features can work together to help you conserve carrier gas.

Operation

- The Helium Conservation Module requires some small changes to your normal operating procedures.
- Always use clean, chromatographic grade gases as the alternate gas supply. Use of lower grade gases will contaminate your system. See Carrier gas requirements.

Table 4 Carrier gas requirements

Gas type	Purity	Supply pressure at the Helium Conservation Module
Nitrogen (carrier)	99.9995%	620 kPa (90 psi) to 690 kPa (100 psi) (827 kPa or 120 psi maximum)
Helium (carrier)	99.9995%	620 kPa (90 psi) to 690 kPa (100 psi) (827 kPa or 120 psi maximum)

- The Helium Conservation Module works with the energy conservation features of your 7890B GC. For more information about energy conservation on the GC, see the Agilent 7890B GC *Operation Manual*. The Operation Manual provides important information about typical detector stabilization times and other information you need to make a useful instrument schedule.

  The maximum pressure reliably delivered to an inlet can be 138 kPa (20 psi) less than the pressure delivered to the Helium Conservation Module.

General settings for all methods

Because the Helium Conservation Module adds pressure control channels to the GC, you must edit all active methods to include the following settings:

- Set the Helium Conservation Module’s auxiliary pressure controls to **Constant Pressure** mode. Since the module supplies the source gas for other EPC modules, never ramp its pressure.
- Keep the Helium Conservation Module’s purge flow On under all conditions. The purge flow prevents contamination from building within the Helium Conservation Module and tubing.

- With maximum allowable pressure supplied to the Helium Conservation module, the maximum inlet supply pressure is 690 kPa (100 psi). See Carrier gas requirements. The module is not compatible with methods that require higher head pressures. Agilent recommends using the module to provide column head pressures of 552 kPa (80 psi) or less.

Method considerations

Before creating the **SLEEP**, **WAKE**, or **CONDITION** methods as described in “To Program the Helium Conservation Module” below, first consider your application settings and determine the best conservation settings.

Split flow

The GC can accurately control higher flows of helium than of nitrogen. If using a high split flow, so that the inlet total flow is approximately 200 mL/min or higher, set a lower split flow in the sleep method. Always set the total flow < 200 mL/min.

Very clean TCD systems

Typically, 15 minutes of purging with the normal carrier gas is sufficient for most GC detectors and MS systems to return to normal expected operation. However, some TCD applications with a very clean, very stable baseline may require more time to stabilize after returning to the application carrier gas. Very clean and stable TCD systems may need up to 3 hours to completely recover the original baseline. Consider your system and application requirements when setting the instrument schedule. Set the GC wake time to give your system enough time to recover before you plan to use it.

Waking the GC—What method is best?

You can wake the GC to the **WAKE** method, **CONDITIONING** method, the last active method, or to the **CONDITIONING** method followed by one of the other methods. All of these approaches will work with your Programmable Helium Conservation Module.

A **WAKE** method sets temperatures and flows. The oven temperature program is isothermal since the GC does not start a run. When the GC loads a **WAKE** method, it remains at those settings until you load another method using the keypad, data system, or by starting a sequence.

A **CONDITIONING** method sets flows and temperatures for the duration of the method's oven program. When the program ends, the GC loads either the **WAKE** method or the last active method before sleep, as specified in the instrument schedule. In general, use the **CONDITIONING** method if you want to run an oven ramp on wake, or to specifically control the wake time before loading your analytical method.

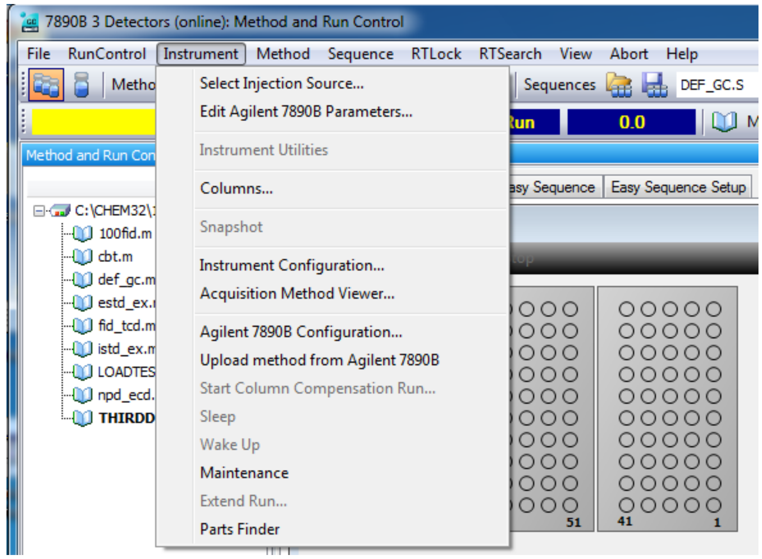
To Program the Helium Conservation Module

The following procedure assumes the use of an Agilent OpenLAB CDS ChemStation Edition data system. **The process is similar if using another Agilent data system or for standalone use.** For standalone use (or for use with a non-Agilent data system) and for details about the instrument schedule, refer to the 7890B GC *Operation Manual*.

This procedure also assumes familiarity with your Agilent data system. Refer to the data system help for more information about its use.

NOTE Your system's Helium Conservation Module may use different numbers for the Aux EPC pressure channels than those described below. See Table 3 on page 7. For the following examples, the Helium Conservation Module is assumed to be installed in the EPC 5 position, as shown in Figure 1 on page 7.

1 Open the data system online session for the GC.
2 If desired, load a method that will be the basis for the **Sleep** method in the Instrument Schedule.
3 Open the Agilent 7890B Configuration dialog. Select **Instrument > Agilent 7890B Configuration**.



4 Select the **Resource Conservation** tab.

5 If desired, click **Synchronize Clocks** to set the GC clock to match the PC clock.

6 From the Instrument Schedule drop-down list, select the desired schedule.

7 Enter the schedule details. When entering the wake times, note that most detectors take about 15 minutes to return to normal after switching from nitrogen back to helium carrier gas. See “Method considerations” on page 19 for more details.

8 If waking to the last active method, or if using a conditioning method, select the appropriate check boxes.

9 Edit the **Sleep** method. Click **Edit Sleep Method**.

   a Click the **Configuration** icon.

   b For the Aux EPC module used for the Helium Conservation Module, set the EPC 3 (purge) gas type to **N2**.

   c For each inlet or other device receiving carrier gas from the Helium Conservation Module, set its gas type to **N2**.

   d Click the **Columns** icon.

   e If needed, click **Show All Flows** to display the Aux EPC flow settings.

   f Set the Aux EPC 1 channel to **Off**. Set the Aux EPC 2 channel (N2) to 552 kPa (80 psi). Leave the Aux EPC 3 channel at 69 kPa (10 psi). Set all Aux EPC channels to **Constant Pressure** mode.

- **g** Click the **Inlets** icon and check the total flows for each inlet. In general, set a low split flow, for example 20 mL/min. Make sure the total inlet flow is < 200 mL/min.
- **h** As desired, you can also reduce temperatures to conserve energy. See the 7890B GC *Operation Manual* for more information.
- **i** Click **Set Sleep Method**.

10 If waking to the **WAKE** or **CONDITION** method, edit the method. Click **Edit Wake Method** or **Edit Conditioning Method**.

- **a** Click the **Configuration** icon.
- **b** For the Aux EPC module used for the Helium Conservation Module, restore the EPC 3 (purge) gas type to **He**.
- **c** For each inlet or other device receiving carrier gas from the Helium Conservation Module, restore its gas type to **He**.
- **d** Click the **Columns** icon.
- **e** Set the Aux EPC 1 channel to **On**, and set the pressure to 552 kPa (80 psi). Set the Aux EPC 2 channel (N2) to Off. Leave the Aux EPC 3 channel at 69 kPa (10 psi). Set all to **Constant Pressure** mode.
- **f** Click the **Inlets** icon and enter the desired flows for each inlet.
- **g** If setting a conditioning method, edit the oven run time and temperature program to the desired values. Make sure the oven run time is long enough to purge residual nitrogen from the system. See "Method considerations" on page 19.
- **h** Click **Set Wake Method** or **Set Conditioning Method**.

11 Click **OK** on the **Agilent 7890B Configuration** dialog to apply the changes to the GC.

Setup is complete. The GC will now follow the programmed instrument schedule.

Refer to the data system's online help for more information about using the software.

Other Uses

With a few modifications, the Programmable Helium Conservation Module can also be used to switch from hydrogen carrier gas to nitrogen carrier gas during times of inactivity.

WARNING **When using hydrogen carrier gas, to avoid a fire or explosion hazard, always connect the Helium Conservation Module purge vent to a fume hood or similar to avoid venting uncombusted hydrogen gas. Read the 7890B GC Safety Manual for additional information.**

To use the Helium Conservation Module for switching hydrogen gas:

- Plumb the hydrogen carrier gas supply to EPC 1 on the module.
- Plumb the nitrogen carrier gas supply to EPC 2 on the module.
- Connect the Programmable Helium Conservation Module purge vent to a fume hood

Operation for hydrogen-nitrogen switching is similar to operation when switching between helium and nitrogen. Use the instrument schedule to switch to inert nitrogen flow when the system is not in use.

Troubleshooting and Tips

If using a conditioning run, you can use higher than normal column flows to help clean out the system faster. The WAKE or CONDITIONING method can also save helium by using lower split flows.

Troubleshooting

If the system becomes Not Ready or goes into a flow shutdown:

- Check gas supplies.
- Check the split flows. The GC can control total nitrogen flows up to approximately 200 mL/min. Reduce the split flow.
- Check the gas pressures delivered to the Helium Conservation Module. The module needs at least 690 kPa (100 psi) to be able to accurately deliver 552 kPa (80 psi) to the inlet EPC modules. The maximum allowable delivery pressure to the module is 827 kPa (120 psi), which would provide a maximum inlet source pressure of 690 kPa (100 psi). For systems with large gas demands, you may need to further lower the total gas usage of the system during sleep times.

Maintenance

There are no user seviceable parts inside the Helium Conservation Module.