29 Installation

Installation at a glance

Tools and supplies for installation

Make sure you have the tools and supplies you need before starting the installation.

Wrenches

- ❒ One 5/16-inch
- ❒ One 3/8-inch
- ❒ Two 7/16-inch
- ❒ One 9/16-inch

Screwdrivers

- ❒ T-10 Torx screwdriver
- ❒ T-20 Torx screwdriver

Tubing

- ❒ Copper tubing, 1/8-inch diameter (1/4-inch diameter if > 15 feet (4.6 m) long)
- ❒ Heavy wall, 1/8-inch diameter stainless steel tubing (for liquid CO_2)
- ❒ Insulated copper tubing, 1/4-inch diameter, (for liquid N_2)
- ❒ Tubing cutter

Fittings

- ❒ 1/8-inch SWAGELOK fittings
- ❒ 1/4-inch SWAGELOK fittings (for liquid nitrogen and valve actuator air tubing)
- ❒ 1/8-inch SWAGELOK Tees
- ❒ Nuts and ferrules

Traps (optional)

- ❒ Preconditioned molecular Sieve 5A moisture trap
- ❒ Hydrocarbon trap
- ❒ Oxygen trap

Other

- ❒ Small, flat-blade screwdriver
- ❒ High-quality electronic leak detector
- ❒ Insulating material (for liquid nitrogen tubing only)

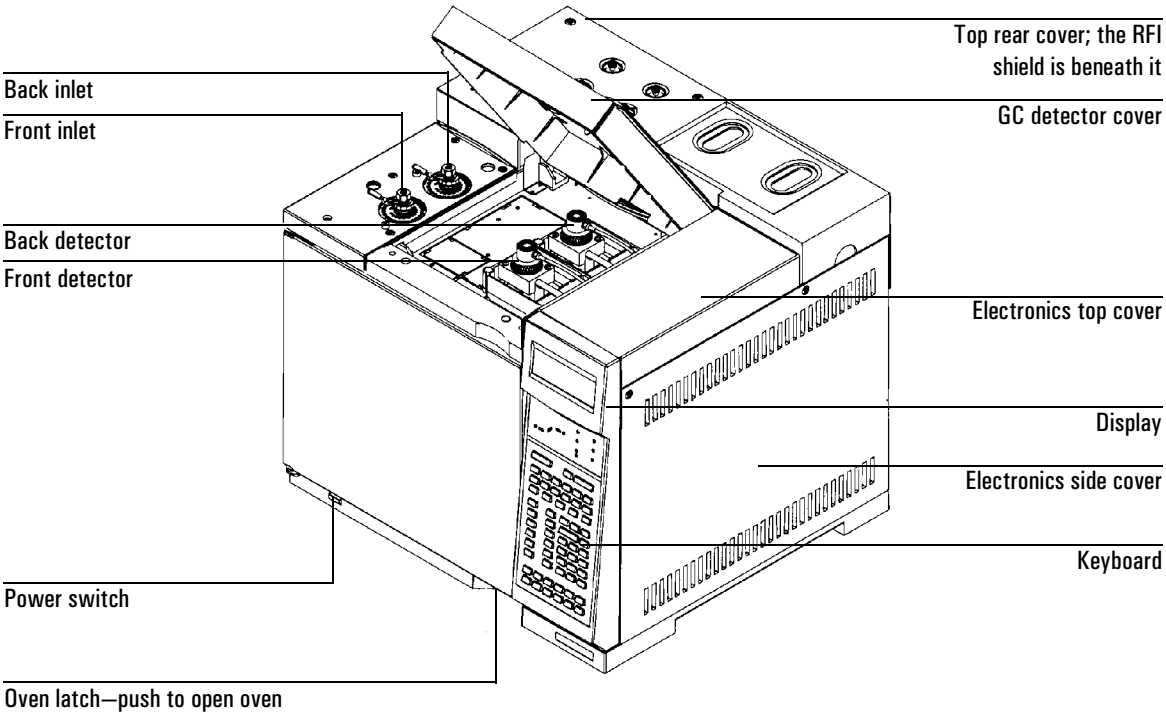


Figure 98. Front view of GC

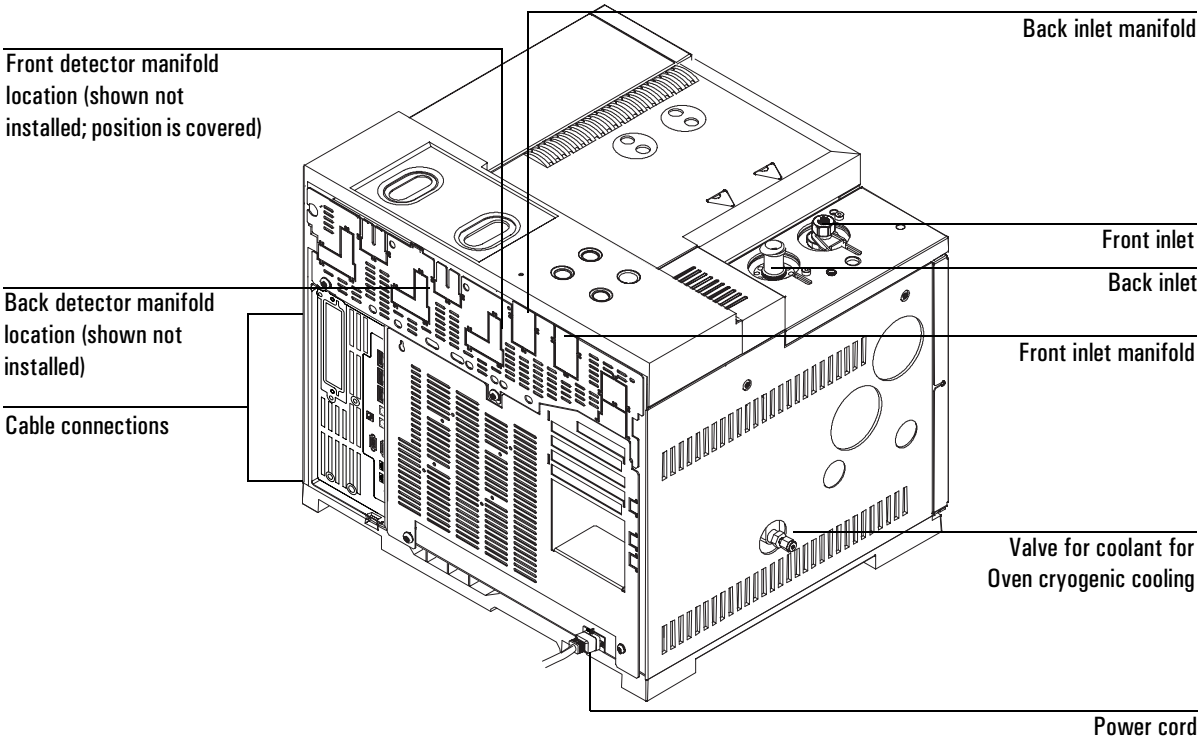


Figure 99. Rear view of GC

Installation

This chapter contains installation procedures for the GC. Most of the installation steps apply to all GC systems—some are optional, such as plumbing for cryogenic cooling and valve actuator air. Instructions are provided for connecting cables from the GC to other instruments in a typical 6890 system. In addition, information about configuring the GC and other instruments is provided.

Most of installation involves plumbing gas to tanks, traps, and manifolds. SWAGELOK™ fittings are used to make leak-tight connections. If you are not sure how to make a SWAGELOK connection, see "Making SWAGELOK Connections" for instruction.

The installation steps assume you need less than 15 feet (4.6 m) of 1/8-inch gas supply tubing for each gas source. For longer installations, use 1/4-inch tubing and appropriate hardware and reducer fittings.

WARNING Hydrogen is a flammable gas. If hydrogen or any other flammable gas is used, periodic leak tests should be performed. Be sure that the hydrogen supply is off until all connections are made, and insure that the inlet fittings are either connected to a column or capped at all times when hydrogen gas is present in the instrument.

Substituting parts or performing any unauthorized modification to the instrument may result in a safety hazard.

The insulation around the inlets, detectors, valve box, and the insulation cups is made of refractory ceramic fibers (RCF). To avoid inhaling RCF particles, we recommend these safety procedures: ventilate your work area; wear long sleeves, gloves, safety glasses, and a disposable dust/mist respirator; dispose of insulation in a sealed plastic bag; wash your hands with mild soap and cold water after handling RCFs.

Step 1. Unpacking the GC

1. Inspect the shipping containers for damage. If a container is damaged or shows signs of stress, notify both the carrier and your local Agilent office.

   Keep all shipping materials for inspection by the carrier.

2. Check the items received against the packing lists. If there are discrepancies, notify your local Agilent office immediately.

   Keep the shipping containers until you have checked their contents for completeness and verified instrument performance.

Step 2. Placing the GC system on the benchtop

The GC requires a benchtop that can support its weight plus that of other equipment you will use with it. Table 70 on page 675 lists some typical weight data. The area must be free of overhanging obstructions that might interfere with cooling and limit access to the top of the instrument.

WARNING Be careful when lifting the GC. Because it is heavy, two people should lift it. When moving the GC, be aware that the back is heavier than the front.

Materials needed:

❒ Oven exhaust deflector, part no. 19247-60510 (optional)

1. Remove the GC from its shipping box.
2. Place the GC on the benchtop. Make sure gas and power supplies are accessible. Place other pieces of equipment near the GC as appropriate. See Table 70 on page 675 for suggested benchtop layouts.
3. If space is limited, attach the oven exhaust deflector to the back of the GC as shown below. The deflector hangs from the exhaust vents on four hooks.

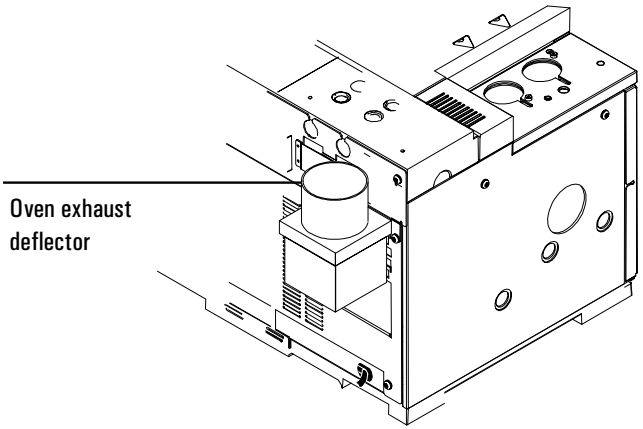


Figure 100. Correct position of the oven exhaust deflector

Step 3. Turning the power on

When you turn the GC on, it runs a series of self-test diagnostics. Run the diagnostics before continuing with the installation to be sure that the instrument electronics are working properly.

1. Verify that the power switch is in the off position.

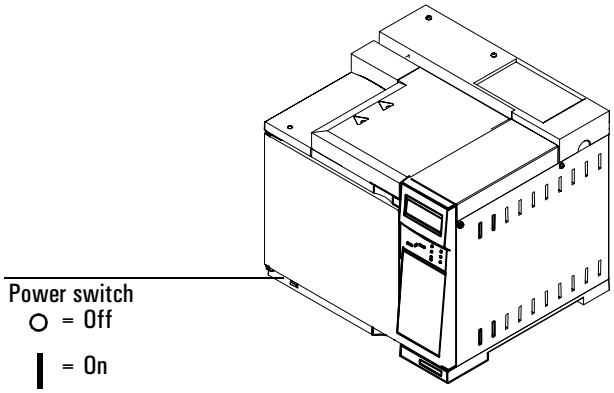


Figure 101. Power switch location

2. Plug the power cord into the back of the GC and power supply. Turn GC on.

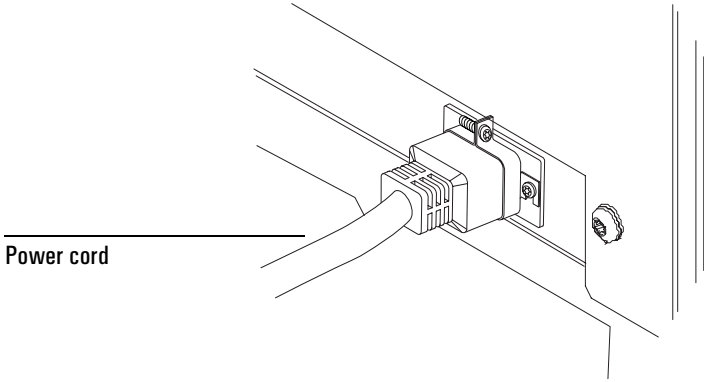


Figure 102. Power cord location

3. The self-test diagnostic tests run automatically. To see the pass/fail message, wait for the test to end and press
   [Oven] [Temp] [On]

   If the screen displays `Power on successful`, turn the GC off and continue with the installation procedure.

   If you do not see this message, turn the GC off and call Agilent service.

Step 4. Connecting tubing to the gas supply tank

Materials needed

- ❒ 1/8-inch preconditioned copper tubing
- ❒ Tubing cutter (part no. 8710-1709)
- ❒ 1/8-inch SWAGELOK nuts, front and back ferrules
- ❒ Two 7/16-inch wrenches

1. Turn off all gases at the source. Determine the length of tubing you need to reach from the gas supply outlet to the inlet manifold on the GC. Take into account any traps or Tee connections you will need.
2. Cut the tubing to length, preferably using a tubing cutter.

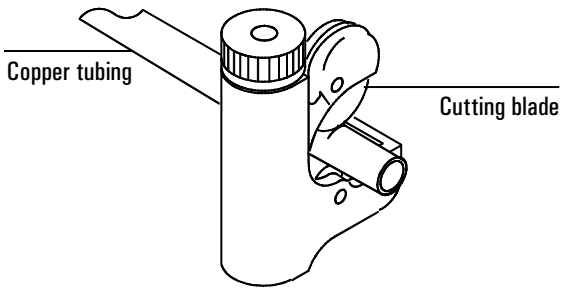


Figure 103. Tubing cutter

3. Connect the tubing to the gas outlet with a SWAGELOK fitting. See "Making SWAGELOK Connections" for information on making SWAGELOK connections.

Step 5. Attaching traps to the gas supply tubing

Materials needed:

- ❒ 1/8-inch preconditioned copper tubing
- ❒ Tubing cutter
- ❒ 1/8-inch SWAGELOK fittings, nuts, and ferrules
- ❒ Two 7/16-inch wrenches and one 1/2-inch wrench
- ❒ Traps

1. Determine where you will install the trap in your supply tubing line. See Figure 104 for the recommended trap order.

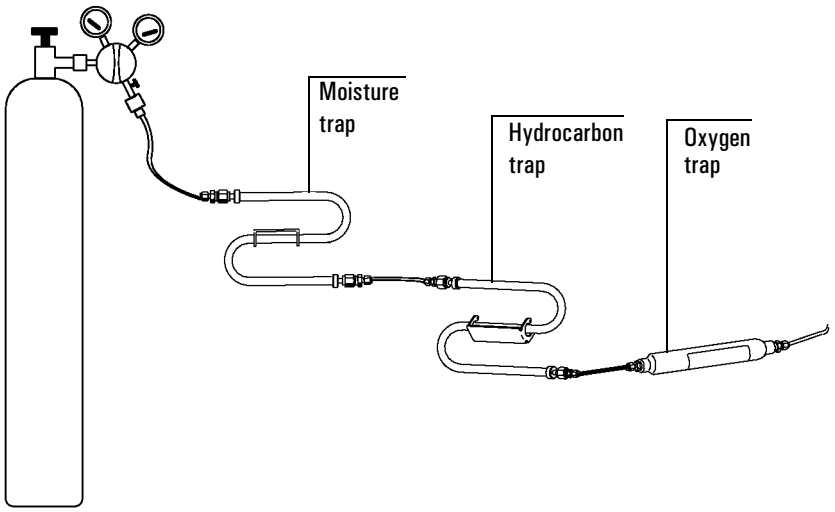


Figure 104. Plumbing diagram

2. Cut the tubing to length using a tubing cutter.
3. Connect the traps and tubing.

Step 6. Attaching a SWAGELOK™ Tee to tubing

If you need to supply gas to more than one inlet or detector module from a single source, use a SWAGELOK ™ Tee near the inlet or detector manifolds.

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

1. Cut the tubing where you want to install the Tee. Connect the tubing and Tee with a SWAGELOK fitting. See Figure 105.

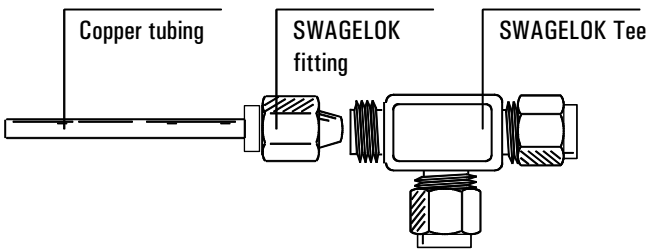


Figure 105. Attaching a SWAGELOK Tee

2. Measure the distance from the Tee to the GC inlets and then attach copper tubing to the open Tee ends with SWAGELOK fittings.
3. You can install a SWAGELOK cap to the open end of a Tee if you do not plan to connect tubing to it immediately.

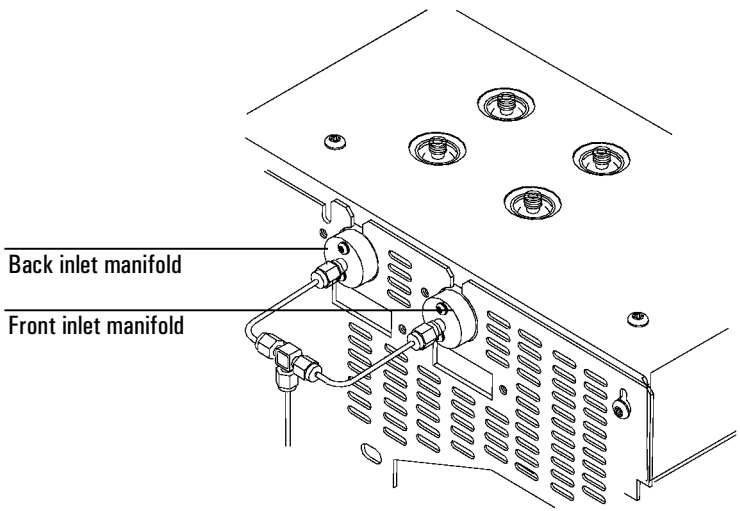
Step 7. Attaching tubing to the inlet manifold

If your GC has EPC inlets, attach the tubing for the gas supply to the inlets on the manifolds on the rear of the instrument. Plumbing for the non-EPC inlets connects inside the pneumatics carrier on the left side of the GC.

Materials needed:

- ❒ 1/8-inch preconditioned copper tubing
- ❒ 1/8-inch SWAGELOK nuts and front and back ferrules
- ❒ Two 7/16-inch wrenches

1. Turn the carrier gas off at its source.
2. Connect the gas supply tubing to the inlet carrier gas manifold with a SWAGELOK nut. See Figure 106.



The GC in this figure has the front and back inlets plumbed with the same carrier gas.

Figure 106. Plumbing the inlet manifolds

Step 8. Attaching tubing to detector manifolds

The gases you connect to a detector depend on the type of detector. The manifolds clearly indicate what types of gas the detectors require and where you should attach the tubing. See the tables on page 680 and for alternative gases for the detector.

This procedure explains how to install gases to the FID. Gases are plumbed to all the detectors in a similar way.

6890 with Electronic Pressure Control

The detector gas inlet fittings are accessible on the instrument back panel.

1. Turn off the gas supplies to be connected at their sources.
2. Each detector gas fitting is labeled. Connect the tubing to the appropriate fitting using a SWAGELOK nut.

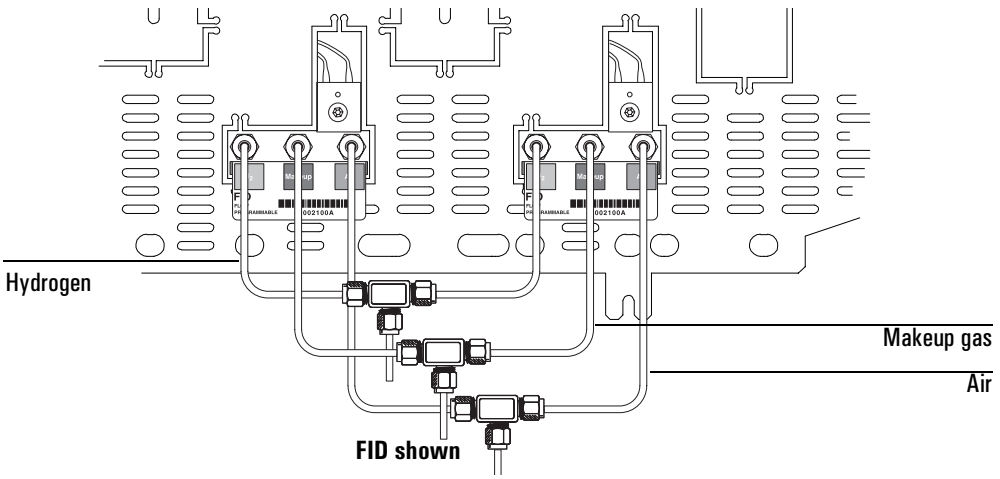


Figure 107. Connecting tubing to an EPC detector

Materials needed:

- ❒ 1/8-inch preconditioned copper tubing
- ❒ Three 1/8-inch SWAGELOK nuts and back and front ferrules sets
- ❒ Two 7/16-inch wrenches

Step 9. Checking for leaks

Liquid leak detectors (Snoop is a common one) are not recommended, especially in areas where cleanliness is very important. If you do use leak detection fluid, immediately rinse the fluid off to remove the soapy film.

WARNING To avoid a potential shock hazard when using liquid detection fluid, turn the GC off and disconnect the main power cord. Be careful not to spill leak solution on electrical leads.

Materials needed:

- ❒ Electronic leak detector (preferred)
- ❒ Leak detection fluid

1. Set the carrier gas pressure at the source (usually tank) regulator to approximately 50 psi.
2. Set the detector gas pressures to the following:
   - Makeup = 50 psi
   - Hydrogen = 50 psi
   - Air = 50 psi
   - TCD reference gas = 50 psi
3. Using the leak detector, check each fitting for leaks.
4. Correct leaks by tightening the connections. Retest the connections; continue tightening until all connections are leak-free.
5. Turn off the inlet and detector gases at the initial supply.

Step 10. Attaching cryogenic liquid supplies

Cryogenic cooling allows you to operate the GC below ambient temperature. A solenoid valve introduces liquid coolant, either CO_2 or N_2, at a rate appropriate to cool the oven to the desired temperature.

The choice of coolant depends largely on how frequently you use cryogenic cooling. You cannot use CO_2 and N_2 interchangeably because they require different valve assemblies. For more information on choosing cryogenic coolant, see "Cryogenic cooling requirements".

Flared or AN tubing fittings are commonly used to connect the liquid supply tubing to the cryo coolant tank. Check with the supplier of the coolant before plumbing to be sure you have the correct fittings.

Attaching liquid carbon dioxide

WARNING Do not use copper or thin-wall stainless steel tubing! Either presents an explosion hazard.

Caution Do not use padded tanks for CO_2 supplies. The cryogenic valve is not designed to handle the higher pressures padded tanks generate.

Materials needed:

- ❒ 1/8-inch heavy-wall, stainless steel tubing
- ❒ Tubing cutter
- ❒ 1/8-inch SWAGELOK nuts and ferrules
- ❒ Two 7/16-inch wrenches

1. Locate the inlet for liquid CO_2 on the **left** side of the GC. Prepare enough tubing to reach from the supply tank to this fitting. See Figure 108.

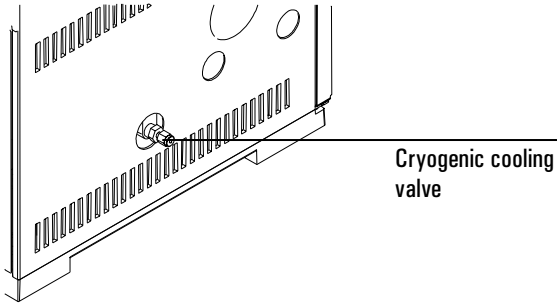


Figure 108. Location of cryogenic cooling valve

2. Connect the supply tubing to the liquid CO_2 tanks outlet with the fitting recommended by the supplier.
3. Use a SWAGELOK fitting to connect the supply tubing to the cryogenic valve inlet.

Attaching liquid nitrogen

Materials needed:

- ❒ 1/4-inch insulated copper tubing
- ❒ Tubing cutter
- ❒ 1/4-inch SWAGELOK fittings, nuts, and ferrules
- ❒ Two 9/16-inch wrenches

1. Position the nitrogen tank as close to the GC as possible to insure that liquid and not gas is delivered to the inlet.
2. Locate the inlet for coolant on the left-hand side of the GC. Prepare enough tubing to reach from the supply tank to this outlet. See Figure 109.

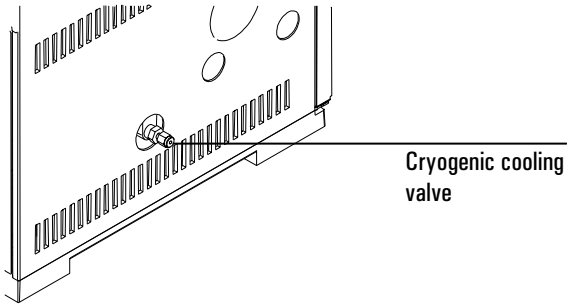


Figure 109. Location of cryogenic cooling valve

3. Connect the supply tubing to the liquid N_2 tank outlet with the fitting recommended by the supplier.
4. Use a SWAGELOK fitting to connect the supply tubing to the cryogenic valve inlet.

Step 11. Attaching valve actuator air

Valves require air to actuate. Valves should have a dedicated air source; they cannot share detector air supplies.

Valve actuator air is supplied through 1/4-inch plastic tubing. If your GC has valves, the plastic tubing will already be attached to the actuators and will extend from the back of the GC.

Caution Route the tubing away from the oven exhaust. The hot air will melt the plastic tubing.

Materials needed:

- ❒ 1/4-inch SWAGELOK fittings and front and back ferrule
- ❒ Two 9/16-inch wrenches

Turn the air off at the source. Use a sharp knife if you need to shorten the tubing. Connect the tubing to the air source using a 1/4-inch SWAGELOK nut. See Figure 110.

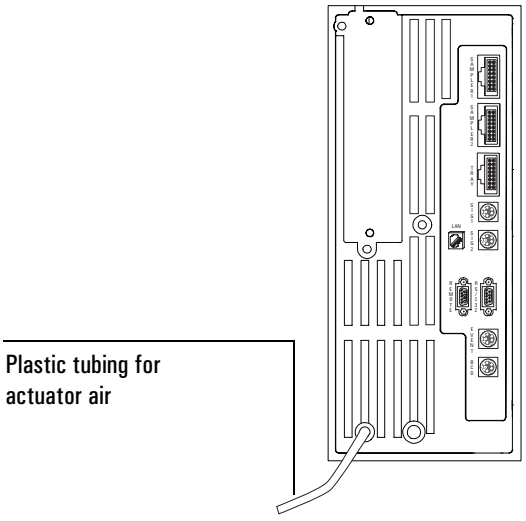


Figure 110. Location of valve actuator air tubing

Step 12. Setting source pressures

The pressure set at a tank regulator depends on these factors:

- The pressure needed to achieve the highest flow rate you intend to use.
  The pressure/flow relationship depends on the column or device involved. The best way to address this is to begin at a moderate pressure level and adjust upward as needed.
- A pressure difference of about 10 psi (138 kPa) across pressure and flow sensing and controlling devices to enable them to work properly.
  This pressure difference requirement is much the same for all sensors and controllers, including flow controllers and pressure regulators.
- The pressure limit of the *weakest* part of the supply system.
  Swagelok fittings and copper tubing are more than adequate for the highest gas pressures encountered in gas chromatography.

  The pneumatics modules of the GC will withstand over 250 psi pressure, but may not function reliably. We recommend a maximum continuous operating pressure of 170 psi to avoid excessive wear and leaks.

  Traps are often the weakest part of the system. They should be labeled, either on the trap itself or in accompanying literature, with a maximum operating pressure. Source pressure must not exceed the *lowest* maximum operating pressure in the supply system.

Suggested starting values of source pressure are:

Gas	Use	Source pressure
Carrier	Packed columns	410 kPa (60 psi)
	Capillary columns	550 kPa (80 psi)
Air	Detectors	550 kPa (80 psi)
Hydrogen	Detectors	410 kPa (60 psi)

Refer to Table 76 for inlet and detector maximum and minimum pressures.

Step 13. Connecting cables

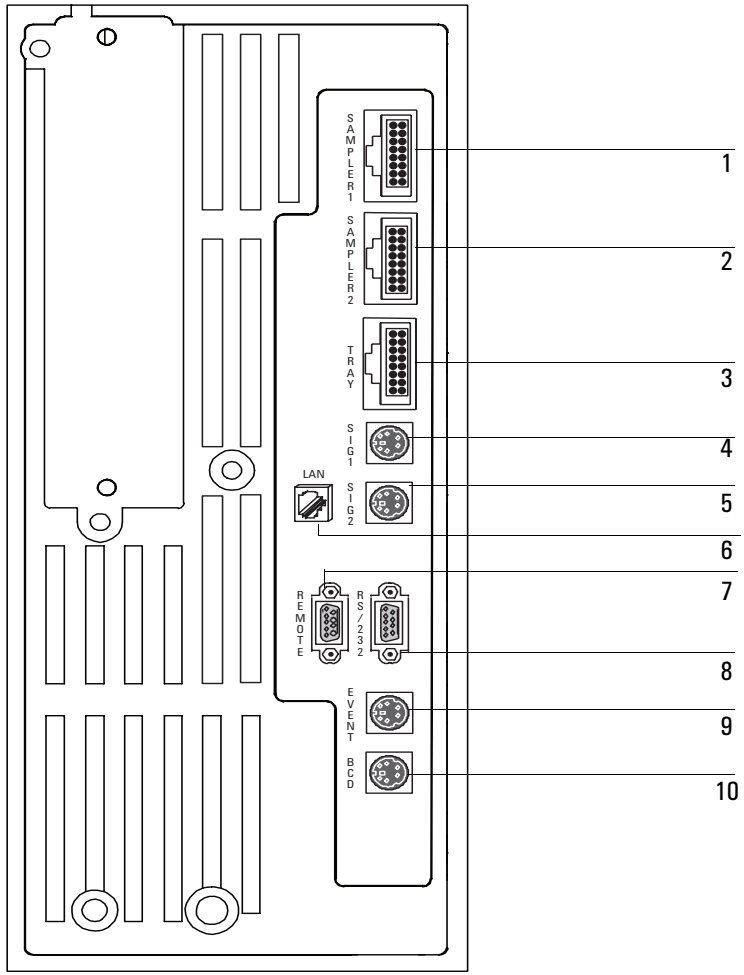
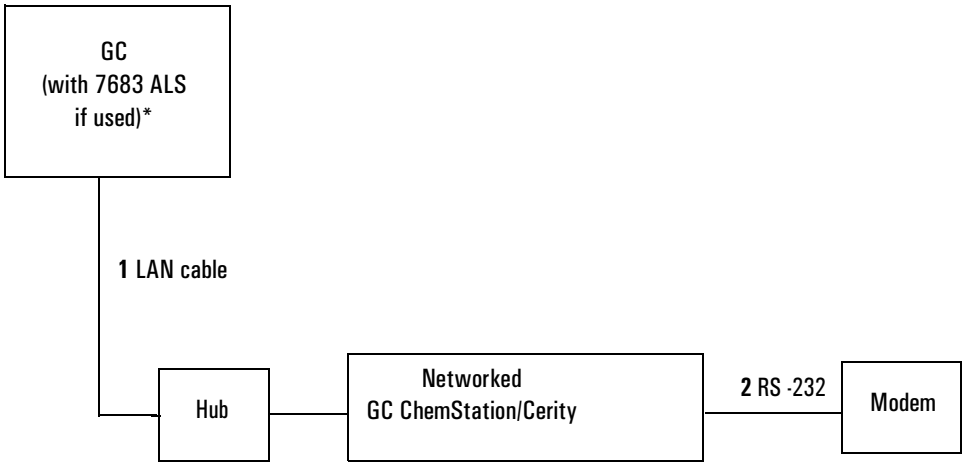


Figure 111. Overview of cable connections on the back of the GC

The GC has an extensive set of communication tools:

- **1, 2 Sampler** Power and communications for a G2613A injector. Use Sampler1 for the front injector.
- **3 Tray** Power and communications for an G2613A tray.
- **4, 5 Analog signal outputs** Two channels of analog data output for use with external signal processors. Each analog output has three voltage ranges.
- **6 LAN** LAN communications
- **7 Remote** Remote port that can be used to synchronize up to ten instruments.
- **8 Modem/RS-232C** For use with modems, computers, and other controller devices.
- **9 External event control** Two passive contact closures and two 24-volt control outputs for controlling external devices. Connected to valve drivers 5 through 8 on the GC.
- **10 BCD** (Binary-Coded Decimal) This connector provides the control relays and a BCD input for a stream selection valve. Does not provide output for use with data handling devices.

There are many system configurations possible with the GC. The figures show two common configurations. See Table 78 and Table 79 for cabling requirements for other combinations. See Figure 112.



* The 7683 controller is internal to the 6890 GC. The G2613A Injector and the 2614 tray plug directly into the GC.

Figure 112. GC—networked GC ChemStation/Cerity—GC Automatic Liquid Sampler

Number	Part no. and description
1	92268 B, LAN cable, Ether twist 4 pair
2	G1530-61120, RS-232/modem cable or 24540-80012, RS-232/modem cable

Table 78. Cabling Requirements

Instrument Connected to	Required Cable(s)	Part no.
7683 Automatic Liquid Sampler	Injector cable is integral Tray cable	 G2614-60610
GC ChemStation	LAN (see below)	
7694 Headspace Sampler	Remote, 9-pin male/6-pin connector	G1290-60570
7695 Purge and Trap Sampler	Remote, 25-pin male/9-pin male	G1500-60820
3395A Integrator	Remote, 9 pin/15 pin Analog, 2 m, 6 pin	03396-61020 G1530-60570
3395B Integrator	Remote, 9 pin/15 pin Analog, 2 m, 6 pin	03396-61010 G1530-60570
3396B Integrator	Remote, 9 pin/15 pin Analog, 2 m, 6 pin	03396-61020 G1530-60570
3396C/3397 Integrator	Remote, 9 pin/15 pin Analog, 2 m, 6 pin	03396-61010 G1530-60570
Non-Agilent Integrator	Analog, 2 m, 6 pin	G1530-60560
35900 C/D/E A/D Converter	Remote, 9-pin male/9-pin male Analog, 2 m, 6 pin	G1530-60930 G1530-60570
Mass Selective Detector	Remote, 2-m, 9-pin male/9-pin male	G1530-60930
Modem	Modem, 9-pin female/9-pin male, or Modem, 9-pin female/25-pin male	G1530-61120, or 24540-80012
Non-Agilent data system	General use remote, 9-pin male/spade lugs External event, 8-pin/spade lugs	35900-60670 (2 m), 35900-60920 (5 m), 35900-60930 (0.5 m) G1530-60590
Non-Agilent instrument, unspecified	External event, 8 pin/spade lugs	G1530-60590
Stream selection valves Gas sampling valves	See documentation accompanying the valve	
LAN	Ether Twist 4 pair	92268B

Table 79. Cabling for Other Instruments in a 6890 System

Instrument 1	Instrument 2	Type of cable	Part no.
Mass Selective Detector	GC ChemStation	LAN	92268B
GC ChemStation	Modem	RS-232	24540-80012, or G1530-61120
7694 Headspace Sampler	GC ChemStation	RS-232, 9-pin female/ 9-pin male	24542U
7694 Headspace Sampler	Integrator	RS-232, 15-pin male/ 9-pin female	03396-60530
7694 Headspace Sampler	Unspecified, non-Agilent instrument	Binary-coded decimal cable	03396-60570
Mass Selective Detector	Purge & Trap or Headspace sampler	Splitter ("Y") cable for remote, 1 male and 2 female connectors	G1530-61200
		Splitter ("H") cable for APG remote, 2 male and 2 female connectors	35900-60800

Cable diagrams

If you connect the GC to a non-Agilent instrument or to the 35900 A-to-D Converter, you must know the function of each wire in the cable. See Table 80.

Analog cable, general use

The GC uses the general use analog cable to communicate with a non-Agilent integrator. The general use cable is also used with non-Agilent detectors. See Figure 113.

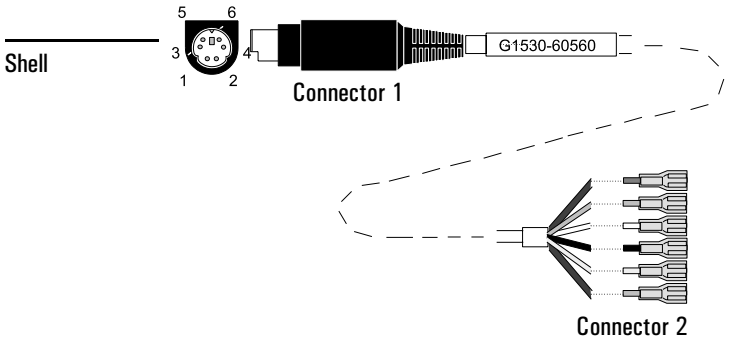


Figure 113. Analog cable, general use (part no. G1530-60560)

Table 80. Analog Cable, General Use Output Connections

Connector 1	Connector 2—Quick connects	Signal
1	Brown or violet	0 to 1 mV (–)
2	White	0 to 1 V, 0 to 10 V(–)
3	Red	0 to 1 mV (+)
4	Black	1 V (+)
6	Blue	10 V (+)
Shell	Orange	Ground

Remote start/stop cable

Two ports are available to remotely start and stop instruments in a loop. For example, you might have an integrator, automatic sampler, and a gas chromatograph connected with Remote cables. You can synchronize a maximum of ten instruments using Remote cables. See Figure 114 and Table 81.

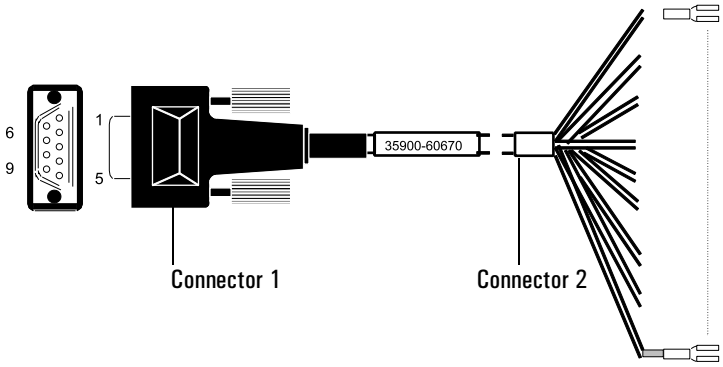


Figure 114. Remote start/stop cables

Table 81. Remote Start/Stop Connections

Connector 1 9 pin male	Connector 2 35900-60670 spade lugs	Signal name
1	Black	Digital ground
2	White	Prepare (low tone)
3	Red	Start (low tone)
4	Green	Start relay (closed during start)
5	Brown	Start relay (closed during start)
6	Blue	Open circuit
7	Orange	Ready (high true input)
8	Yellow	Stop (low tone)
9	Violet	Open circuit

Binary-coded decimal cable

The BCD cable contains eight passive inputs that sense total binary-coded decimal levels. See Figure 115 and Table 82.

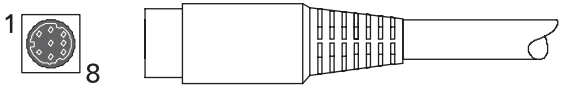


Figure 115. Typical BCD input cable

Table 82. BCD Input Connections

Pin	Function	Maximum rating
1	Relay	48 V AV.DC, 250mA
2	Relay	48 V AC/DC, 250mA
3	LS digit 0	
4	LS digit 1	
5	LS digit 2	
6	LS digit 3	
7	MS digit 0	
8	GND	
Shield	Chassis GND	

External event cable

Two passive relay contact closures and two 24-volt control outputs are available for controlling external devices. Devices connected to the passive contact

closures must be connected to their own power source. See Figure 116 and Table 83.

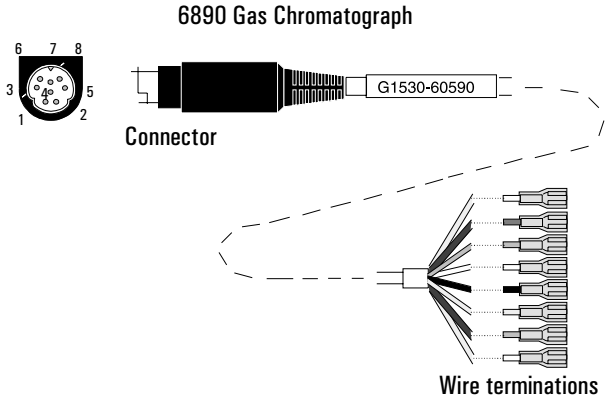


Figure 116. External event cable (part no. G1530-60590)

Table 83. External Event Connections

Connector	Signal name	Maximum rating	Wire terminations	Corresponds to valve #
24 volt control output				
1	24 volt output 1	75 mA output	Yellow	5
2	24 volt output 2	75 mA output	Black	6
3	Ground		Red	
4	Ground		White	
Relay contact closures (normally open)				
5	Contact closure 1	48V AC/DC, 250 mA	Orange	7
6	Contact closure 1		Green	7
7	Contact closure 2	48 V AC/DC, 250 mA	Brown or violet	8
8	Contact closure 2		Blue	8

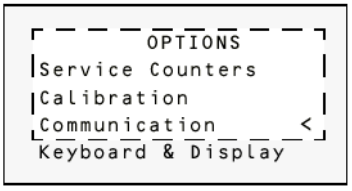
Step 14. Configuring the GC

For network (LAN) operation, you must first configure the GC. You can configure the GC to automatically receive its TCP/IP addressing information from a DHCP name server, or set the address directly at the keyboard.

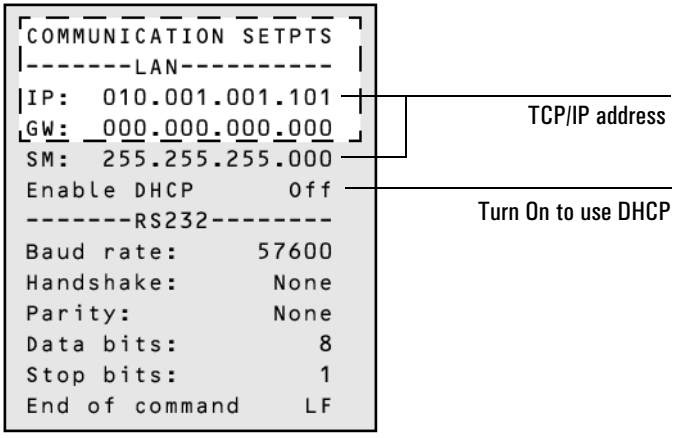
Consult your data system documentation or contact your LAN administrator to determine the appropriate TCP/IP addressing information.

Procedure: Setting up a LAN configuration

1. At the keyboard, press [Options].



2. From the open control table, scroll to Communication. Press [Enter].
3. **To use DHCP to set the GC's LAN address**, scroll to Enable DHCP and turn it On. The TCP/IP address information disappears. When prompted, turn the GC off then on again to use the new setting.



4. **To set the LAN address at the GC front keyboard**, scroll to Enable DHCP and turn it Off.

   - Enter the TCP/IP address information in the appropriate spaces.
   - Press [Enter] to input each item, or press [Clear] to cancel changes.
   - After each entry, you will be prompted to turn the GC off, then on again. Press any key to clear this message.

   After completing all entries, turn the GC off then on again to use the new setting.