Agilent

Agilent 8860B Gas Chromatograph

Installation and First Startup

Notices

Manual Part Number

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Safety Notices

CAUTION

A CAUTION 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 damage to the product or loss of important data. Do not proceed beyond a CAUTION notice until the indicated conditions are fully understood and met.

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

1 Installing the GC

This section contains installation procedures for the Agilent 8860B GC. Depending on the ordered options, some steps are optional, such as connecting valve actuator gas.

Instructions for connecting cables from the GC to other instruments in a typical 8860B Series system are included here, in **Cabling Diagrams and Remote Start/Stop**.

Overview of Installation

Purpose of this procedure

This procedure ensures that instruments and systems are installed and functioning as designed. Correct installation is the first step in ensuring that instruments and systems operate reliably over their lifetimes.

Customer responsibilities

1. Make sure your site meets the basic requirements, including the necessary space, electrical outlets, gases, tubing, operating supplies, consumables and other usage-dependent items, required for a successful installation. Refer to the *Agilent GC, GC/MS, HS & ALS Site Preparation Guide*.
2. If Agilent is delivering installation and introduction services, users of the instrument should be present throughout these services; otherwise, these users will miss important operational, maintenance, and safety information.

Additional information is available via the Browser Interface help & information suite.

About Agilent's installation service

The installation service does not include:

- Network setup with other computers, or to the site or building LAN.
- Customization of the system.
- Method development and testing.
- Analysis of customer standards or samples.
- Testing against the instrument performance specification.

If you need assistance beyond this installation service, please contact your local Agilent office. Assistance with installation and with user-specific services and applications is available and will be contracted separately. Contact Agilent at www.agilent.com/en/contact-us/page.

Tools and additional parts required

Installation requires the following tools, fittings, and hardware. **These items are not included with the instrument.**

- Precleaned copper tubing, 1/8-inch or 1/4-inch od.
- Fittings.
- Tubing cutter.
- Filters for gas supplies.
- 7/16-inch and 9/16-inch wrenches for assembling Swagelok fittings.
- Carrier and other gas supplies.

- Pressure regulator for each gas supply.
- A computer, tablet, or other LAN capable device (for accessing GC user information and for updating GC firmware when needed).
- Any additional LAN components, such as cables and a switch or hub, for connection to the site LAN (not included in Agilent installation services).

The Agilent 8860B Gas Chromatograph *Site Preparation Guide* contains a listing of Agilent installation kits and a description of parts included with each kit. These kits contain filters, fittings, tubing, tools (wrenches, tubing cutter, drivers, and so on), and other required parts for installing a GC.

Performing checkout

Checkout can be performed using the Browser Interface, if desired, via the **System Checkout** diagnostic test.

If using an Agilent data system, you can perform the checkout procedure from the data system. Read these GC installation instructions and the instructions for installing the data system.

System installation

If installing an ALS, the ALS can be used for checkout. Refer to the ALS installation documentation for details.

When installed as part of a complete system including an Agilent data system (for example, Agilent OpenLab CDS), first install the GC up to the checkout column bakeout step (see **Install the checkout column**). Once the bakeout ends, configure the new GC in the data system and open the online instrument session. Use the data system to perform the checkout test.

When installed as part of other complete systems, for example in an Agilent GC/MSD or GC/MS system, refer to the installation instructions for that system.

Configuring the GC

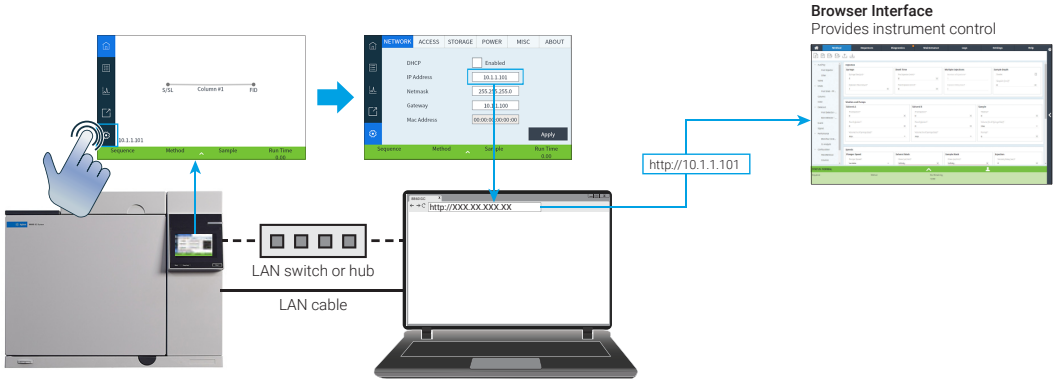
To configure the various components of your GC, you must access the Browser Interface from a computer on the same network as your GC. For more information about connecting to the Browser Interface, see **Connecting to the Browser Interface**.

To access the copy of this manual stored on your GC, enter **`http://<your GC's IP address>/install`** into the web browser of your choice.

Connecting to the Browser Interface

To connect to the GC using a browser:

1. If you do not know the GC's IP address or host name, use the touchscreen to find it. Select ⚙ **(Settings)> NETWORK**.



2. Open a web browser. Supported browsers include Chrome, Safari (on a tablet), and Edge. Make sure the browser version is up to date.
3. Enter **`http://xxx.xxx.xxx.xxx`**, where **`xxx.xxx.xxx.xxx`** is the GC's IP address. (If using a host name, enter it instead.) In this example, the GC IP address is **`10.1.1.101`**. Accessing the Browser Interface only requires that the tablet or computer be connected to the same gateway as the GC; no internet connection is required.

The 8860B GC

Figure 1. Front of the GC

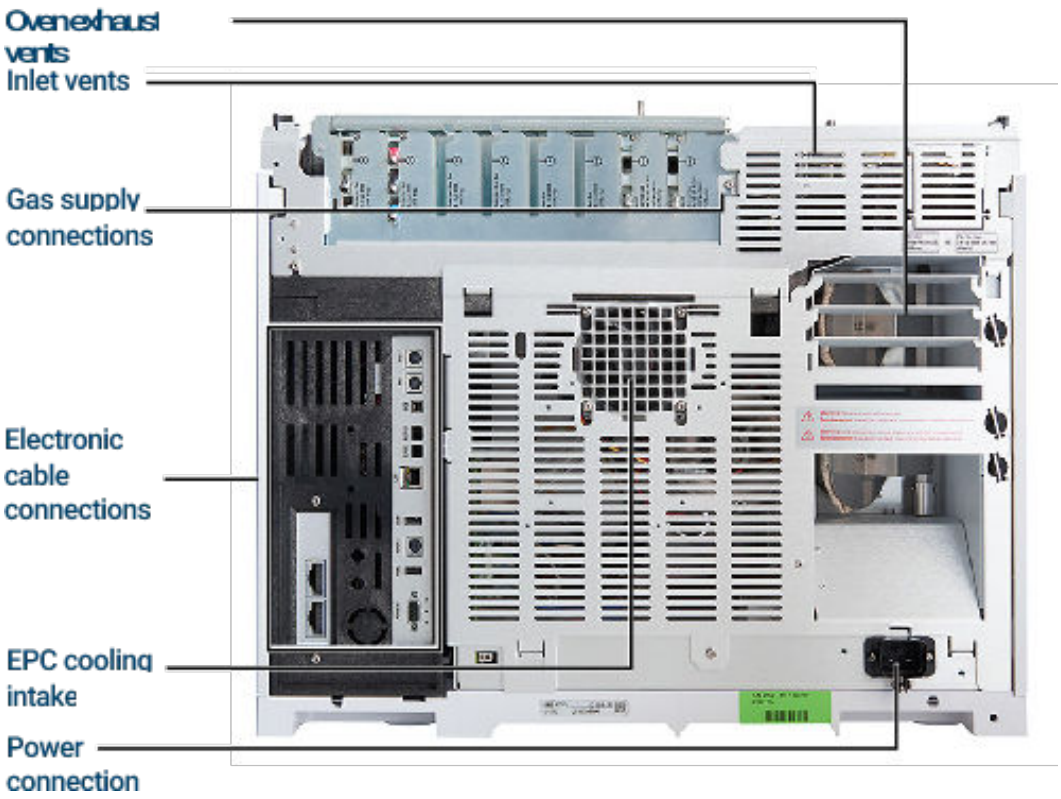
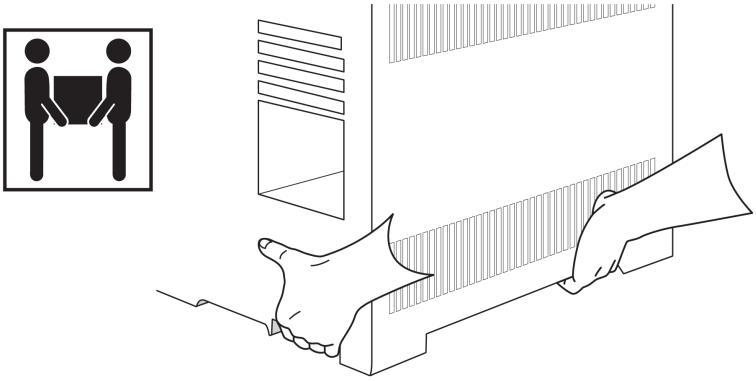


Figure 2. Back of the GC

Unpacking

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.

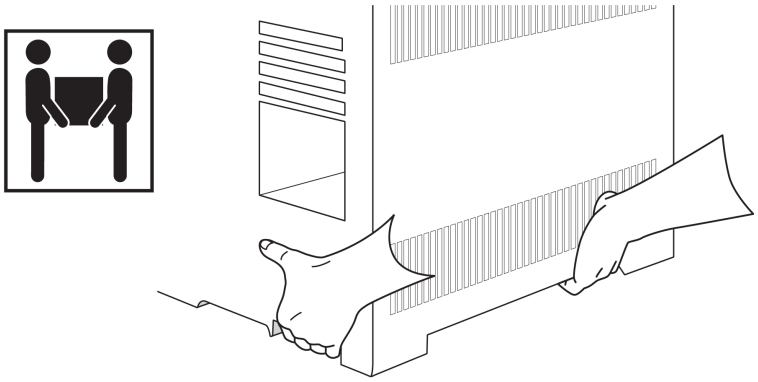


1. Inspect the shipping containers for damage.
2. If a container is damaged or shows signs of stress, do the following:
   a. Notify both the carrier and your local Agilent sales office.
   b. Keep all shipping materials for inspection by the carrier.
3. Check the items received against the packing lists.
4. If there are discrepancies, notify your local Agilent sales office immediately.
5. Retain the shipping containers until you check their contents for completeness and verified instrument performance.

Place the GC on the bench

The GC requires a bench that can support its weight plus that of other equipment you will use with it. The area must be free of overhanging obstructions that might interfere with autosamplers, or that limit access to the top of the instrument. The area must include sufficient space behind the GC to allow for cooling. Refer to the *GC, GC/MS, HS & ALS Site Preparation Guide* for information.

1. Remove the GC from its shipping box.



2. Place the GC on the bench top. Make sure gas and power supplies are accessible. Place related equipment near the GC.

WARNING **The GC requires a two person lift.**

WARNING **The power cord is the power disconnect device. Do not position the instrument such that access to the coupler or plug is obstructed.**

CAUTION **Make sure your GC has adequate distance from the wall and other instruments.**

3. If space is limited behind the GC, attach the optional oven exhaust deflector to the back of the GC as shown below. (Order Option 306 or part number G3450-81650.) The deflector hangs from the exhaust vents on four hooks.

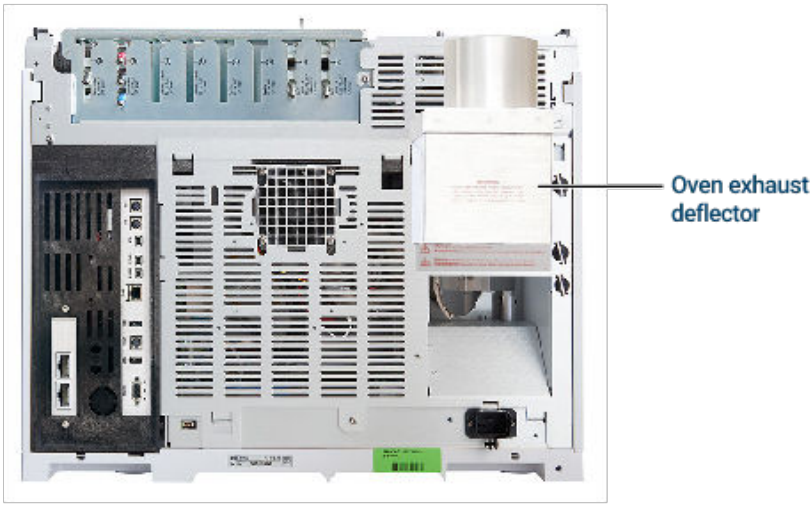


Figure 3. Correct position of the oven exhaust deflector

The oven exhaust deflector accepts a 10-cm (4 in.) diameter exhaust duct, and adds about 13 cm to the depth of the GC, but this additional depth does not increase the depth required for proper ventilation.

Verify line voltage, voltage settings, and power cord

1. Locate the power label near the power cord connector on the back of the GC. Compare the instrument power settings with the laboratory line voltage. See **Power consumption**.
2. Verify that the power cord is correct for the voltage and location. See **Common instrument power cord plugs**.

WARNING

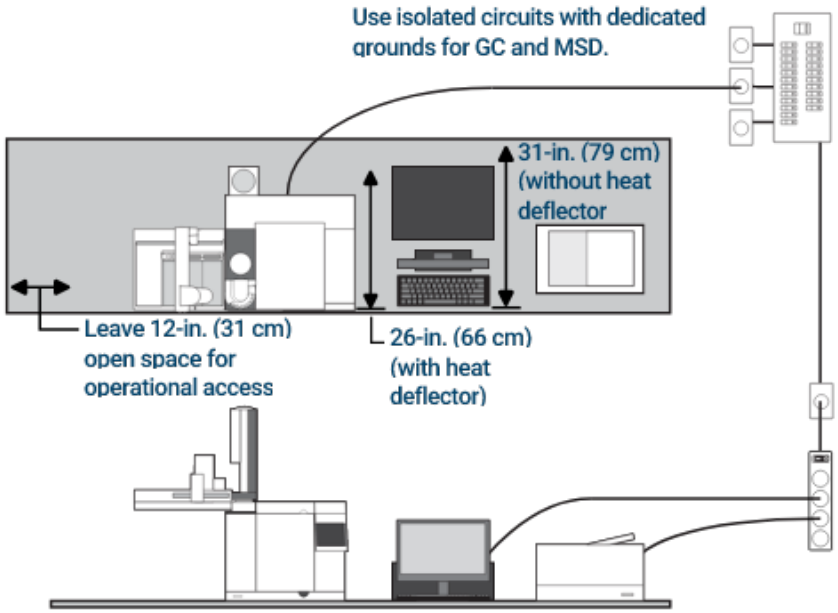
Electrical shock hazard. To avoid injury, only a qualified person should measure line voltage.

3. Have a qualified person measure the actual power outlet voltage and verify that it meets the tolerance requirements listed in **Line voltage**. See also **Grounding**.

The following sections detail the power specifications and requirements for reference.

Line voltage

Typical GC System - 8860B GC with computer and printer.



WARNING

To protect users, the metal instrument panels and cabinet are grounded through the three-conductor power line cord in accordance with International Electrotechnical Commission (IEC) requirements.

A proper earth ground is required for GC operations. Any interruption of the grounding conductor or disconnection of the power cord could cause a shock that could result in personal injury.

Be sure to verify proper receptacle grounding.

WARNING

Do not use extension cords with Agilent instruments. Extension cords normally are not rated to carry enough power and can be a safety hazard.

1. Make sure that each instrument in your GC system can be connected to a dedicated circuit with an isolated ground. (Note that ALS instruments receive their power from the GC.)
2. Power requirements are printed near the power cord attachment on the rear panel of each instrument. Although your GC should arrive ready for operation in your country, compare its voltage requirements with those listed in **Power consumption**. If the voltage option you ordered is not suitable for your installation, contact Agilent.

Power consumption

The number and type of electrical outlets required for installation depends on the size and complexity of your system. A GC system with a computer, monitor, printer, and hub requires 5 outlets. **The outlet for the GC must be a dedicated circuit.**

Each GC has a label near the power cord connector that lists its line voltage requirements. See the examples below.

The GC power consumption and requirements depend on the type of oven that you ordered and the country the unit shipped to. Fast oven options 002 and 003 require more power than the standard oven.

See your Site Preparation Guide for a list of the power cords available for the GC. If your power cord is incorrect, order the cord appropriate for the country.

Table 1. Power requirements

Product	Oven type	Line voltage (VAC)	Frequency (Hz)	Power Rating (VA)	Current rating (amps)	Power outlet current rating
8860/8860B GC	Standard	100 single phase (−10% / +10%)	48–63	1500	15	15 Amp Dedicated
8860 GC	Standard	120 single phase (−10% / +10%)	48–63	2250	18.8	20 Amp Dedicated
8860 GC	Standard	220/230/240 single phase (−10% / +10%)	48–63	2250	10.2/9.8/9.4	10 Amp Dedicated
8860 GC	Standard	200 single phase (−10% / +10%)	48–63	2250	11.2	15 Amp Dedicated
8860B GC	Standard	120 single phase (−10% / +10%)	48–63	2350	19.6	20 Amp Dedicated

Product	Oven type	Line voltage (VAC)	Frequency (Hz)	Power Rating (VA)	Current rating (amps)	Power outlet current rating
8860B GC	Standard	220/230/240 single phase (−10% / +10%)	48–63	2350	10.7/10.2/9.8	10 Amp Dedicated
8860B GC	Standard	200 single phase (−10% / +10%)	48–63	2350	11.8	15 Amp Dedicated
MSD						
5975 Series MSD		120 (−10% / +5%)	50/60 ± 5%	1100 (400 for foreline pump only)	8	10 Amp
5975 Series MSD		220–240 (−10% / +5%)	50/60 ± 5%	1100 (400 for foreline pump only)	8	10 Amp
5975 Series MSD		200 (−10% / +5%)	50/60 ± 5%	1100 (400 for foreline pump only)	8	10 Amp
5977 Series MSD		120 (−10% / +5%)	50/60 ± 5%	1100 (400 for foreline pump only)	8	10 Amp
5977 Series MSD		220–240 (−10% / +5%)	50/60 ± 5%	1100 (400 for foreline pump only)	8	10 Amp
5977 Series MSD		200 (−10% / +5%)	50/60 ± 5%	1100 (400 for foreline pump only)	8	10 Amp
MS						
7010 or 7000 Triple Quad MS		120 (−10% / +5%)	50/60 ± 5%	1600	15	15 Amp Dedicated
7010 or 7000 Triple Quad MS		220–240 (−10% / +5%)	50/60 ± 5%	1600	15	15 Amp Dedicated
7010 or 7000 Triple Quad MS		200 (−10% / +5%)	50/60 ± 5%	1600	15	15 Amp Dedicated
HS						
7697A Headspace		Americas: 120 single phase (−10% / +10%)	50/60 ± 5%	850	6.2	15 Amp
7697A Headspace		200/220/230/240 single/split phase (−10% / +10%)	50/60 ± 5%	850	3.8/3.4/3.3/3.1	10 Amp
8697 Headspace		100/120 single phase (−10% / + 10%)	50/60	850	6.2	15 Amp

Product	Oven type	Line voltage (VAC)	Frequency (Hz)	Power Rating (VA)	Current rating (amps)	Power outlet current rating
8697 Headspace		200/220/230/240 single/split phase (−10% / +10%)	50/60	850	3.8/3.4/3.3/3.1	10 Amp
All						
Data system PC (monitor, CPU, printer)		100/120 (−10% / +5%)	50/60 ± 5%	1000	10/8.3	15 Amp Dedicated
Data system PC (monitor, CPU, printer)		200/240 (−10% / +5%)	50/60 ± 5%	1000	4.1-5	10 Amp Dedicated

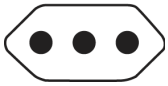
Notes

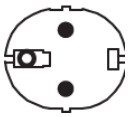
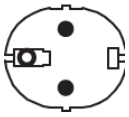
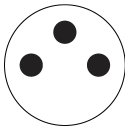
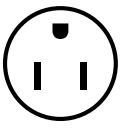
1. Some US labs have 3 phase service resulting in 208 V at the wall receptacle. It is important for a qualified person to measure the line voltage at the receptacle for the GC. Option 003, 208 V fast oven, uses a 220 V unit with operating range of 193 to 231 V.
2. Use of power line conditioners is not recommended for Agilent GC and GC-MS systems. Doing so may cause damage to the equipment. If a UPS is required due to poor power quality or as backup power, please request UPS selection guidance from Agilent.

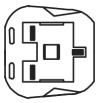
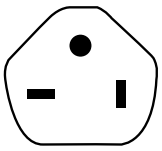
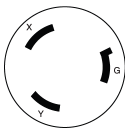
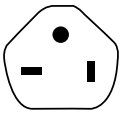
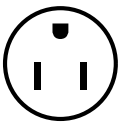
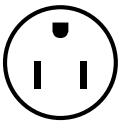
Common instrument power cord plugs

Table 2 shows common Agilent power cord plugs.

Table 2. Power cords

Part number	Country	Voltage	Amps	Cable length (m)	GC connector type	Termination type	Plug
8121-3116 #	Argentina	220	10	2.5	C13	IRAM 2073	
8121-3119	Argentina	220	16	2.5	C19	IRAM 2073	
8121-3115	Australia/ New Zealand	230	10	2.5	C13	AS 3112	
8120-8619	Australia / New Zealand	230	15	2.5	C19	AS 3112	
8121-1809 #	Brazil	220	10	2.5	C13	NBR 14136 BR/3	
8121-3321	Brazil	120/220	16	2.5	C19	NBR 14136 BR/3/20	
8120-6978 #	Chile/Italy	230/220	10	2.5	C13	CEI 23-50	
8121-1084	Chile/Italy	230/220	16	2.5	C19	CEI 23-50	
8121-1766	China	220	16	2.5	C19	GB 1002 GB 2099	
8121-0723	China	220	10	2.5	C13	GB 1002 GB 2099	
8120-8622	Denmark	230	16	2.5	C19	IEC60309	

Part number	Country	Voltage	Amps	Cable length (m)	GC connector type	Termination type	Plug
8121-3112	Denmark	230	10	2.5	C13	SB 107-2-D1 DK2-5a	
8120-4416	Switzerland	230	10	2.5	C13	SEV 1011 SEV 6534/2	
8121-1222	Europe / Korea	220 / 230 / 240	16	2.5	C19	CEE 7/7	
8121-3121	Europe / Korea	220 / 230 / 240	10	2.5	C13	CEE 7/7	
8121-0710	South Africa	230	16	2.5	C19	SANS 164/1	
8121-3118 #	South Africa	230	10	2.5	C13	SANS 164/1	
8121-3201 #	India	230	10	2.5	C13	IS 1293	
8121-3232	India	230	16	2.5	C19	IS 1293	
8121-3111 #	Israel	230	10	2.5	C13	SI 32	
8121-0161	Israel	230	16	2.5	C19	SI 32	
8121-1763	Japan	100	15	2.5	C19	JIS C8303	
8121-2569	Japan	200	15	2.5	C19	NEMA L6-20 Japan	

Part number	Country	Voltage	Amps	Cable length (m)	GC connector type	Termination type	Plug
8120-8620	United Kingdom, Hong Kong, Singapore, Malaysia	220/230	13	2.5	C19	BS1363/A SS145	
8121-3110 #	United Kingdom, Hong Kong, Singapore, Malaysia	230	10	2.5	C13	BS1363/A SS145	
8121-3132	United States/South America (general)	120	20	2.5	C19	NEMA 5-20P	
8121-0075	United States / South America (unspecified)	240	15	2.5	C19	NEMA L6-15P	
8121-3132	Taiwan	110	20	2.5	C19	NEMA 5-20P	
8121-2932 #	Taiwan	220	15	2.5	C13	CNS 690	
8121-2989	Taiwan	220	15	2.5	C19	CNS 690	
8120-0674 #	Thailand and Philippines	220	10	2.5	C13	NEMA 5-15	
8121-1764	Thailand and Philippines	220	15	2.5	C19	NEMA 5-15	

8860B GC only

Grounding

To protect users, the metal instrument panels and cabinet are grounded through the three-conductor power line cord in accordance with International Electrotechnical Commission (IEC) requirements.

When plugged into a properly grounded receptacle, the three-conductor power line cord grounds the instrument and minimizes shock hazard. A properly grounded receptacle is one that is connected to a suitable earth ground. Proper receptacle grounding should be verified.

Make sure the GC is connected to a dedicated circuit.

Connect GC to LAN, Local Computer, or Tablet

If you intend to connect your system to your site's LAN network, you must have an additional shielded twisted pair network cable (8121-0940).

Use a network cable to connect the GC LAN port to your site LAN or directly to a local computer.

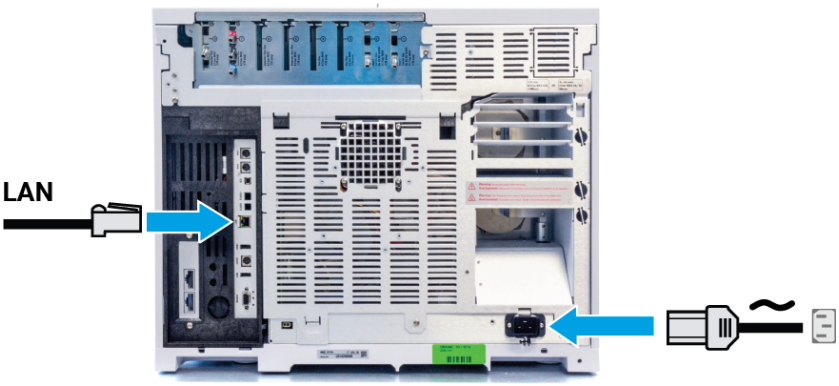


Figure 4. 8860B LAN connection

A single LAN communications cable is supplied with the GC. The switch (or hub) and other cables must be ordered separately, if needed.

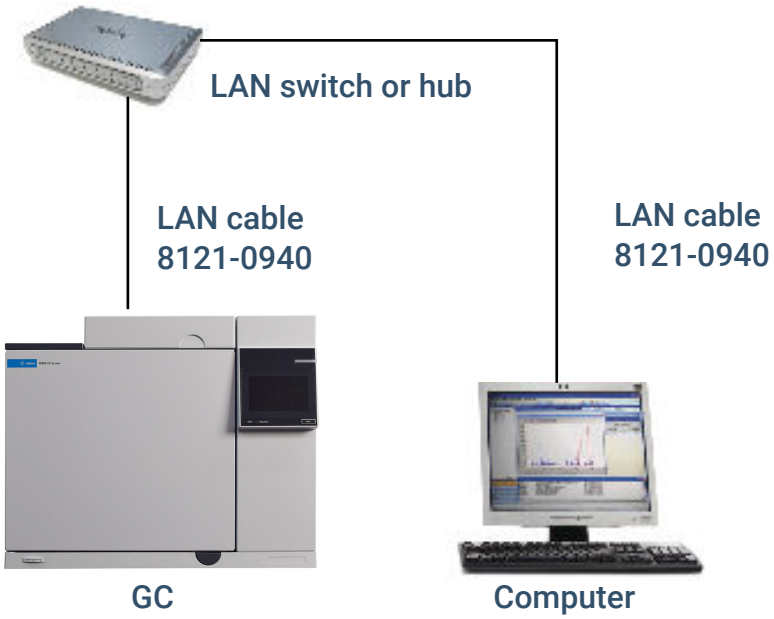


Figure 5. Simple supported LAN configuration: LAN Switch or hub

NOTE

Agilent is not responsible for connecting to or establishing communication with your site LAN network. The Agilent representative will test the system's ability to communicate on a mini-hub or LAN switch only.

Connect the power cord and turn on the GC

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

Figure 6. Power Switch location

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

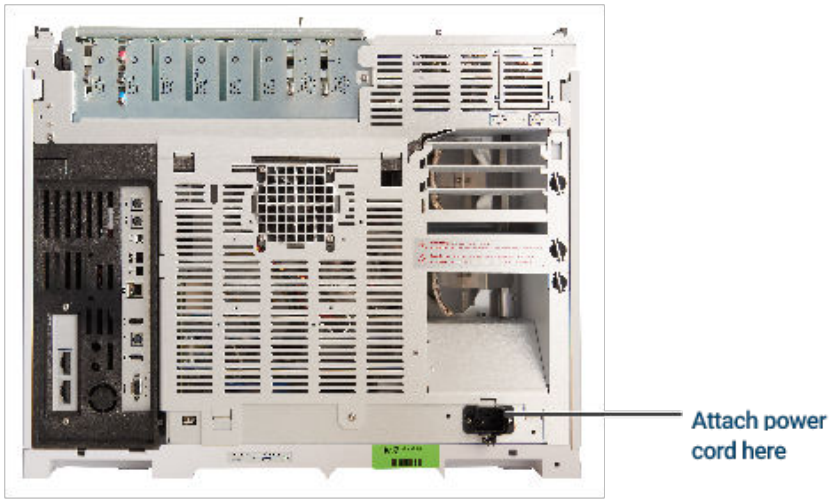


Figure 7. Power cord location

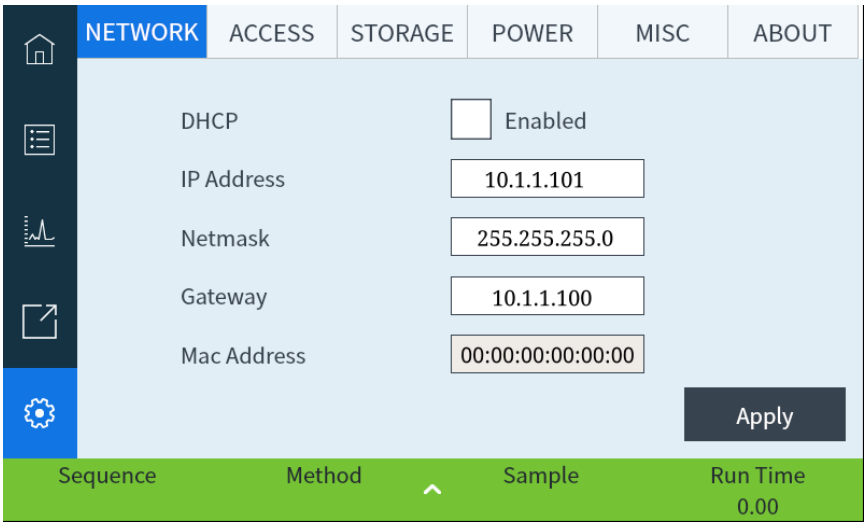
Configure the GC IP address

If you intend to connect your system to your site's network, each piece of equipment must have a unique IP address assigned to it. For an isolated LAN installation, see **Table 3** for typical IP addresses.

Table 3. Typical IP addresses for an isolated LAN

	GC	Computer
IP address	10.1.1.101	10.1.1.100
Subnet mask	255.255.255.0	255.255.255.0

1. Select ⚙ **(Settings) > GC IP**.



2. Enter the GC **IP address**, **Gateway**, and **Net Mask** (subnet mask).

Set the Pressure Units

To set the pressure units used in a given method, select **Method > Configuration > Miscellaneous**, and select the desired pressure units to use in methods.

Configure Carrier Gas Types

Select **Method > Configuration > Modules** and use the dropdown menu to select the Carrier Gas Types connected to your inlets. Repeat for any additional inlets installed in your GC.

Connect Gases and Traps

Plumb the gas sources to the filters and flow modules. 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 instructions.

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 ensure 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.

Install the gas regulators

1. Select the appropriate CGA regulator for each gas type. (In other countries, refer to local standards. See the GC's *Site Preparation Guide* for requirements.)

   Table 4. Gas regulators, 1/8-inch, U.S. only[1]

Description	Part number
CGA 346, 125 psig max (8.6 bar), Air	5183-4641
CGA 350, 125 psig max (8.6 bar), H2, Ar/Me	5183-4642
CGA 540, 125 psig max (8.6 bar), O2	5183-4643
CGA 580, 125 psig max (8.6 bar), He, Ar, N2	5183-4644
CGA 590, 125 psig max (8.6 bar), Air	5183-4645

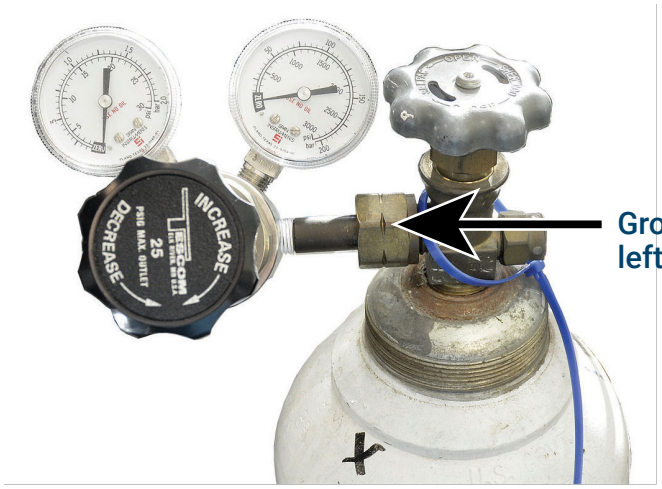
   [1]For 1/4-inch tubing, purchase a 1/4-inch to 1/8-inch adapter, U.S. only.

CAUTION

   Never use a liquid thread sealant on gas fittings. Liquid thread sealants introduce contamination into the GC plumbing.

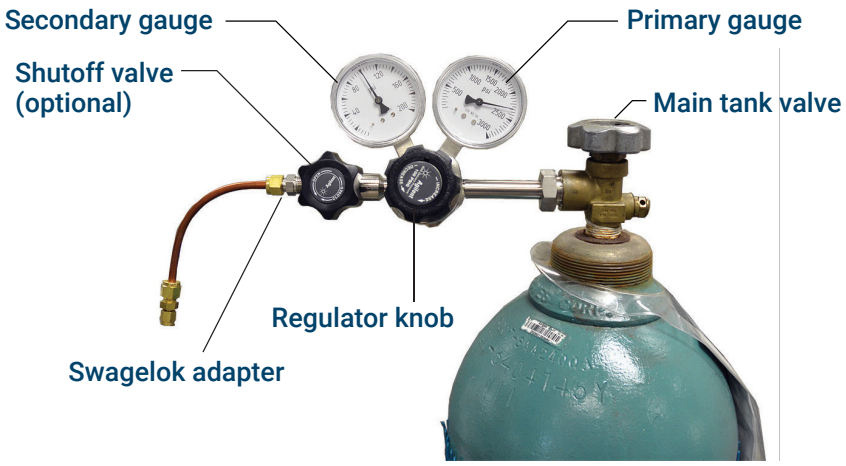
2. Confirm that the outlet fitting of the regulator is 1/8-inch Swagelok. If not, install the appropriate adapter fitting. Wrap the fitting threads using PTFE tape. Wrap the tape in a clockwise direction so that the adapter threads do not unwrap the tape. Be careful to keep the tape away from the end of the fitting. Two to three tightly wound wraps are sufficient. Tighten the Swagelok adapter fitting securely to the NPT pipe thread fitting.

3. Install the regulator onto the compressed gas cylinder main fitting.
   - Check the thread type. Some regulators use left-hand thread fittings. For left-handed threads, the nut will have a groove in it.



4. Purge the air from the regulator by repeating the following procedure 5 times:
   a. Fully close the regulator knob, then open the main tank valve.
   b. Turn the regulator knob fully counter-clockwise to open the tank main valve, pressurizing the primary side of the regulator.
   c. Turn OFF the tank main valve.
   d. Slowly turn the regulator knob clockwise to release (“bleed off”) the gas pressure.
   e. Close the regulator knob.

The image below illustrates a typical pressure regulator installation. In the example shown below, which uses an optional shutoff valve, open the shutoff valve and leave open during purging.



Connect the tubing to the gas source

NOTE

If you need more than 4.5 m (15 feet) of supply tubing to connect to a gas source, use 1/4-inch tubing with appropriate hardware. See the GC's *Site Preparation Guide* for part numbers.

1. Turn off all gases at their sources. Measure the length of tubing needed to connect the gas supply outlet to the inlet fitting on the GC. Take into account any traps or tees you will need.

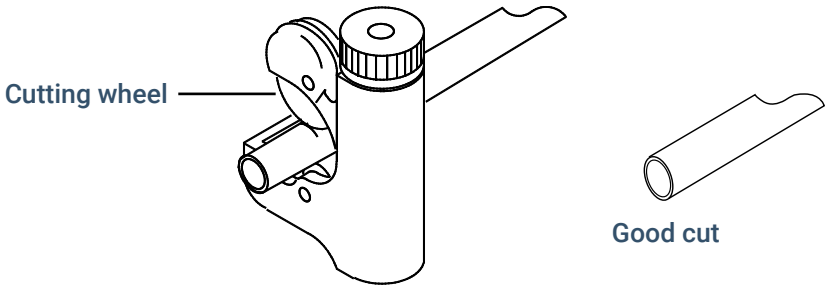


Figure 8. Typical tubing cutter

2. Cut the tubing to length with a tubing cutter. See **Figure 8**.
3. Connect the tubing to the gas source with a Swagelok fitting. See **Making Swagelok Connections**.

Install traps

1. Determine where you will install the traps in your supply tubing line. **Figure 9** shows the recommended trap order for the carrier gas and the recommended locations for On/Off valves. Also see the *Site Preparation Guide*.

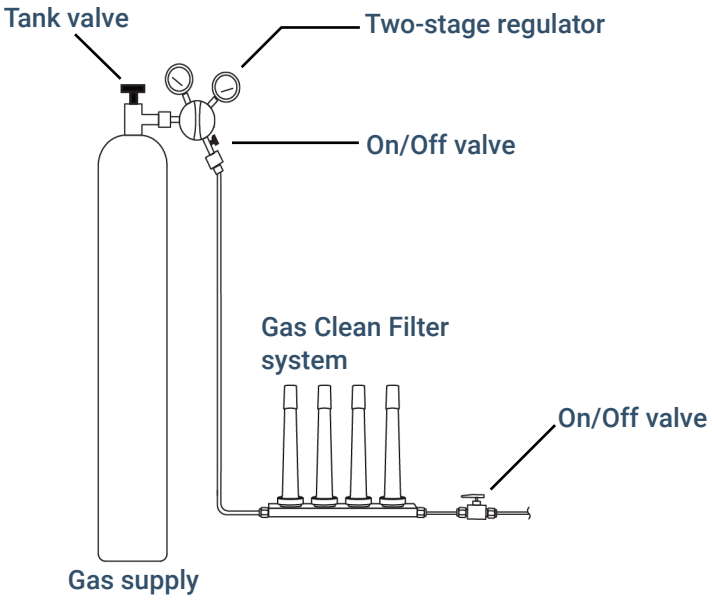


Figure 9. Plumb the gas supplies

2. Cut the tubing to length with a tubing cutter.
3. Connect the traps and tubing. On/Off valves are not essential, but are very useful when a tank or trap must be changed. (If purchasing Agilent compliance services, an on/off valve must be installed for each inlet gas supply.)

Plumb to EPC flow modules

Inlet and detector EPC flow modules are mounted very close together across the back of the GC. See **Figure 10**.

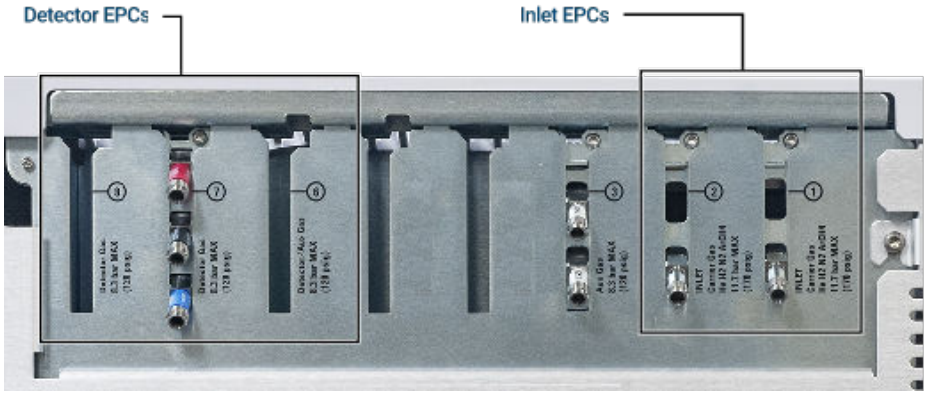


Figure 10. Plumb flow modules

Purge the supply lines for a few minutes before connecting them to the GC flow modules.

Be sure to vent uncombusted hydrogen to a fume hood or other safe location.

When two inlets use the same carrier gas, we recommend using a Tee fitting that includes shutoff valves for performing leak tests.

When two detectors use the same gases, we recommend using a Tee fitting. Shutoff valves are not required.

TCD connections

The carrier gas and reference gas must come from the same source. Because of the close spacing of the EPC modules, the simplest way to do this is to attach lengths of tubing to each input to bring the ends outside the back panel, then join them with a Tee.

Side mounted detector connections

If the GC is equipped with a side-mounted detector, attach the carrier gas to the single gas connection at the back of the side mount enclosure. (An internal Tee feeds the reference gas and input.)

Install Aux EPC module frits for your application

Skip this section if an Aux EPC module is not installed.

The AUX EPC module ships with brown (FID air) restrictors in all channels. For certain applications, you will have to replace this restrictor (frit) so the EPC module can provide flows in the correct ranges. See **Table 5**. Also refer to the other instrument's or application's documentation.

Table 5. G3526-60502 Aux EPC restrictor kit

Description	Qty	Part number	Marking	Flow	Resistance	Often used with
O-rings, 6/pk	1	5181-3344				
Frit	0	G3430-80061	1 ring Brown	400 ± 30 SCCM air @ 40 psig	Low	FID air, purged splitters, Deans switch
Frit	3	G3430-80062	2 rings Red	30 ± 1.5 SCCM H2 @ 15 psig	Medium	FID hydrogen
Frit	3	G3430-80063	3 rings Blue	3.33 ± 0.3 SCCM H2 @ 15 psig	High	NPD hydrogen
Frit	0	G3430-20011	None		Zero (none)	Purged splitter, Deans switch when using backflush

Notes for this table

- Frit G3430-80061 ships in each AUX channel.
- Restrictor kit G3526-60502 is included in the AUX module ship kit.
- Always use new O-rings (orderable part number 5180-4181, O-rings, 12/pk, or part number 5181-3344 (6/pk) in EPC restrictor kit).
- Install tubing and connectors as needed for each additional gas supply required.
- Do not install an external flow restrictor.

Install hydrogen sensor calibration gas

If a G6598A hydrogen sensor is installed in the GC, connect the hydrogen sensor calibration gas (5190-6890). This gas is 2% hydrogen in air. The hydrogen sensor ship kit includes a pressure

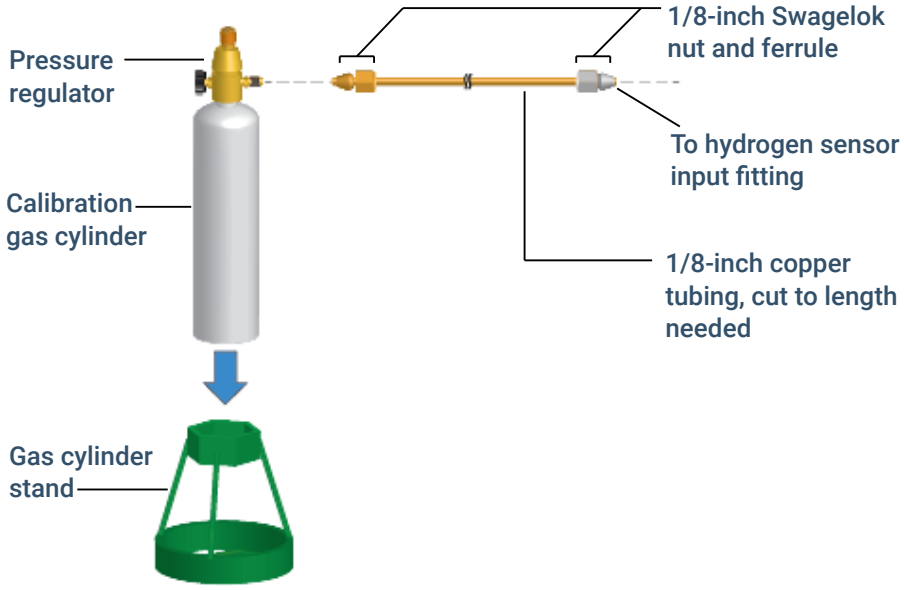
regulator (G3440-80216) that installs directly onto the calibration gas cylinder. Agilent also provides sufficient copper tubing and hardware to connect the pressure regulator to the hydrogen sensor assembly calibration gas input fitting.

Install the calibration gas

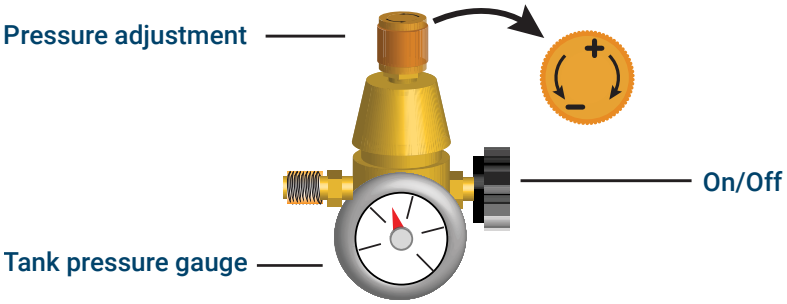
1. Set the gas cylinder stand upright on the lab bench near the GC.

WARNING

The gas cylinder is pressurized. Do not place the cylinder on its side or behind the oven exhaust vent!



2. Turn the pressure regulator completely off and set the output pressure as low as possible (full counterclockwise).



3. Install the pressure regulator onto the calibration gas cylinder (it screws on).
4. Connect the calibration gas cylinder output tubing to the hydrogen sensor module.
   - Use the tubing, nuts, and ferrules provided in the hydrogen sensor kit.
   - See the figure under **step 1** .
5. Install the calibration gas cylinder into the stand and secure using the screw.
6. Turn on the supply pressure at the pressure regulator. (You will adjust it later.)
7. Check for leaks in the fittings using a leak detection fluid. Be careful not to let any fluid contact GC electronics. Use leak detection fluid only on connections outside of the GC. Correct any leaks.

Calibrate the hydrogen sensor

1. Select **Settings > Calibration > H2 Sensor > Start Calibration**.
2. When prompted to set the calibration flow, click **Set Flow** to confirm.
3. Allow the oven to cool to the set point before continuing with the calibration. Actual oven temperature will display. Select **Continue** when the temperature setpoint has been met.
4. Open the GC oven door and connect a flowmeter tube to the sensor tube in the oven.

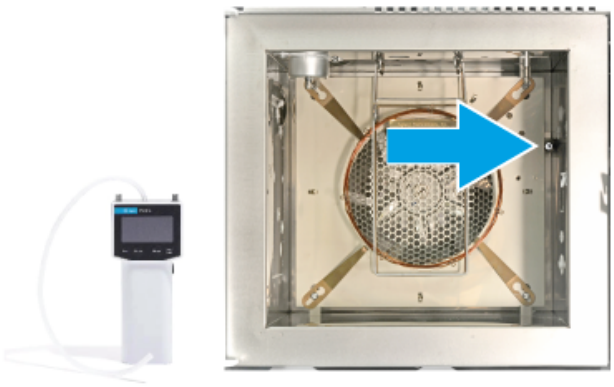
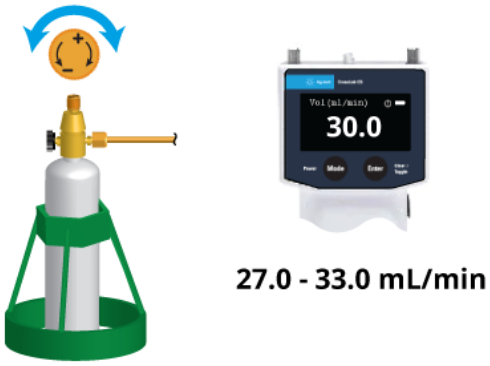


Figure 11. GC oven (front view of oven shown)

5. Select **Turn On**. The calibration cycle begins. The hydrogen sensor module will begin to send calibration gas across the sensor.
6. While continuing to measure the flow rate from the tube, adjust the pressure regulator on the calibration gas cylinder until the flow rate is approximately 30 mL/min (+/- 3mL/min). Remove the flowmeter and close the oven door.



7. Allow the calibration cycle to complete (approximately 5 minutes total time).
   If calibration fails, check the gas supply. Is the calibration gas cylinder being used? Is the gas type correct? Are there any leaks? See **Leak test all connections and set source pressures**
8. Turn off the calibration gas. You may disconnect the gas from the GC, if desired.

Leak test all connections and set source pressures

Liquid leak detectors, such as soapy water, are not recommended, especially in areas where cleanliness is very important. If there is a leak, these liquids can contaminate the plumbing and affect your analyses. If you do use leak detection fluid, immediately rinse the fitting to remove the soapy film.

When checking for leaks of hydrogen or helium, Agilent recommends the G6693A leak detector, or similar.

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.

Perform a pressure decay test.

1. Turn off the GC.
2. Set the regulator pressure to 415 kPa (60 psi).
3. Fully turn the regulator pressure adjustment knob counterclockwise to shut the valve.
4. Wait 10 min. If there is a pressure loss greater than 7 kPa (1 psi), there is a leak in the external connections. Use the leak detector to check each fitting for leaks. See **Figure 12**.

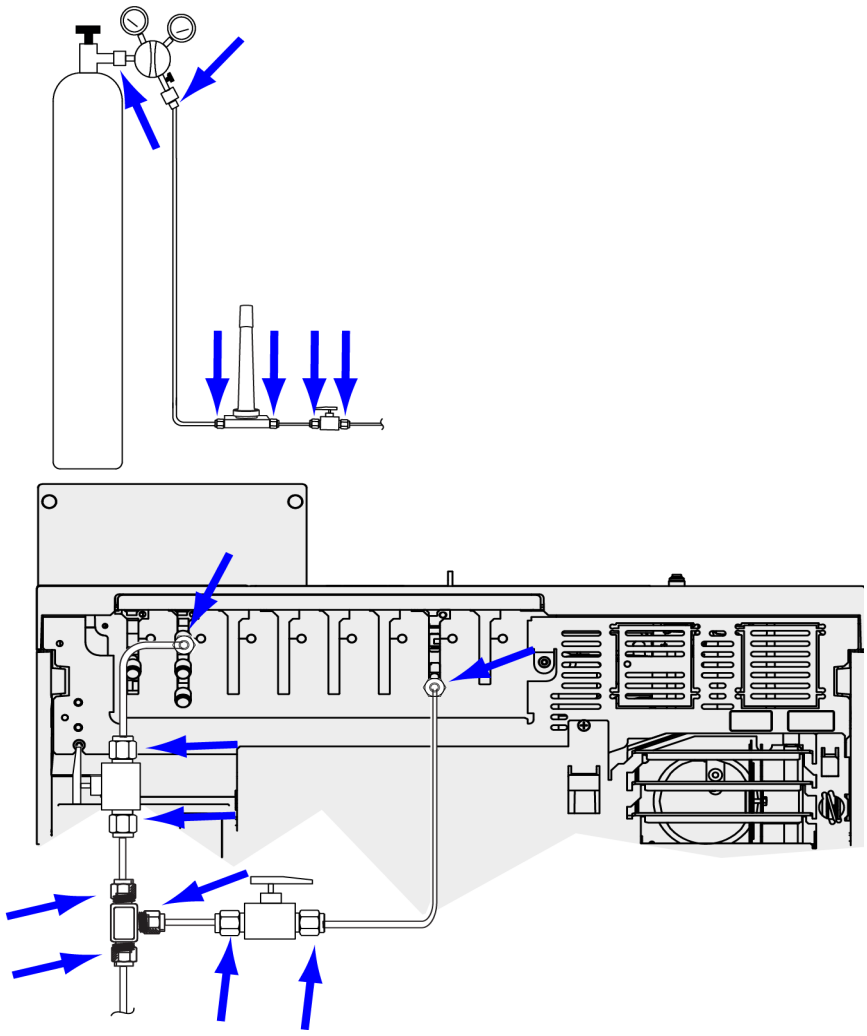


Figure 12. Locations to check for leaks

5. Correct leaks by tightening the connections and then retest the connections.

Set source gas pressures

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

- The inlet pressure needed to achieve the highest column flow rate required by your method. 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.
- The number of flow control devices (for example, pressure regulators) in the line. A GC flow module counts as one device.
  The pressure delivered at the GC should be at least 170 kPa (25 psi) higher than the maximum pressure required for your method. A pressure difference of about 170 kPa (25 psi) across flow controlling devices enables them to work properly.
- The pressure limit of the weakest part of the supply system.
  Swagelok fittings and copper tubing are more than adequate for the highest pressures used in gas chromatography.

We recommend a maximum continuous operating pressure of 1170 kPa (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.

Table 6 suggests starting values of source pressure.

Table 6. Suggested starting pressures

Gas	Use	Source pressure
Carrier	Packed column	410 kPa (60 psi)
	Capillary columns	550 kPa (80 psi)
Air for FID, FPD	Detectors	550 kPa (80 psi)
Hydrogen	Detectors	410 kPa (60 psi)
Makeup gas	Detectors	410 kPa (60 psi)
TCD Reference	TCD	410 kPa (60 psi)
Air for valve actuators	Valves	345 kPa (50 psi)

Install inlet checkout parts

If using a split/splitless inlet, install the liner and O-ring needed for checkout. See the GC's *Operation* manual, and the procedures listed in the GC's *Maintaining Your GC* manual.

If installing a GC/MS system, refer to the GC/MS installation manuals for the correct inlet hardware to install.

Install ALS, if ordered

If installing an ALS, install it now. Refer to its instructions.

Prepare the sampler for checkout. See the checkout procedures and information in the GC's *Operation* Manual.

1. Prepare a 2-mL screw-top sample vial with checkout sample.
2. Prepare 4-mL waste vials and place them into the turret.
3. Prepare fresh solvent solutions as needed for the checkout sample for your detector type. Place the solvent vials into the injector turret. For details on the solvent needed, see the GC's *Operation* Manual.

Configuring GC-MSD communications

Select ⚙ **(Settings) > MSD IP**. The MSD IP address entered here must exactly match the IP address entered in the data system and at the MSD keyboard.

Once the instruments have IP addresses and are connected to the LAN, complete the GC/MS configuration and enable enhanced communications, Parts Finder data, and MS-friendly features such as the MS Vent method as follows:

1. Select ⚙ **(Settings) > MSD IP**.
2. If configuring a 5977B/C MSD, select **LCOMM** from the dropdown menu under **Connection Type**, and input the MSD's IP Address, Gateway, and Net Mask. Otherwise, select **DCOMM** and input the MSD's IP address.
3. Select **Enable Communication**.
4. Enter details for the MSD.

Connect the external cables

In addition to the LAN cable as referenced in **"Connect GC to LAN, Local Computer, or Tablet"**, other cables may be installed for control of the GC's automatic liquid sampler (ALS), connecting signal output to integrators, synchronizing the start and end of a run between various instruments, sensing conditions external to the GC, and controlling devices external to the GC.

Back panel connectors

The figure below shows the connectors on the back panel of the GC.

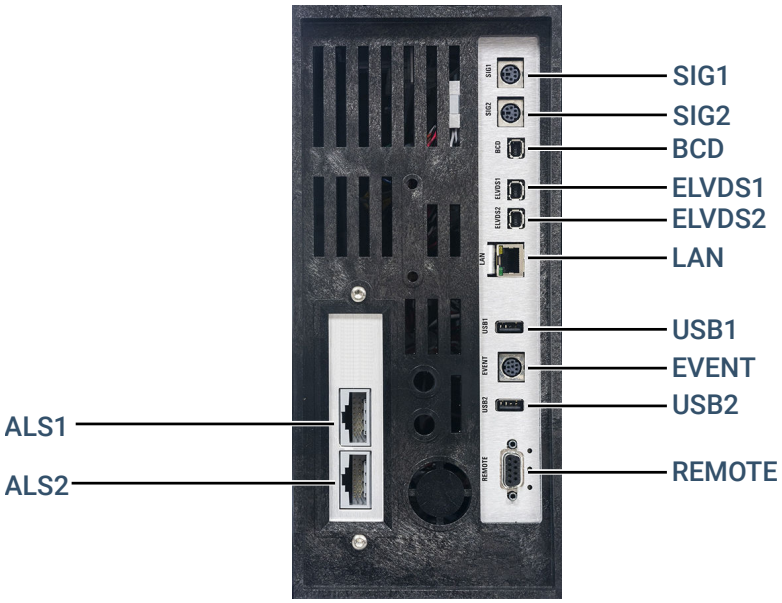


Figure 13. Back panel

See also **"Cable Diagrams"**.

Sampler connectors

If using an ALS, connect it to the GC using the following connectors:

Injector Optional. A 16-position injector or 50-position injector.

TRAY Optional. The 150-position sample tray (includes optional barcode reader/heater/mixer control, if purchased). Not compatible with a 50-position injector.

(The GC can have only one 50-position injector.)

The SIG (analog output) connectors

Optional. Use SIG1 and SIG2 for analog output signals.

REMOTE connector

Provides a port to remotely start and stop other instruments using the APG protocol. A maximum of 10 instruments can be synchronized using this connector. See **"Using the Remote Start/Stop Cable"** for more detail.

EVENT connector

This connector provides two passive contact closures and two 24-volt outputs for controlling external devices. The outputs are controlled by valve drivers 5 through 8.

BCD input connector

This connector provides two control relays and a BCD input for a stream selection valve or a BCD generating device.

USB connectors

These connectors are reserved for specific Agilent accessories only.

LAN connector

Standard Local Area Network (LAN) connector, for communication with data systems and other devices via TCP/IP.

Connecting cables

Use the supplied LAN cable to connect the GC to a LAN switch or hub as shown below in **Figure 14**. Other LAN configurations are possible. Refer to your Agilent data system documentation for details about its supported LAN configurations.

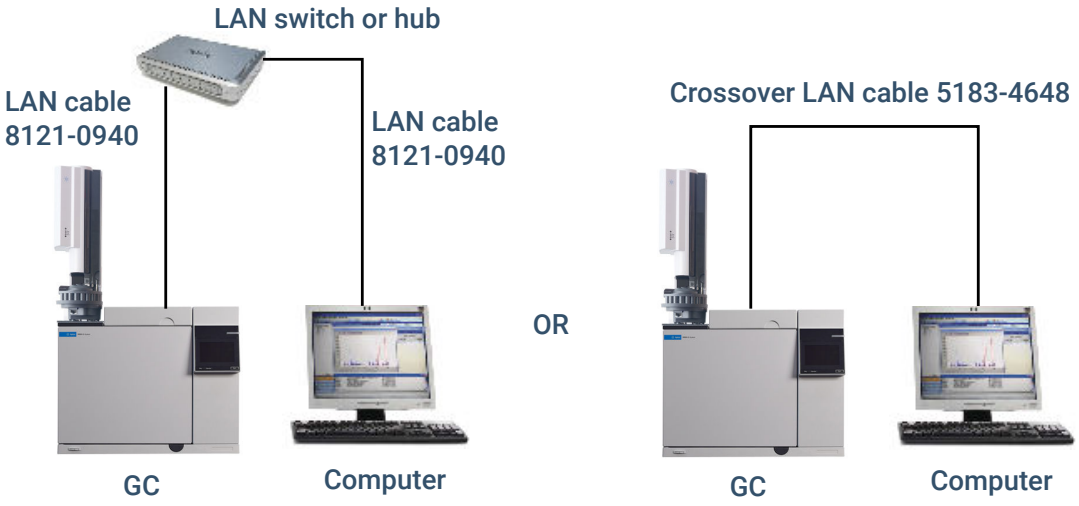


Figure 14. Simple supported LAN configurations: LAN switch or hub (left) and direct connection (right)

Table 7. Typical IP addresses for an isolated LAN

	GC	Computer
IP address	10.1.1.101	10.1.1.100
Subnet mask	255.255.255.0	255.255.255.0

A single LAN communications cable is supplied with the GC. The switch (or hub) and other cables must be ordered separately, if needed. See **Table 8** and **Table 9** for cabling requirements for other configurations.

Table 8. Cabling requirements

8860B Series GC connected to:	Required Cable(s)	Part number
Samplers		
7693A Automatic Liquid Sampler	Injector cable or tray cable	G4514-60610
7650 Automatic Liquid Sampler	Injector cable	G4514-60610
7683 Automatic Liquid Sampler	Injector cable is integral	G2614-60610
	Tray cable	
7697A Headspace Sampler	Remote, 9-pin male/9-pin connector	G1530-60930
G1289B/G1290B Headspace Sampler	Remote, 9-pin male/9-pin connector	G1530-60930
PAL3/CTC automatic sampler	Cable, 4 conductor, remote start	G6500-82013
Mass Spectrometers and MS systems		
Mass Selective Detector	Y-Cable, remote start/stop, 2-m, 9-pin male/9-pin male	G1530-61200
Mass Selective Detector	MS to GC communications cable,1.1 m, 9-pin male/ELVDS	G3450-60019
GC / Agilent external sampler / MS or MSD system (for example, GC/HS/MSD or GC/Thermal Desorber/MSD)	Y-Cable, remote start/stop	G1530-61200
GC / TMS-9800/ MS or MSD system	Y-Cable, remote start/stop	G1530-61200
	Interface cable for Agilent 6890/7890/8890 to P&T	14-6689-086
Integrators		
3395B/3396C Integrator	Remote, 9 pin/15 pin	03396-61010
	Analog, 2 m, 6 pin	G1530-60570
Non-Agilent Integrator	General purpose analog signal cable 2 m, 6 pin	G1530-60560
Non-Agilent data system	General use remote, 9-pin male/spade lugs (various lengths)	35900-60670 (2 m), 35900-60920 (5 m), 35900-60930 (0.5 m)
Other devices		
Non-Agilent instrument, unspecified	External event, 8 pin/spade lugs	G1530-60590
Valco pulser module (used with PDHID)	Valve pulser module power supply cable (includes green EVENT label)	G1580-60730
Stream selection valves	See documentation accompanying the valve	G3450-60570
	BCD to MPV Cable	
Gas sampling valves (external)	External valve cable (includes green EVENT label)	G1580-60710
LAN		
LAN	Cable, networking CAT 5, 25 feet	8121-0940
	Cable, LAN, crossover	5183-4648

Table 9. Cabling for other instruments in a 8860B Series GC system

Instrument 1	Instrument 2	Type of cable	Part number
Mass Selective Detector	Purge & trap, thermal desorber, or headspace sampler	Splitter ("Y") cable for remote start/stop, 1 male and 2 female connectors	G1530-61200
		Splitter ("H") cable for APG remote, 2 male and 2 female connectors	35900-60800

GC / MS / Agilent data system / ALS

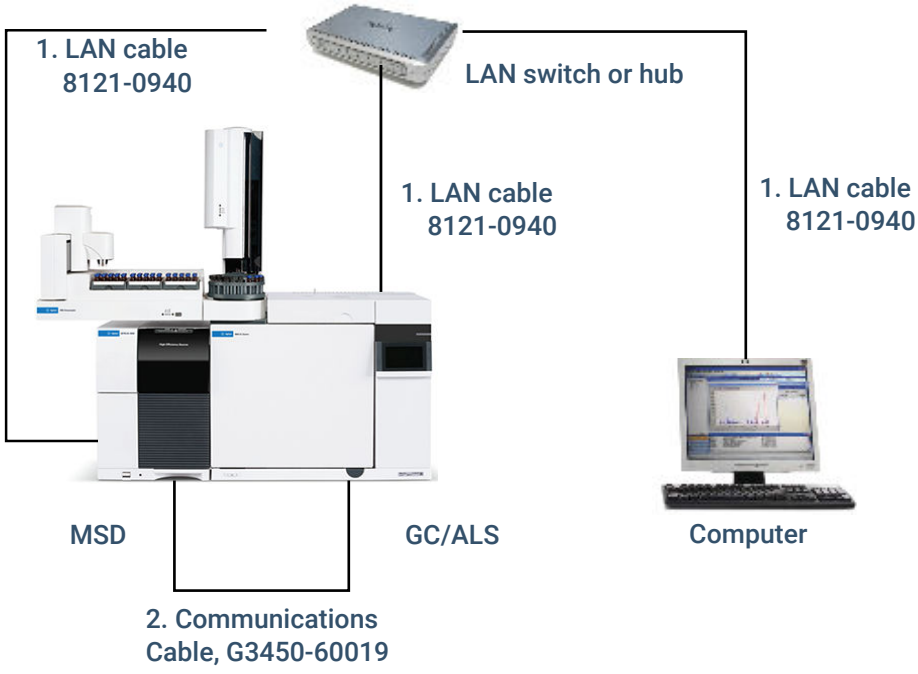


Table 10. Cables for a typical GC/MSD or GC/MS system

Number	Part number and description
1	8121-0940, Cable, LAN, 25 foot
2	G3450-60019, 1.1-m MS to GC communications cable, 9-pin male/ ELVDS

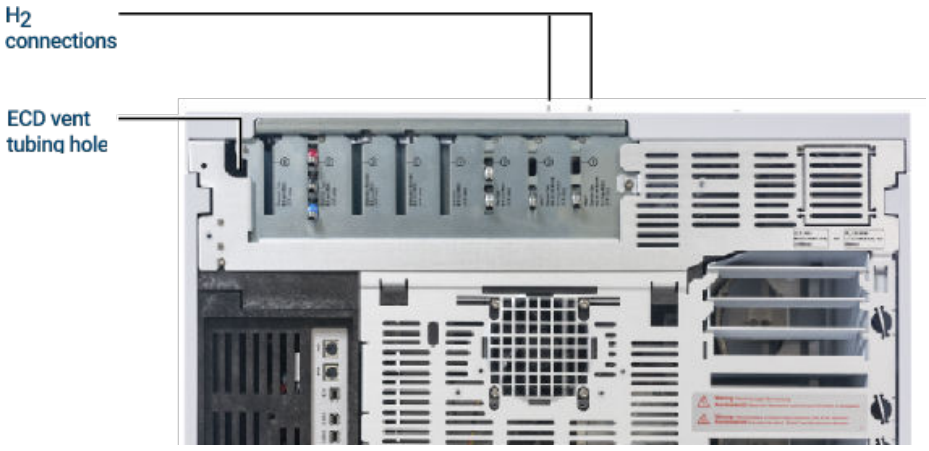
Additional cabling configurations

For additional cabling configurations, see **Cabling Diagrams and Remote Start/Stop**.

Vent ECD or uncombusted hydrogen to a fume hood

If using a ECD, or if using hydrogen carrier gas that will be uncombusted, you must either safely vent the exhaust or operate the GC inside a fume hood. For example, if using hydrogen carrier gas the GC would vent uncombusted hydrogen from a thermal conductivity detector (TCD) and from the inlet split vent and septum purge vent.

The ECD exhaust vents through a coiled tube. Connect tubing from the tube fitting at the end of this tubing to an exhaust hood via a hole in the back panel.



For a TCD, you must supply vent tubing and fittings to connect to the detector exhaust tube on the top of the detector. Route the tubing out the back of the GC, following the same path as for the ECD vent tubing.

The other detectors (FID and FPD) combust any hydrogen carrier gas.

Connect valve actuator air (if present)

Valves are driven by air actuators. Valves should have a dedicated air source; they cannot share detector air supplies.

CAUTION Do not share air between a detector and valves.

Valves can use nitrogen as an alternate supply. In this case, the nitrogen does not have to be chromatographic grade but must be free from contaminants.

Valve actuator air is supplied through 1/4-inch plastic tubing. If your GC was ordered with valves, the plastic tubing will already be attached to the actuators and will extend from the back of the GC. Additional valves are shipped with a 1/4 to 1/8-inch reducing union to be used in plumbing.

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

Turn off the air supply at the source. If needed, shorten the supplied plastic tubing using a sharp knife. Connect the tubing to the air source using a 1/4-inch Swagelok nut and ferrules. See **Figure 15**.

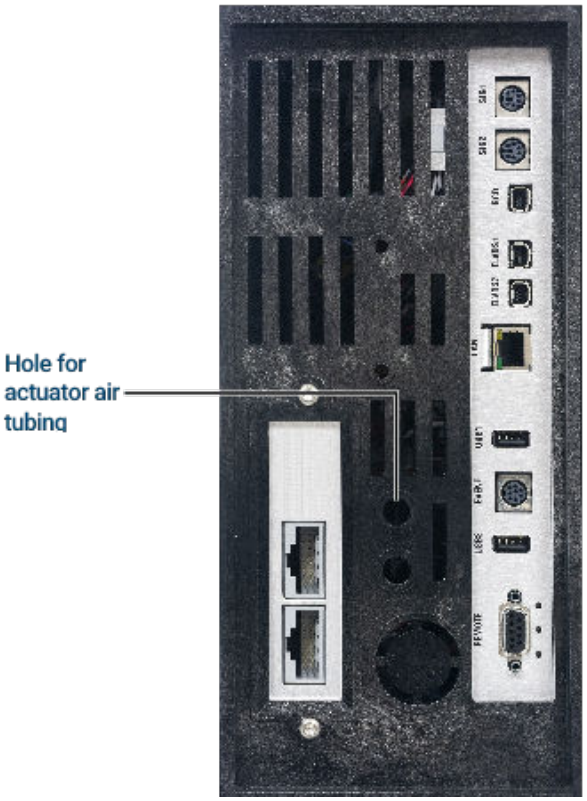


Figure 15. Valve actuator air tubing

Configure Headspace Communications

The 7697 and the 8697 headspace sampler can be configured to communicate with the connected GC. This feature requires a 7697 HS with firmware A.01.08.4 (or greater) or 8697 HS with firmware 1.3.0.59 (or greater). With communications configured, the HS knows GC method timings and programs, and can synchronize with the GC clock and follow the GC instrument schedule.

To configure GC-HS communications:

1. Select **Settings > Configuration > Headspace**.
2. Use this page to enter details for, and control, the headspace sampler.
3. Select **Apply**. The entered changes are saved to the GC.

If communications fails, check the IP addresses. Verify that the GC's IP address is correct in the headspace sampler, and that the headspace sampler's IP address is correct in the GC. Also check that both instruments are turned on and connected to the LAN. Verify all LAN cable connections.

After GC installation, complete HS configuration. Refer to the HS control software help and the HS manuals for information on the configuration options.

Configure the checkout column

The GC provides an automated procedure, available from the browser interface, to install a column in the GC. Go to **Maintenance > Column > Perform Maintenance > Install Column > Start Maintenance**. If using the automated procedure, column configuration is included. Skip to **"Transfer the checkout sample to a screw-top sample vial"**.

The instructions below describe how to install and condition the column manually, if not using the automated procedure.

You must configure the consumable items (such as the checkout column).

Checkout column

The column length, inside diameter, and film thickness are on a metal tag attached to the column.

1. Select **Method > Configuration > Columns.**
2. Double-click or double-tap in the column row (or in the next empty row). When prompted, enter the column details, such as dimensions, type, temperatures, and so on. Select **OK** to accept the entries.
3. Use the drop-down lists to select the column's **Inlet**, **Outlet**, and **Heated By** values.

This completes configuration for a single capillary column. Also see the Operation manual for more information about configuring columns.

Install the checkout column

A capillary column was shipped with the GC to be used to confirm proper operation. Agilent suggests that it be used only for that purpose.

Before use, the column must be conditioned to remove any contaminants.

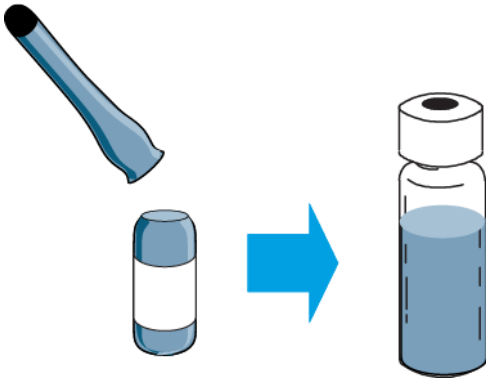
The GC provides an automated procedure, available from the browser interface, to install a column in the GC. (**Maintenance > Column > Perform Maintenance > Install Column > Start Maintenance**) When the procedure finishes, skip to **"Transfer the checkout sample to a screw-top sample vial"**..

The instructions below describe how to install and condition the column manually, if not using the automated procedure.

1. Locate the installation instructions for the column, inlet, and detector you will use. Refer to the *Maintaining Your GC* manual. See the sections on your specific inlet and detector types.
2. Install the column in the inlet.
3. Connect the free end of the column to the detector, as described in *Maintaining Your GC*.
4. Turn on the carrier gas.
5. If using a split/splitless inlet, perform an Inlet Leak Check. Select **Diagnostics > Diagnostic Tests**, select **Inlets**, then select **Leak and Restriction Test**. Press **Start Test** to begin the check. If the check fails, tighten connections.
6. Set the oven temperature and inlet flow conditions specified for conditioning the column. Select **Method** to access current GC temperatures and flows.
   - Set the oven temperature to 20 °C higher than the highest checkout method temperature (do not exceed the column maximum temperature). For example, for FID checkout set the oven temperature to 210 °C.
   - Set the detector temperature to 20 °C higher than the checkout method temperature. For example, for FID checkout set the detector temperature to 320 °C.
7. Turn the detector gases on. Light the flame, if appropriate.
8. Heat the detector to the temperature given in the bakeout instructions, and hold at temperature for the time given in the instructions.

Transfer the checkout sample to a screw-top sample vial

1. The checkout sample is contained in sealed glass vials. Wrap a piece of cloth or a paper towel around the vial to protect your fingers and snap the top off.



2. Use a pipette to transfer the sample to a 2-mL screw-top vial. (If using an ALS, use a vial suitable for the ALS turret or tray, as applicable.)

When the system stabilizes, run one injection

Perform the checkout procedure by selecting **Diagnostics > Instrument > System Checkout** , or perform it as described below and in the Operation Manual.

1. Enter the parameters for the checkout procedure.
   - If using an Agilent data system, use it to create a checkout method.
   - . If not using a data system, enter the setpoints using the Browser Interface.
2. When the GC is ready to begin a run (the touchscreen status shows **STATUS: READY**), make the injection and start the run. (When a component of the GC is not ready to begin a run, the touchscreen shows **STATUS: NOT READY**.)
   For a manual injection, wait until the status shows **STATUS: WAITING FOR PREP RUN**, then press **Prep Run**. When the status shows **Ready** (green), inject the sample and press **Start**.

3. Evaluate results by comparing the chromatogram you generated with the one in the checkout procedure. There should be a close resemblance.

Prepare for the Next Analysis

After evaluating the GC under the checkout conditions, installation checkout is complete. The next step is to prepare the GC for your next analysis. Be sure to cool the GC before making changes.

Most consumables have automated procedures for installation. Navigate to **Maintenance > Perform Maintenance**, then select and run each procedure needed. Alternatively, follow the steps below.

1. Cool all heated zones to < 40 °C, and set safe gas flows. Place the GC in maintenance mode: **Maintenance > Instrument > Perform Maintenance > Maintenance Mode > Start Maintenance** and wait for the GC to become ready.
2. Shut off all gas valves at the gas source.
3. When the GC is cool, do the following:
   - Install the appropriate inlet hardware (can include septum, liner, liner-O-ring, inlet gold seal, inserts, and so on).
   - Install the appropriate detector hardware (wavelength filter for FPD+, jet for FID or NPD).
   - Change to any alternate gas sources as needed for the new analysis.
   - Install the desired column and condition it per the manufacturer's recommendations.
   - Configure the GC to match any hardware or gas type changes (columns, liners, carrier or makeup gas types, and so on).
   - Load or create the desired method.

2 Making Swagelok Connections

Making Swagelok Connections
Using a Swagelok Tee

The gas supply tubing is attached with Swagelok fittings. If you are not familiar with Swagelok connections, review the following procedures.

Making Swagelok Connections

Objective

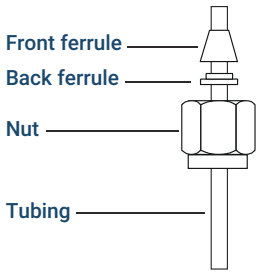
To make a tubing connection that does not leak and that can be taken apart without damaging the fitting.

Materials needed

- 1/8-inch (or 1/4-inch, if used) preconditioned copper tubing
- 1/8-inch (or 1/4-inch, if used) Swagelok nuts
- Front and back ferrules
- Two 7/16-inch (for 1/8-inch nuts) or 9/16-inch (for 1/4-inch nuts) wrenches

Procedure

1. Place a Swagelok nut, back ferrule, and front ferrule on the tubing as shown in **Figure 16**.



IMPORTANT!
The narrow end of the back ferrule fits into the rear of the front ferrule.

Figure 16. Swagelok nuts and ferrules

2. Push the tubing into the stainless steel fitting.
3. Make sure that the front ferrule is fully engaged. Slide the Swagelok nut over the ferrule and thread it onto the plug.
4. Push the tube fully into the plug, then withdraw it approximately 1 to 2 mm. See **Figure 17**.

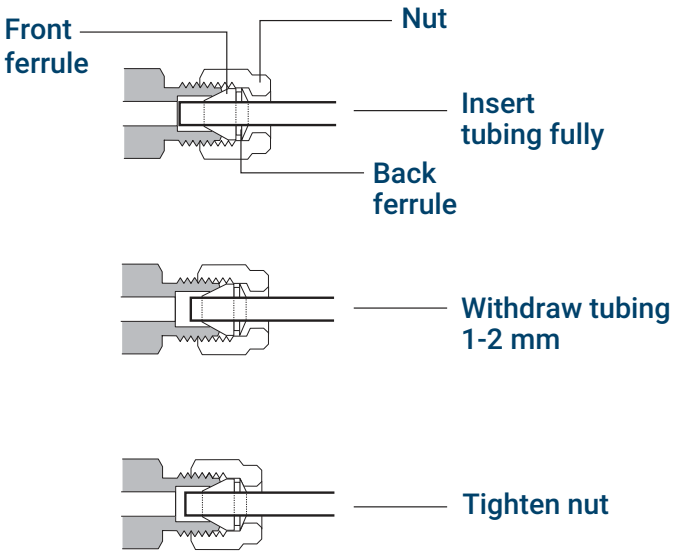


Figure 17. Insert the tubing

5. Finger-tighten the nut.
6. Mark the nut with a pencil line. See **Figure 18**.

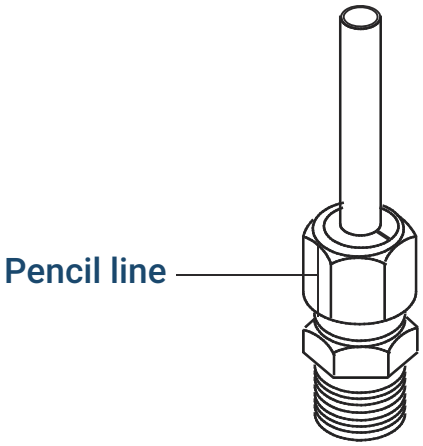


Figure 18. Marking the fitting

7. For 1/8-inch Swagelok fittings, use a pair of wrenches to tighten the fitting 3/4 of a turn. See **Figure 19**.

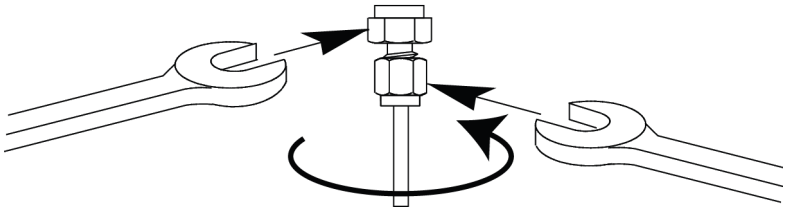


Figure 19. Final tightening

8. Remove the plug from the fitting. To connect the tubing, with nut and ferrules, to another fitting, finger-tighten the nut, then use a wrench to tighten it 3/4 (1/8-inch fittings) of a turn.

9. Both correctly and incorrectly swaged connections are shown in **Figure 20**. Note that the end of the tubing in a correctly swaged fitting is not crushed and does not interfere with the action of the ferrules.

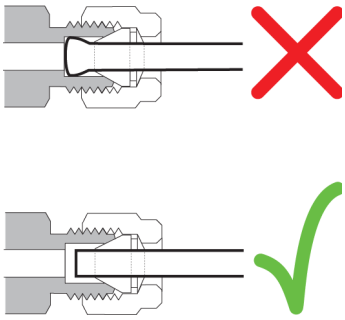


Figure 20. Completed fitting

Using a Swagelok Tee

To supply gas from a single source to more than one input, use a Swagelok Tee.

Do not combine valve actuator air with flame ionization air. The valve action will cause major upsets in the detector signal.

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 (optional)

1. Cut the tubing where you want to install the Tee. Connect the tubing and Tee with a Swagelok fitting. See **Figure 21**.

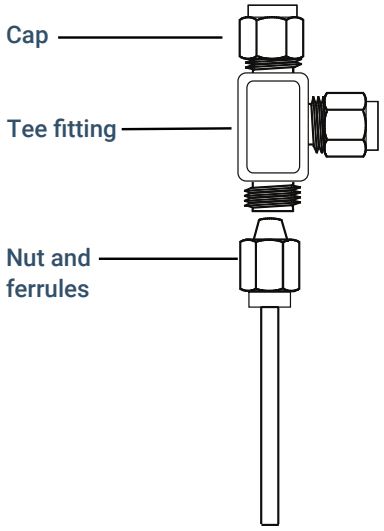


Figure 21. Swagelok tee

2. Measure the distance from the Tee to the instrument fittings. Attach copper tubing to the open Tee ends with Swagelok fittings.

3 Cabling Diagrams and Remote Start/Stop

This section lists cabling requirements and connection diagrams that apply to less common or specialized GC installations.

Using the Remote Start/Stop Cable

Remote start/stop is used to synchronize two or more instruments. For example, you might connect an integrator and the GC so that the Start/Stop buttons on either instrument control both of them. You can synchronize a maximum of ten instruments using Remote cables.

Connecting Agilent products

If connecting two Agilent products with Remote cables, the sending and receiving circuits will be compatible—just plug in both ends of the cable.

Connecting non-Agilent products

If connecting to a non-Agilent product, the following paragraphs contain information you will need to ensure compatibility.

APG Remote signal electrical specifications

The APG signals are a modified open collector type. The signal levels are generally TTL levels (low voltage is logic zero, high voltage is logic one) but the open circuit voltage will be between 2.5 and 3.7 V. The typical voltage is 3 V. A voltage over 2.2 V will be interpreted as a high logic state while a voltage below 0.4 V will be interpreted as a low logic state. These levels provide some margin over the specifications of the devices used.

The pull-up resistance, connected to the open-circuit voltage, is in the range of about 1 kOhms to 1.5 kOhms. For a logic-low state, for a single device on the bus, the minimum current you must be able to sink is 3.3 mA. Since devices are connected in parallel, when you have multiple devices this minimum current must be multiplied by the number of devices attached on the bus. The maximum voltage for a low-input state is 0.4 V.

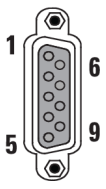
The bus is passively pulled high. Leakage current out of a port must be less than 0.2 mA to keep the voltage from being pulled lower than 2.2 V. Higher leakage current may cause the state to be interpreted as a low.

Over-voltage protection: APG Remote connections are clamped by a zener diode to 5.6 V. Exceeding this voltage will damage the circuit (GC logic board).

APG Remote - Suggested drive circuits

A signal on the APG bus may be driven by another APG device or by one of the following circuits:

- A relay, with one side connected to ground, when closed will set a logic-low state.
- An NPN transistor, with the emitter connected to ground and the collector connected to the signal line will set a logic-low state if proper base current is supplied.
- An open-collector logic gate will perform this same function.
- A low-side drive IC will also work, but Darlington-type drivers should be avoided as they will not meet the low-side voltage requirement of less than 0.4 V



APG Remote connector

Pin	Function	Logic
1	Digital ground	
2	Prepare	LOW true
3	Start	LOW true (output)
4	Start relay	
5	Start relay	
6	Not used	
7	Ready	HIGH true (output)
8	Stop	LOW true
9	Not used	

APG Remote signal descriptions

Prepare (Low True)

Request to prepare for analysis. Receiver is any module performing pre-analysis activities. For example, shorting pin 2 to ground will put the GC into Prep Run state. This is useful for Splitless Mode to prepare the inlet for injection or when using Gas Saver. This function is not needed by Agilent autosampler systems.

Ready (High True)

If the Ready line is high (> 2.2 VDC) then the system is ready for next analysis. Receiver is any sequence controller.

Start (Low True)

Request to start run/timetable. Receiver is any module performing runtime-controlled activities. The GC requires a pulse duration of at least 500 micro-seconds to sense a start from an external device.

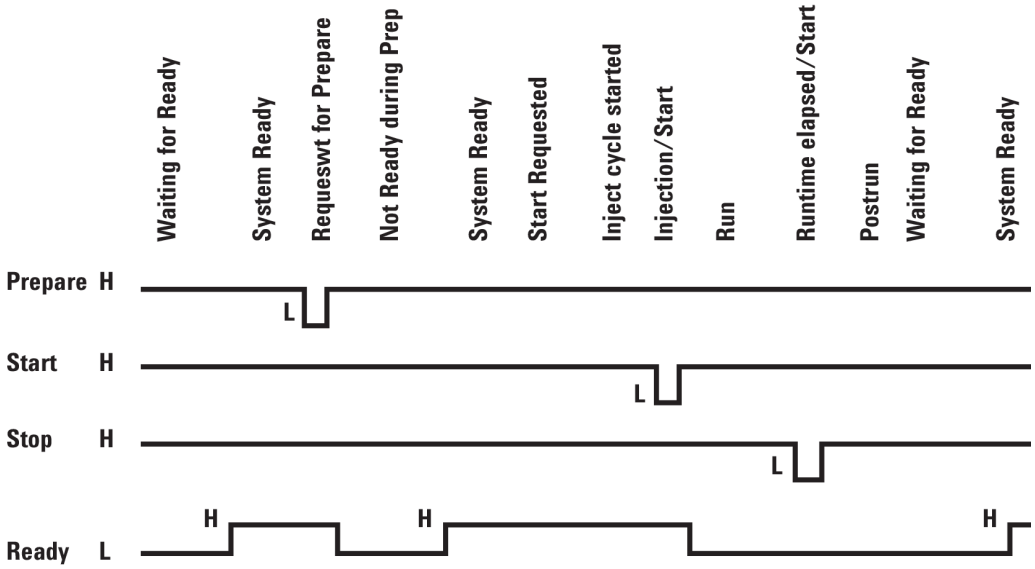
Start Relay (Contact Closure)

A 120 millisecond contact closure used as an isolated output to start another device that is not compatible or connected with APG Remote pin 3.

Stop (Low True)

Request to reach system ready state as soon as possible (for example, stop run, abort or finish, and stop injection). Receiver is any module performing runtime-controlled activities. Normally this line is not connected, if the GC oven program is used to control the method Stop time.

APG Remote timing diagram



Multi-instrument Cabling Examples

GC / ALS / Non-Agilent Data System

Number	Part number and description
1	G1530-60930, General use APG remote cable, 9-pin male/spade lug (0.5m)
2	G1530-60590, External event cable, 8-pin/spade lugs

G1530-60930 APG remote cable spade lug identification			G1530-60590 External event cable spade lug identification		
Connector 1 9 pin (male)	Signal name	Connector 2 spade lugs	Pin	Color	Signal
1	GND	Black	1	Yellow	24 V Out
2	Prepare	White	2	Black	24 V Out 2
3	Start	Red	3	Red	Ground
4	Shut down	Green	4	White	Ground
5	Reserved	Brown	5	Orange	Contact 1
6	Power on	Blue	6	Green	Contact 1
7	Ready	Orange	7	Brown	Contact 2
8	Stop	Yellow	8	Blue	Contact 2
9	Start Request	Violet	9		

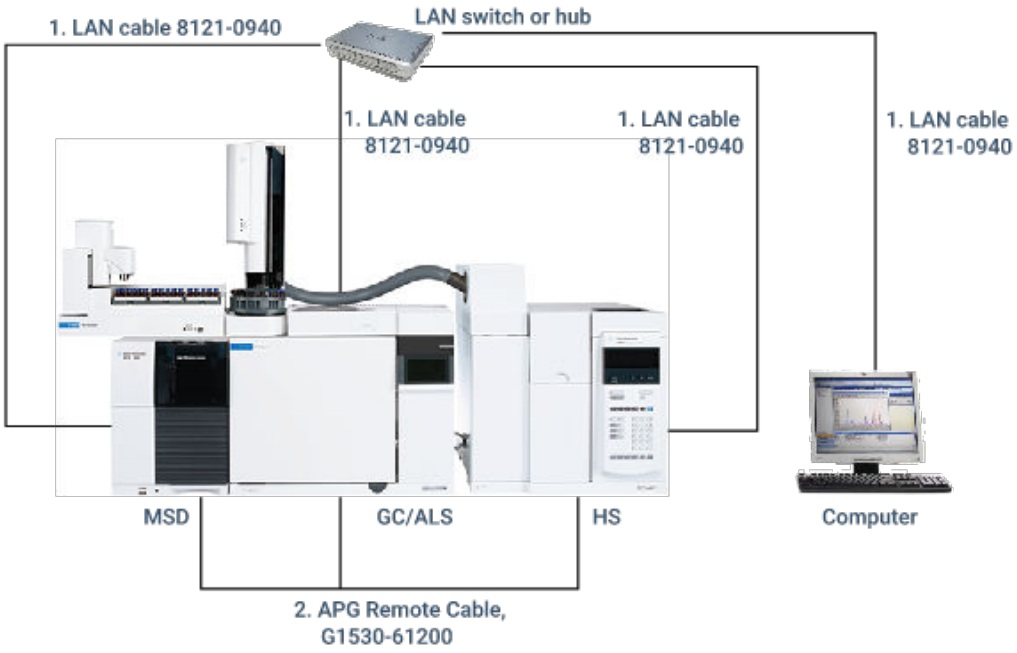
GC / 3395A/3396B Integrator / ALS

Number	Part number and description
1	03396-61010, 2-m APG remote cable, 9-pin/15-pin
2	G1530-60570, 2-m Analog cable, 6-pin

GC / 3396C Integrator / ALS

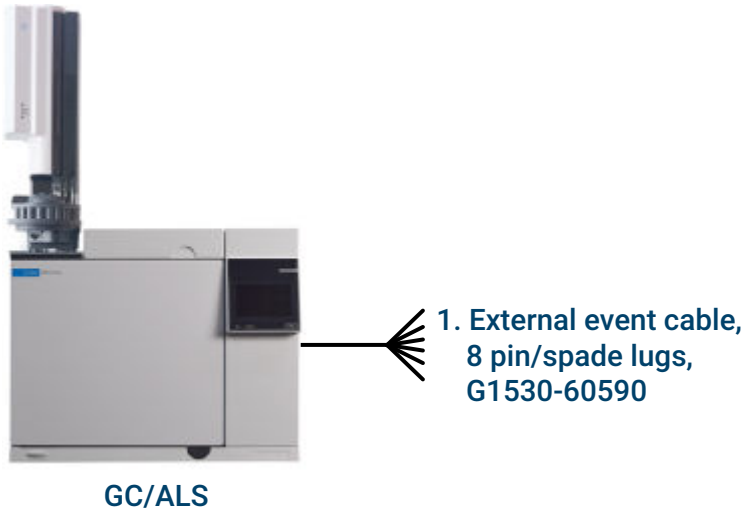
Number	Part number and description
1	G1530-60930, 2-m APG remote cable, 9-pin male/9-pin male
2	G1530-60570, 2-m Analog cable, 6-pin

Example: Using a Y-Cable in a setup (GC/MSD/Data System/Headspace Sampler)



Number	Part number and description
1	8121-0940, Cable, LAN, 25 foot
2	G1530-61200, 2-m Y-cable, remote start/stop

GC / External Events (unspecified, non-Agilent instrument)



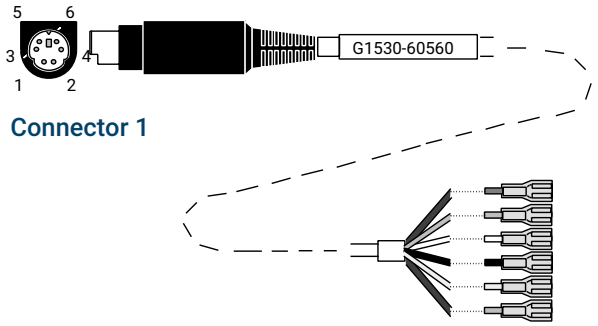
Number	Part number and description
1	G1530-60590, External events cable, 8-pin/spade lugs

Connector	Signal name	Maximum rating	Wire color	Corresponds to valve #
24 volt control output				
1	24 volt output 1	150 mA output	Yellow	9
2	24 volt output 2	150 mA output	Black	10
3	Ground		Red	
4	Ground		White	
Relay contact closures (normally open)				
5	Contact closure 1	48 V 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

Cable Diagrams

Analog signal cable, general use, G1530-60560

Connects GC signal outputs to non-Agilent products. Also used for the Analog Input Board (AIB).



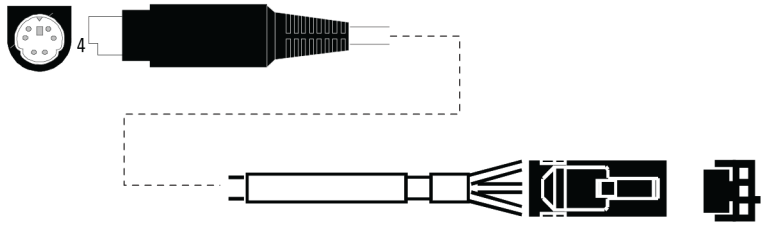
The pin assignments for the general use analog out cable are listed in **Table 11**.

Table 11. Analog cable, general use, output connections

Connector 1	Connector 2, wire color	Signal
1	Brown or violet	Not used
2	White	0 to 1 V, 0 to 10 V (–)
3	Red	Not used
4	Black	1 V (+)
6	Blue	10 V (+)
Shell	Orange	Ground

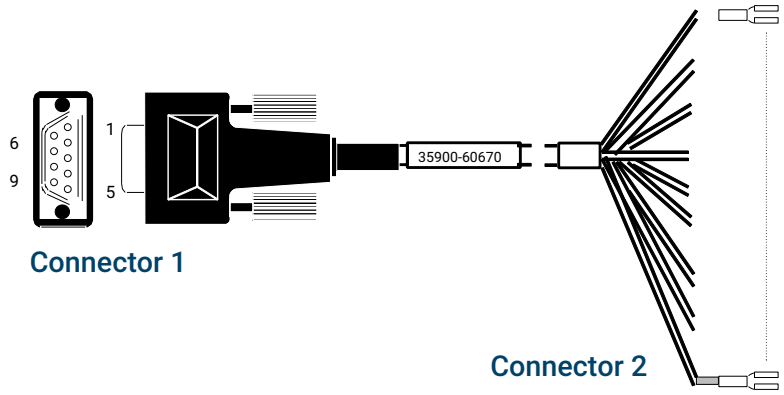
Agilent analog signal cable, G1530-60570

This cable connects an Analog out port to an external data system. Both 0 to 1 volt and 0 to 10 volts are provided. Connects both GC signal outputs to Agilent 3395B/3396C integrators, and the 35900 A/D.



Analog output cable to an Agilent product

Remote start/stop cable, general use, 35900-60670



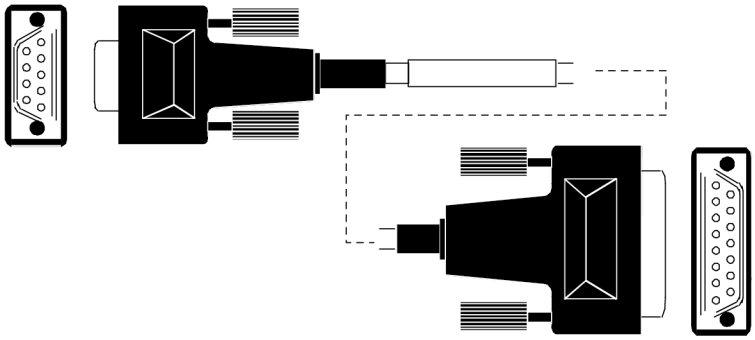
The pin assignments for the remote start/stop cable are listed in **Table 12**.

Table 12. Remote start/stop cable connections

Connector 1, 9-pin male	Connector 2, wire color	Signal
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

Agilent APG remote start/stop cable, 03396-61010

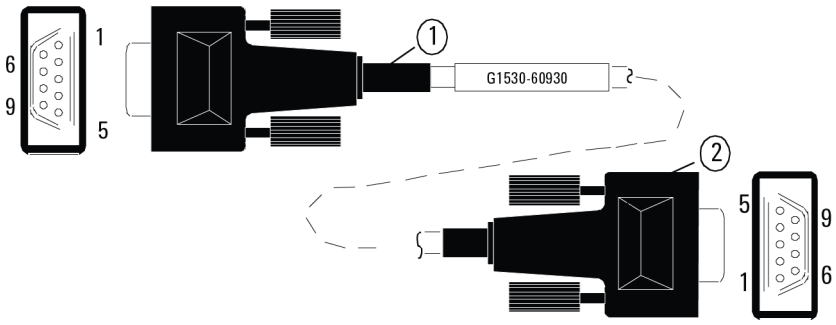
Synchronizes the GC with an Agilent integrator. Additional cables may be used to add more instruments (up to 10 total).



Remote start/stop cable, GC to Agilent integrator

Agilent APG remote start/stop cable, G1530-60930

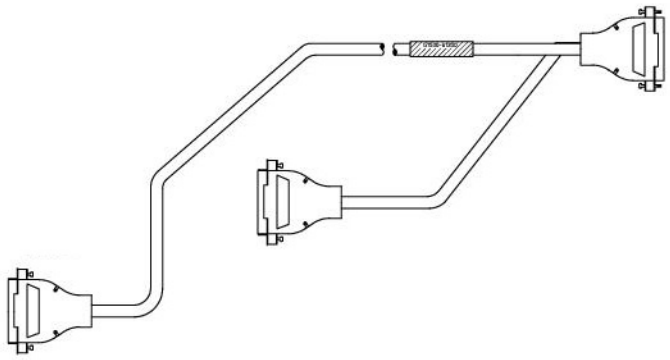
Synchronizes the GC with another Agilent instrument. Additional cables may be used to add more instruments (up to 10 total).



Remote start/stop cable, GC to Agilent instrument

Agilent remote start/stop Y-cable, G1530-61200

Synchronizes the GC with another 2 Agilent instruments.



Remote start/stop cable, GC to Agilent instrument

BCD cable, G3450-60570

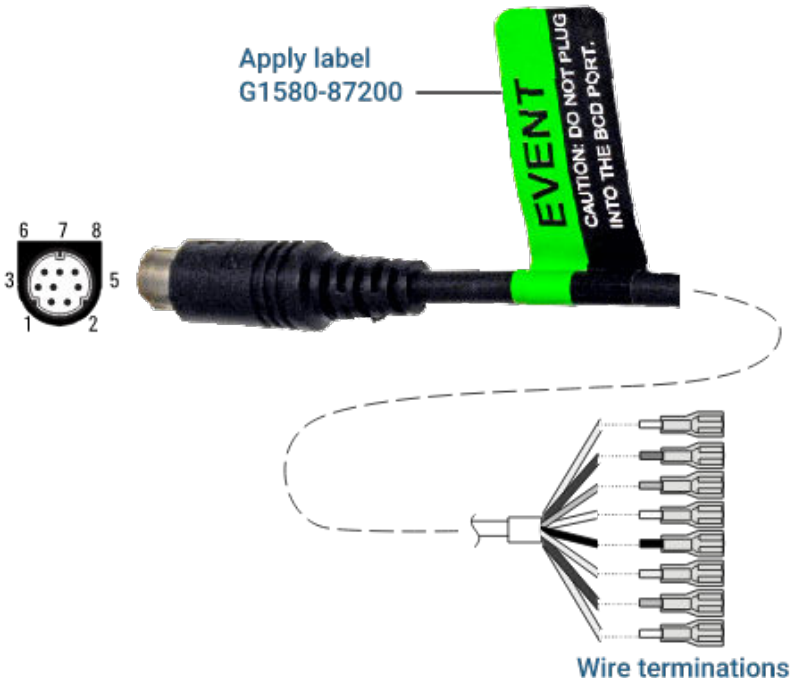
The BCD cable connector has eight passive inputs that sense total binary-coded decimal levels. The pin assignments for this connector are listed in **Table 13**.

Table 13. BCD cable connections

Connector 1 Pin	Connector 2 Pin	Ribbon Cable Wire Color
	1	Brown
	2	Red
1	3	Orange
	4	Yellow

Connector 1 Pin	Connector 2 Pin	Ribbon Cable Wire Color
	5	Green
	6	Blue
	7	Violet
	8	Gray
	9	White
2, 8	10	Black
	11	Brown
6	12	Red
	13	Orange
5	14	Yellow
	15	Green
4	16	Blue
7	17	Violet
3	18	Gray
	19	White
	20	Black
	21	Brown
	22	Red
	23	Orange
	24	Yellow
	25	Green
	26	Blue

External event cable, G1530-60590



The external event cable has two passive relay contact closures with two 24-volt control outputs. Devices connected to the passive contact closures must be connected to their own power sources.

The pin assignments for this cable are listed in **Table 14**.

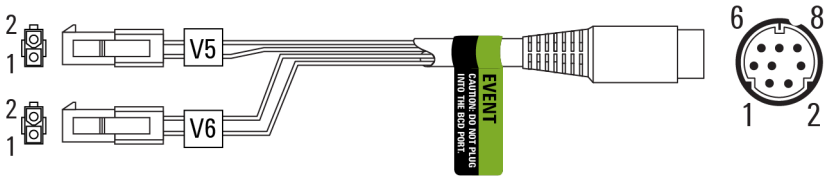
Table 14. External events cable

Connector 1 pin	Signal name	Maximum rating	Connector 2, wire color	Controlled by valve #
24 volts output				
1	24 V output 1	150 mA	Yellow	9
2	24 V output 2	150 mA	Black	10
3	Ground		Red	
4	Ground		White	
Relay contact closures (normally open)				
5	Closure 1	48 V AC/DC, 250 mA	Orange	7
6	Closure 1		Green	7
7	Closure 2	48 V AC/DC, 250 mA	Brown or violet	8
8	Closure 2		Blue	8

When used for external event control, apply label G1580-87200 to identify the cable for EVENT use.

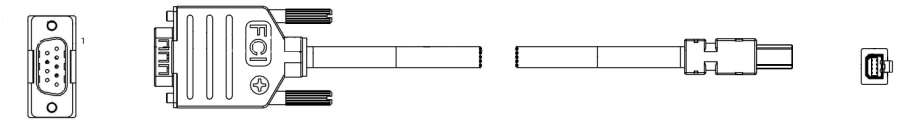
External valve cable, G1580-60710

Supplies power for certain valve applications.



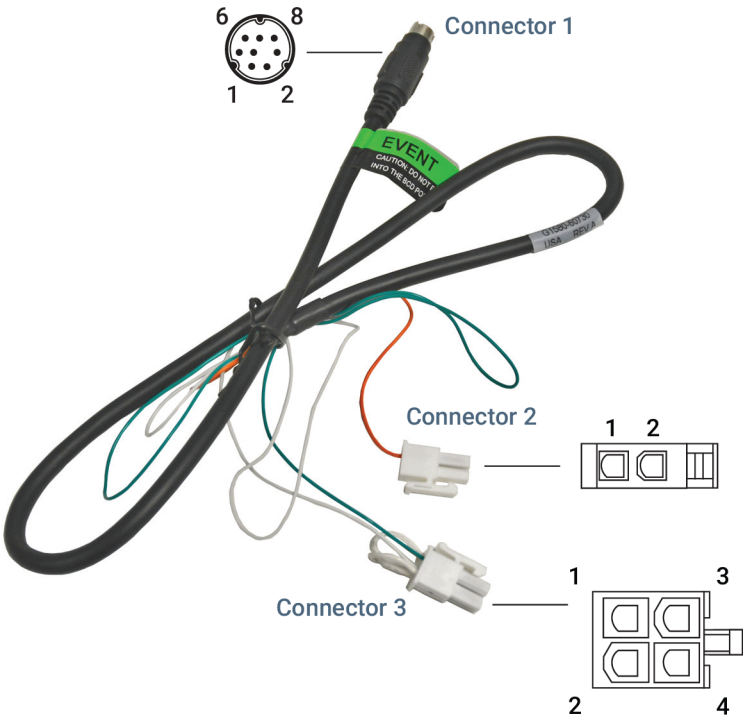
Connector 1 pin	Wire color	Connector and pin	Function
1	Yellow	V5 pin 1	24 V, 150 mA max.
2	Black	V6 pin 1	24 V, 150 mA max.
3	Red	V5 pin 2	Ground
4	White	V6 pin 2	Ground
5			
6			
7			
8			

GC to MSD LVDS Cable G3450-60019



Pulser module power supply cable, G1580-60730

Supplies power for a PDHID pulser module.



Connector 1 pin	Wire color	Connector and pin	Function
1	Yellow		
2	Black		
3	Red		
4	White	Connector 3 pin 1[1]	Ground
5	Orange	Connector 2 pin 1	Contact closure 1, 48 V AC/DC, 250 mA
6	Green	Connector 3 pin 3	Contact closure 1
7	Brown		
8	Blue		

[1]Connector 3: Pin 1 is jumpered to pin 2. Pin 2 is jumpered to pin 4.

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