NGC Chromatography Systems and ChromLab Software

Installation Guide

Version 6.1

BIO-RAD

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1 Introduction

The NGC chromatography systems are preparative systems designed to rapidly automate the purification of biomolecules. The flexible, modular, and economical design makes NGC the instrument of choice for method development and scale-up. It is available in six preplumbed, factory-tested configurations at two different flow rates. Each preconfigured system can be further customized and upgraded by adding valves, detectors, or pumps in order to meet specific application needs. Any system can be configured for either low flow rate or high flow rate operation by simply changing the system pump modules. As a result, a single hardware platform can be modified as the application need and scale change.

ChromLab software enables you to control, manage, and evaluate the NGC system and the purification runs.

Main Features

NGC chromatography systems enable you to do the following:

- Easily create purification and maintenance protocols from predefined method templates and protocol phases
- Automate multicolumn purification processes using preprogrammed templates and multiple column switching valves
- Automate multiple sample injections using either the sample inlet valve and the sample pump or the C-96 autosampler
- Expand sample monitoring using the signal import module (SIM) to export digital signals to, and import digital signals from, external detectors
- Collect large-volume fractions using multiple outlet valves while also collecting small-volume fractions using the BioFrac fraction collector
- Automatically prepare buffers using preprogrammed buffer blending protocols
- Analyze purification results through 1-click peak integration, determine protein concentration, and calculate column performance
- Automate purification protocol optimization using the scouting wizard
- Easily locate fractions containing peaks of interest and view the protein concentration within each fraction
- Extend the preconfigured systems with additional valves for buffers, samples, and columns
- Organize the location of the modules to optimize separation performance based on method scale and complexity, and to minimize the system swept volume
- Minimize errors when connecting tubing using the Point-to-Plumb feature in ChromLab software

Safety Information

This section explains the different safety alerts within this document. This section also provides information about the safe use and setup of the instrument.

Safety Alerts

This document contains **WARNINGS** and **Cautions** pertaining to the installation and use of the NGC instrument.

Alert Icon		Definition
	Flammable/ Extreme Heat	A hazardous situation that could result in serious personal injury or extreme damage to the instrument. Do not proceed until all stated conditions are met and clearly understood.
	Electrical Shock	A hazardous situation that could result in serious personal injury or extreme damage to the instrument. Do not proceed until all stated conditions are met and clearly understood.
		A hazardous situation that could result in minor or moderate personal injury or damage to the instrument. Do not proceed until all stated conditions are met and clearly understood.

Safety Precautions

Caution: The weight of the NGC system varies from moderate to heavy depending on the system in place. Take care when lifting the instrument onto the lab bench or into a standard cold cabinet. To reduce the risk of personal injury or damage to the instrument, three or more people should perform this task.

WARNING! Disconnect power to the NGC system before inserting, removing, or moving modules. No user-serviceable parts are inside any component unless noted in this manual. Refer servicing questions to Bio-Rad service personnel.

Regulatory Information

The NGC instrument has been tested and found to be in compliance with all applicable requirements of the following safety and electromagnetic compliance standards. The NGC instrument is labeled with the following compliance marks.

Safety Compliance

CE Mark:

- EN61010-1 Electrical Equipment for Measurement, Control, and Laboratory Use
- IEC 61010-1 Safety Requirements for Measurement, Control, and Laboratory Use, Part 1: General Requirements

cTUVus Mark:

- UL STD No. 61010-1 Electrical Equipment for Measurement, Control, and Laboratory Use, Part 1: General Requirements
- CAN/CSA C22.2 No. 61010-1-12 Safety Requirements for Measurement, Control, and Laboratory Use, Part 1: General Requirements (includes Amendment 1)

Products with these safety compliance marks are safe to use when operated in accordance with the instruction manual. This does not extend to accessories with no marks, even when used with this unit.

Electromagnetic Compatibility (EMC)

CE Mark:

- EN61326 Class A Electrical Equipment for Measurement, Control, and Laboratory Use, General Requirements

The NGC instrument is designed to operate in a controlled electromagnetic environment. Do not use radio transmitters within 10 ft (3 m) of the instrument.

FCC Warning and Notes

The NGC instrument complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

It is possible that emissions from the NGC instrument may interfere with some sensitive appliances when placed nearby or on the same circuit as those appliances. The user should be aware of this potential and take appropriate measures to avoid interference.

The NGC instrument should not be modified or altered in any way. Alteration of the NGC instrument will:

- Void the manufacturer's warranty
- Void the IEC/EN/UL/CSA 61010-1 safety compliance
- Create a potential safety hazard

Bio-Rad Laboratories is not responsible for any injury or damage caused by the use of this instrument for purposes other than those for which it is intended, or by modifications of the instrument not performed by Bio-Rad Laboratories or an authorized agent.

Important: The NGC instrument is intended for laboratory use only.

We strongly recommend that you follow the safety specifications listed throughout this manual. Use only the supplied power cord with the instrument, making sure to choose the plug adapter that corresponds to the electrical outlets in your region.

Finding Out More

After you install NGC documentation from the NGC Chromatography Systems Software USB drive, you can access installed NGC guides and tutorials on the Help menu in any ChromLab view.

More information about the NGC chromatography systems and ChromLab software is available from the following sources.

- The NGC Chromatography Systems and ChromLab Software Instrument Guide is available on your NGC Chromatography Systems Software USB drive as a .pdf fileas a .pdf file. This illustrated guide details the modules that make up the NGC instrument and includes troubleshooting and maintenance information.
- The NGC Chromatography Systems and ChromLab Software User Guide is available on your NGC Chromatography Systems Software USB drive as a .pdf file. This guide explains how to use ChromLab software to set up and control the NGC instrument, run protein separations and other operations manually, program methods to automate purification runs, evaluate the results, and print experiment reports.
- For ChromLab Help, clicking in dialog boxes accesses relative information. Screen-level help is also available on the Help menu.
- NGC video tutorials are available on the NGC Chromatography Systems Software USB drive as .mp4 files.

  Tip: You can click the Bio-Rad logo in the upper left corner of any ChromLab window to launch the Bio-Rad website.

2 Preparing Your Site

This chapter explains how to prepare your site to successfully install your NGC chromatography system and ChromLab software.

Delivery Crate Dimensions

The crated NGC instrument is very heavy, approximately 160–215 lb (72.6–97.6 kg) depending on the configuration. Bio-Rad strongly recommends that you use a pallet jack to move the instrument pallet from the shipping dock to the laboratory.

Table 1. Specifications for the NGC delivery crate

Item	Specification
NGC Quest	Length: 32 in.; 81.3 cm Width: 27 in.; 68.6 cm Height: 33 in.; 83.8 cm Weight: 161 lb; 73.1 kg
NGC Quest Plus	Length: 32 in.; 8138 cm Width: 27 in.; 68.6 cm Height: 33 in.; 83.8 cm Weight: 167 lb; 75.8 kg
NGC Scout	Length: 32 in.; 81.3 cm Width: 27 in.; 68.6 cm Height: 33 in.; 83.8 cm Weight: 166 lb; 75.4 kg

Table 1. Specifications for the NGC delivery crate, continued

Item	Specification
NGC Scout Plus	Length: 32 in.; 81.3 cm Width: 27 in.; 68.6 cm Height: 33 in.; 83.8 cm Weight: 172 lb; 78.1 kg
NGC Discover	Length: 32 in.; 81.3 cm Width: 27 in.; 68.6 cm Height: 41 in.; 104.1 cm Weight: 216 lb; 98.1 kg
Individual tier (for example, the fourth tier on the NGC Discover Pro system)	Length: 27 in.; 68.6 cm Width: 27 in.; 68.6 cm Height: 14 in.; 35.6 cm Weight: 40 lb; 18.2 kg

Note: The fourth tier (the upper tier on the NGC Discover Pro system) is packaged separately.

Room Requirements

Bench Space

Ensure that the bench or rack on which you install the NGC system is designed to support its weight.

Table 2. Specifications for the NGC instrument

Item	Specification
NGC instrument dimensions	Length: 24 in.; 61.0 cm Width: 19 in.; 48.3 cm Height (measured from lab bench): ■ NGC Quest and NGC Scout series: 19 in.; 48.3 cm ■ NGC Discover series: 26.5 in.; 67.3 cm ■ NGC Discover Pro series: 34 in; 86.4 cm
Note: These dimensions are for the NGC instrument only. They do not include the touch screen or accessories such as columns, air detectors, and buffer tray.	
NGC instrument weight	■ NGC Quest: 90 lb; 40.9 kg ■ NGC Quest Plus: 97 lb; 44.0 kg ■ NGC Scout: 94 lb; 42.7 kg ■ NGC Scout Plus: 100 lb; 45.4 kg ■ NGC Discover: 141 lb; 64 kg ■ NGC Discover Pro: 171 lb; 77.6 kg
Instrument top with buffer tray	Height: 3 in.; 7.6 cm Weight: 8 lb; 3.6 kg

Table 2. Specifications for the NGC instrument, continued

Item	Specification
Touch screen dimensions	Height: 10 in.; 25.4 cm Length: ■ Arm contracted: 13 in.; 33.0 cm ■ Arm extended: 15 in.; 38.1 cm Width: ■ Arm contracted: 1 in.; 2.5 cm ■ Arm extended: 4 in.; 10.2 cm
Touch screen weight (with arm)	4 lb; 1.8 kg

Environment

Table 3. Supported environmental specifications

Parameter	Temperature Range	Humidity Range
Operating conditions	4 to 40°C (35 to 104°F)	0–95% RH, noncondensing
Storage conditions	4 to 40°C (35 to 104°F)	0–95% RH, noncondensing
Shipping conditions	–40 to 65°C (–40 to 149°F)	0–95% RH, noncondensing

Power Requirements

The power supply to the NGC system must be stable and within specifications at all times to ensure optimal operation. The power cable connected to the power inlet port must be rated for 7 amps or more.

Table 4. Power requirements for the NGC instrument and the computer running ChromLab

Parameter	Requirement
Mains input voltage	AC 100–240V; 50–60 Hz
NGC maximum power usage	<750 watts
Number of power sockets	Minimum of three power sockets: ■ One socket for the NGC instrument ■ One socket for the computer running ChromLab software ■ One socket for each fraction collector ■ A socket for any supported peripheral instrument that you attach (for example, the C-96 autosampler) **Tip:** The touch screen does not require a separate power supply.
Type of power sockets	IEC type connections, grounded sockets

ChromLab System Requirements

Bio-Rad can provide a PC with ChromLab software preinstalled or you can install ChromLab onto a computer at your site. Table 5 lists the minimum system requirements for the computer running ChromLab software (known as the ChromLab computer).

Note: For the minimum system requirements to install ChromLab software in a shared database environment, see either the ChromLab Software, User Management Edition User Guide or the ChromLab Software, Security Edition User Guide.

Table 5. Minimum system requirements for the ChromLab computer

Hardware	Minimum Requirement
Computer	
Operating system	One of the following: ■ Microsoft Windows 10 Pro (64-bit only) ■ Microsoft Windows 10 Enterprise (64-bit only)
Processor	Intel Core i7 (Quad-Core) or equivalent, 3.0 GHz minimum
RAM	4 GB minimum
Hard disk space	250 GB minimum, 500 GB recommended
Required peripherals:	USB 2.0 high speed ports (2 minimum) Mouse Keyboard 2 gigabit Ethernet port (1 minimum)
Monitor	
Screen resolution	1,200 x 900 (1,280 x 1,024 recommended)
Screen colors	True color mode (24 bits) or higher

Preparing the ChromLab Computer

To ensure the ChromLab computer operates the NGC system smoothly and accurately displays ChromLab software you might need to

- Turn off sleep/hibernate mode
- Turn off automatic updates
- Set the display fonts

To turn off sleep/hibernate mode

1. On the ChromLab computer, select Control Panel > Power Options and click Change plan settings for the selected power plan.
2. On the Change settings for the plan page, click Change advanced power settings.
3. On the Advanced settings tab, expand the Sleep option, then expand Sleep after, and do one of the following:
   - If your ChromLab computer is a laptop, click On battery or Plugged in (or both) and select Never from the dropdown list.
   - If your ChromLab computer is a desktop computer, click Setting and select Never from the dropdown list.
4. On the Advanced settings tab, expand Hibernate after, and then do one of the following:
   - If your ChromLab computer is a laptop, click On battery or Plugged in (or both) and select Never from the dropdown list.
   - If your ChromLab computer is a desktop computer, click Setting and select Never from the dropdown list.
5. Click OK to save the settings and close the Power Options dialog box.

To turn off automatic updates

1. On the ChromLab computer, select Control Panel > Windows Update and choose Change settings in the left pane.
2. Under Important updates, choose Never check for updates (not recommended) from the dropdown list.
3. Click OK to save the setting and close the Change Settings window.

To change the font size

1. On the ChromLab computer, select Control Panel > Fonts and choose Change font size in the left pane.
2. Select Smaller – 100% (default) if it is not already selected and click Apply.
3. Close the Display window.

3 Setting Up NGC Chromatography Systems

After you unpack the NGC chromatography system and install it in a standard cold cabinet or on the lab bench you will need to

- Attach the touch screen
- Connect the drain tube to the buffer tray
- Connect the power and communication cables
- Connect the NGC system to the ChromLab computer

This chapter explains how to perform these and other setup tasks.

Tip: Before setting up the system, familiarize yourself with the NGC system and its modules, ports, accessory kits, cables, and power switches.

NGC Systems Accessories Kit

Each NGC system ships with an accessories kit. The contents of the kit are specific to the system. Verify the contents against those listed in the sections that follow.

The accessories kits contain the tubing, loops, and fittings necessary to complete the setup of the shipped configuration. All kits include

- NGC fittings kit
- 1 ml syringe
- Luer adapter
- Fittings tightener
- Touch screen and pivot arm kit
- Tool to attach touch screen
- Pump head wash inlet tubing (2)
- Pump head wash priming line
- 1/4-28 union
- System pump inlet tubing (2)
- 1 ml sample loop
- Waste tubing (2)
- Injection port
- 20 psi backpressure regulator
- Tubing retainers, small (1, for PEEK tubing management)
- Tubing retainers, large (2, for PTFE tubing management)
- Column tubing (2) and fittings (from inject valve to column top and from column bottom to UV detector inlet)
- Tube #2 (conductivity flow cell to 20 psi backpressure regulator)
- Tube #4 (backpressure regulator to the NGC Fraction Collector (NGC FC) or BioFrac fraction collector)

NGC Scout Accessories Kit

The kit for the NGC Scout system includes all the accessories in the NGC systems kit as well as

- Tube #2 (20 psi backpressure regulator to pH valve inlet)
- pH waste tubing
- pH calibration port inlet tubing
- Colored tubing for the buffer blending valve

NGC Discover Accessories Kit

The kit for the NGC Discover system includes all accessories in the NGC Scout kit as well as

- Pump head wash inlet tubing (2) for the sample pump
- Pump head wash priming line for the sample pump
- 1/4-28 union
- Sample pump inlet tubing
- System pump inlet tubing (14) for inlet valves
- Column tubing (10) and fittings (from the column switching valve Top positions to column top, and from column bottom to column switching valve Bottom positions)

NGC Discover Pro Accessories Kit

The kit for the NGC Discover Pro system includes all the accessories in the NGC Discover kit as well as

- Buffer inlet tubing (8) for inlet valve
- Tube #6 for the inlet valve
- Outlet valve tubing (12) for the outlet valve
- Tube #10 for the outlet valve

Attaching the Touch Screen

The installation procedure for the touch screen varies depending on the location of the NGC instrument (lab bench or standard cold cabinet). This section explains how to attach the touch screen to the instrument in either location.

The communication cable for the touch screen is approximately 5' (1.52 m) in length. A 10' or 15' (3.0 or 4.57 m) cable is also available.

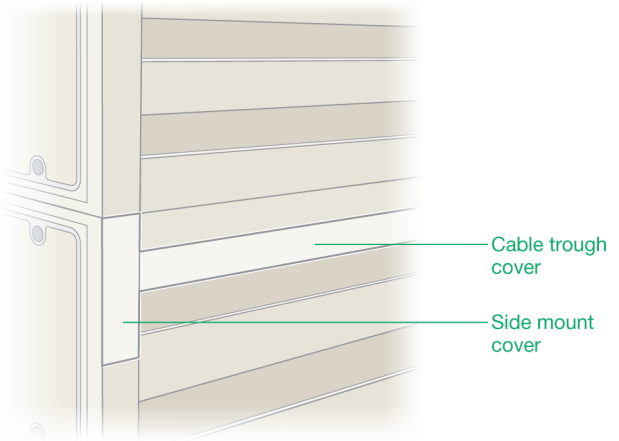
Important: The communication cable for the touch screen does not have a standard DVI connector, even though its connector resembles one. Do not attempt to connect the touch screen to the NGC system with any cable other than the one supplied with the system to avoid serious damage to the instrument.

NGC System Location Is on a Lab Bench

Note: This procedure assumes you will attach the touch screen on the left side of the NGC instrument. If you plan to attach the touch screen on the right side of the instrument, you must reposition the touch screen's pivot arm assembly. See Repositioning the Touch Screen Pivot Arm Assembly on page 31 for more information.

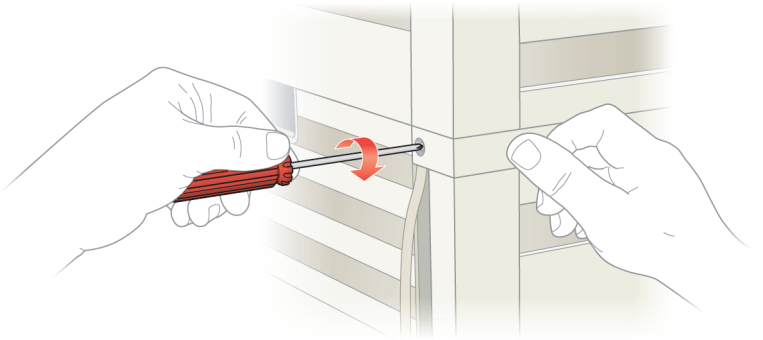
To attach the touch screen when the NGC system is on a lab bench

1. Determine the side of the NGC instrument (right or left) on which to attach the touch screen.
2. Remove the side mount cover from the side of the instrument.



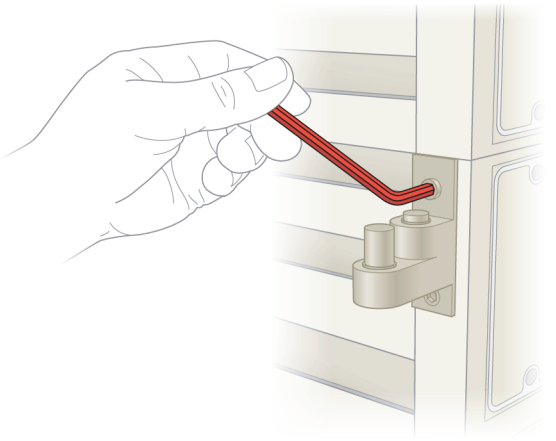
Note: The top section in this image is a third tier. (The NGC Discover system is a 3-tier system.) The touch screen is attached at the top of the second tier. If you have an NGC Quest or an NGC Scout system, you will not have a third tier. Locate the side mount cover at the top of the second tier.

3. Using a Phillips screwdriver, remove the screw that secures the cable trough cover to the back of the instrument.

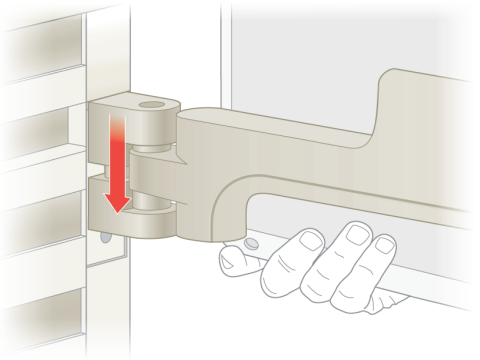


Note: Store these components in a safe place for future use.

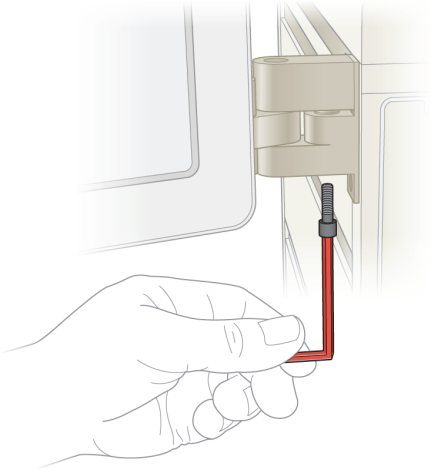
4. Using two ¼-20 x ¾" hex bolts and the hex key labeled pumphead provided in the NGC accessories kit, attach the touch screen mount to the side of the NGC instrument.



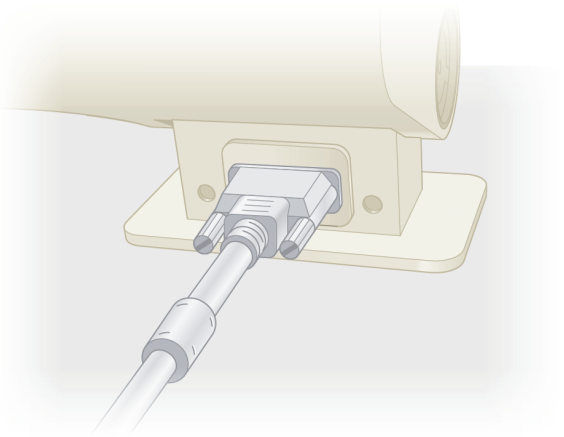
5. Slide the touch screen display onto the mounting post.



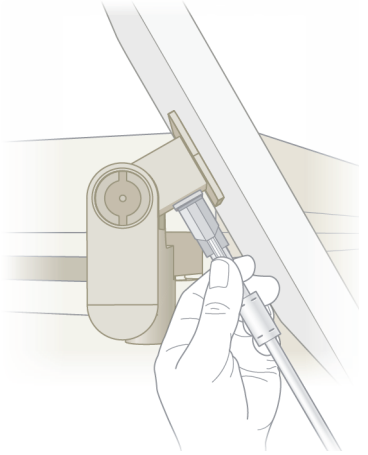
6. Insert a ¼-20 x ¾" hex bolt underneath the mount to secure the touch screen.



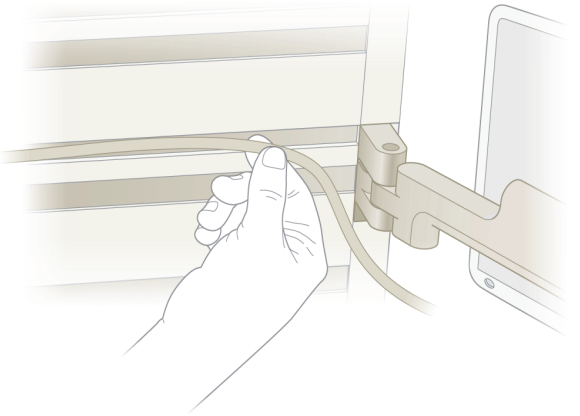
7. Locate the touch screen display cable in the accessories kit.
8. Firmly push the touch screen cable into the port underneath the touch screen and tighten the thumbscrews.



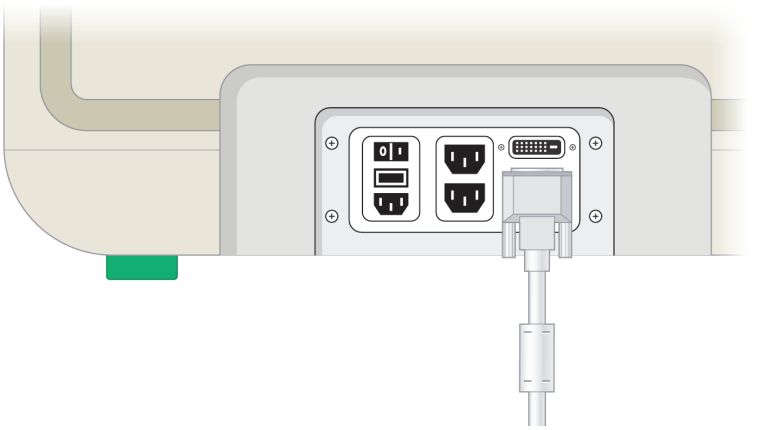
Tip: You can rotate the monitor if you need more room to insert the cable.



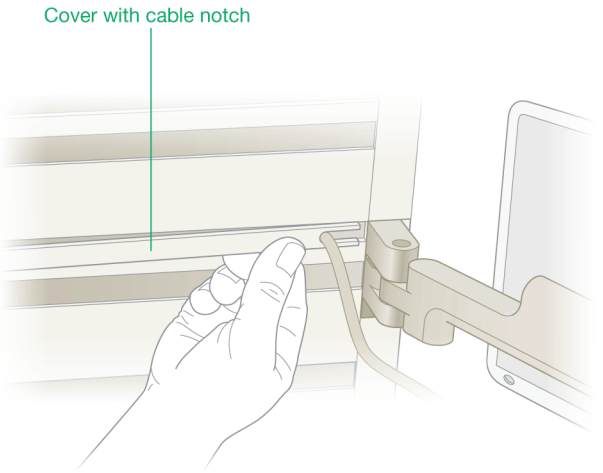
9. Route the display cable through the side and rear cable troughs on the instrument.



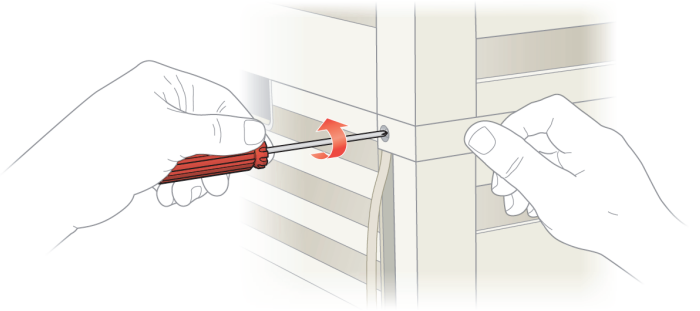
10. Insert the touch screen cable into the touch screen connector port on the back of the instrument and tighten the thumbscrews.



11. Locate the touch screen cable cover in the accessories kit. This is the cover with the cable notch.
12. Slide the touch screen cable cover into place to cover the cable.



13. Secure the cover to the back of the instrument with a 6-32 x 1 ¼" Phillips screw.

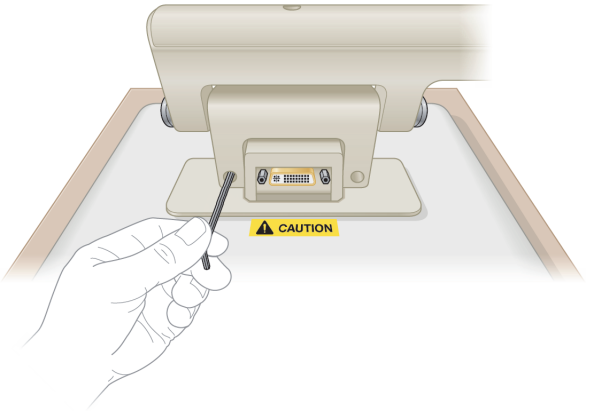


Repositioning the Touch Screen Pivot Arm Assembly

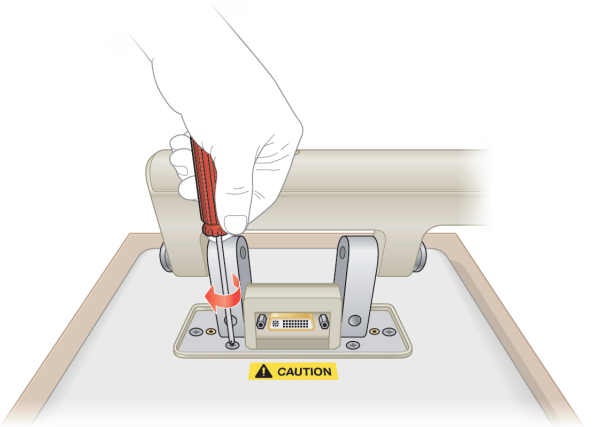
If you attach the touch screen to the right side of the NGC instrument, you must reposition its pivot arm assembly before mounting the touch screen onto the mounting bracket.

To reposition the touch screen's pivot arm assembly

1. Place the touch screen monitor face down on a clean surface to prevent scratching.
2. Using the 7/64 hex key provided in the accessories kit, remove the cover from the back of the touch screen monitor.

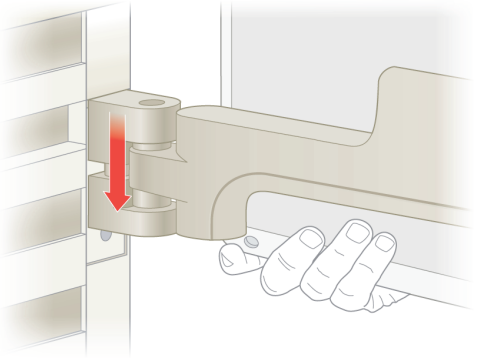


3. Using a Phillips screwdriver, remove the six screws that attach the touch screen to the pivot arm assembly and place them aside.



4. Lift the pivot arm assembly off of the touch screen. The mounting assembly should be in your right hand.
5. Turn the pivot arm assembly around 180° so that the mounting assembly is now in your left hand and insert the assembly into its position on the back of the touch screen.
6. Using the six screws that you removed in step 3, reattach the pivot arm assembly to the touch screen with a Phillips screwdriver.
7. Reattach the cover to the back of the touch screen with the 7/64 hex key.
8. Pivot the touch screen so that the screen faces forward and the cable connector is at the bottom of the screen.

9. After you attach the mounting post to the side of the instrument, slide the touch screen display onto it.



10. Insert a ¼-20 x ¾" hex bolt underneath the mount to secure the touch screen.

NGC System Location Is a Standard Cold Cabinet

To connect the touch screen to the NGC system when the system is located in a cold cabinet perform the following tasks:

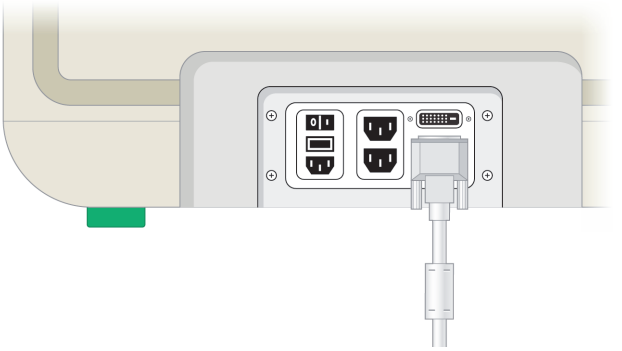
- Connect the touch screen and communication cables to the NGC instrument before inserting it into the cold cabinet
- Place the instrument in the cold cabinet
- Connect the touch screen to the touch screen stand
- Connect the touch screen cable to the touch screen

These tasks are explained in detail in the sections that follow.

To connect the touch screen and communication cables

1. Determine the side of the cold cabinet into which you plan to install the instrument and place a table on that side of the cabinet.
2. Locate the touch screen display cable in the accessories kit or the NGC touch screen bracket kit (#788-5060).

   Tip: Bio-Rad provides a standard 5' (1.52 m) cable in the accessories kit and a 15' cable with the NGC touch screen bracket kit or the NGC touch screen stand (#788-5040). A 10' (3.0 m) cable is also available.
3. Insert the touch screen cable into the touch screen connector port on the back of the instrument and tighten the thumbscrews.



4. Complete the steps in the section To connect the power and communication cables on page 78.

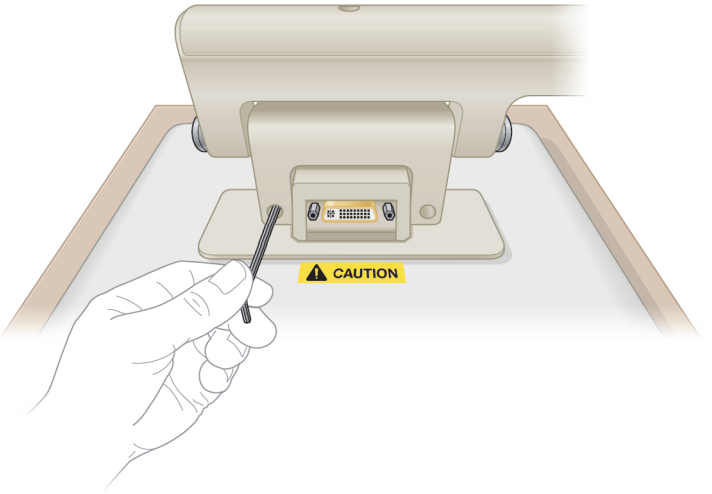
To place the instrument in the cold cabinet

Caution: Two or more individuals should lift the instrument.

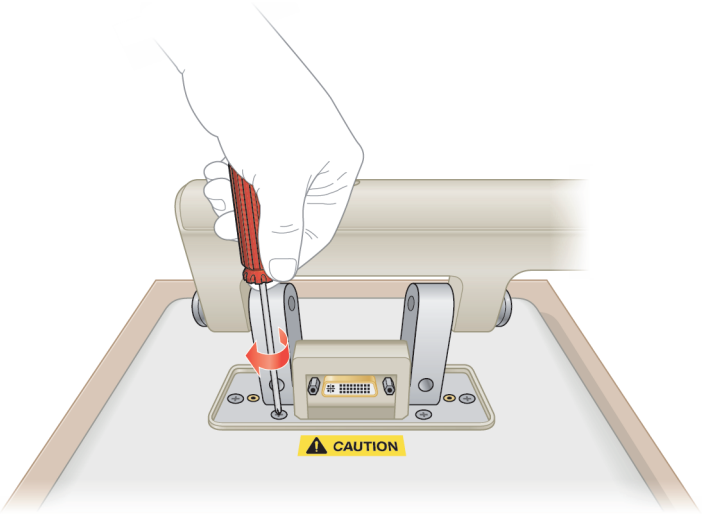
▶ Carefully lift the instrument into the cold cabinet. See the packaging insert for information about lifting the NGC instrument.

To attach the touch screen to the touch screen stand

1. Place the touch screen monitor face down on a clean surface to prevent scratching.
2. Using the 7/64 hex key provided in the accessories kit, remove the cover from the back of the touch screen monitor.

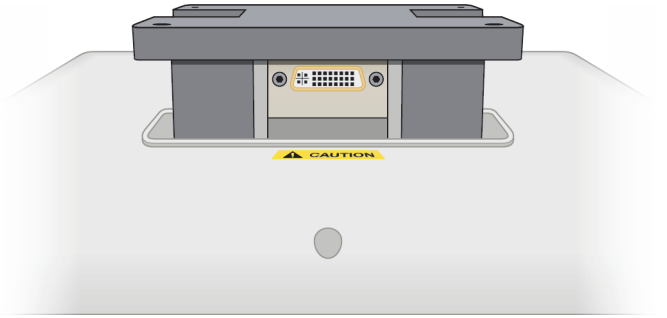


3. Using a Phillips screwdriver, remove the six screws that attach the touch screen to the pivot arm assembly and place them aside. You will need them in step 6.

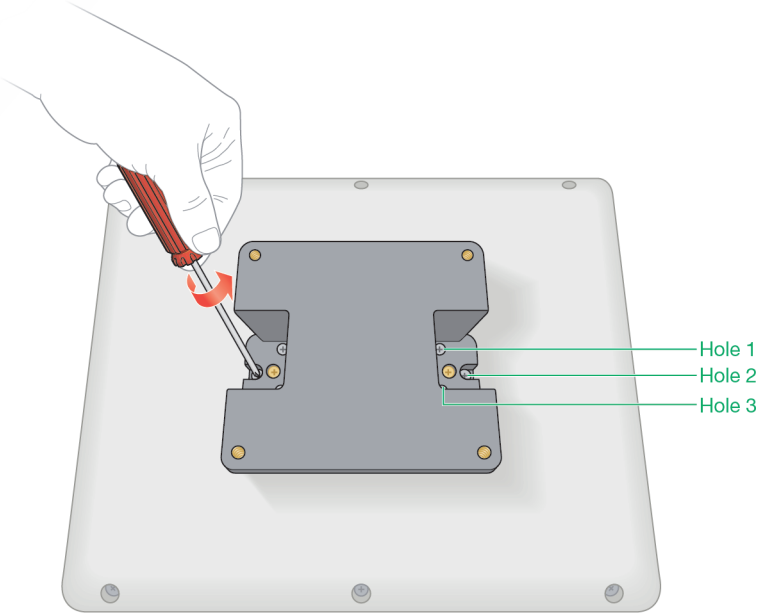


4. Locate the touch screen mounting bracket in the NGC Touch Screen Mounting Stand kit (#788-5040).

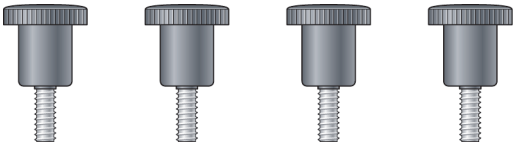
5. Position the bracket on the back of the touch screen so that the bracket opening is on the bottom. You should see the cable connector port through the bracket opening.



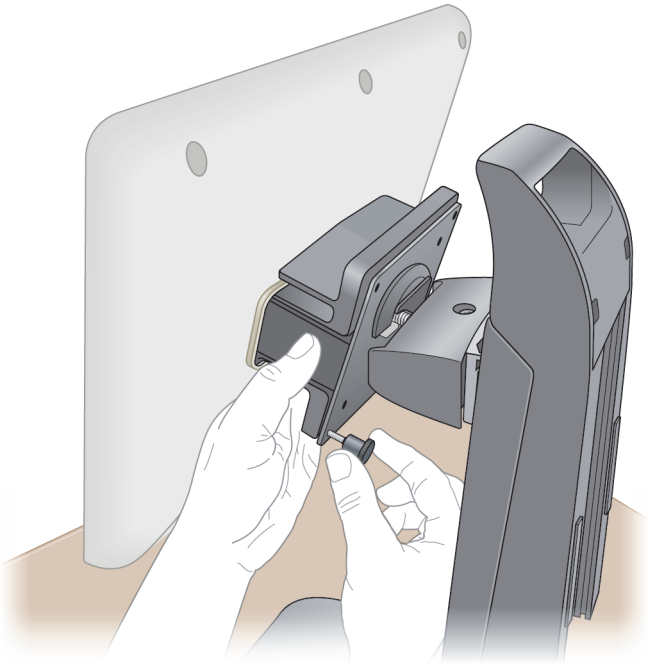
6. Attach the mounting bracket to the touch screen with the six screws that you set aside in step 3.



7. Locate the four thumb screws in the packaging for the touch screen stand.



8. Using the four thumb screws, loosely attach the touch screen bracket assembly to the stand. Then tighten the thumb screws evenly after you have completed the initial mounting.



9. Place the mounted touch screen on the table outside the cold cabinet.
10. Locate the end of the touch screen display cable that you routed through the access port.
11. Firmly push the touch screen cable into the port at the bottom of the touch screen mounting bracket and tighten the thumbscrews.

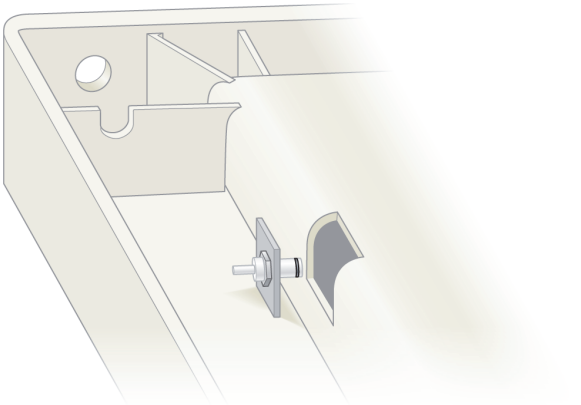
Connecting the Drain Tube to the Buffer Tray

The top of the NGC system is molded to contain the buffer tray and route its drain tube to the right or left side of the instrument. The drain tube connects to the buffer tray through a connector on the back of the instrument top.

Note: The drain tube connector is barbed to keep the tube tightly in position. After it is securely attached to the connector, the tube will be very difficult to remove. Plan your setup carefully before attaching the drain tube to the connector.

To connect the drain tube to the buffer tray

1. Locate the instrument top and buffer tray.
2. Place the top upside down on the lab counter with the back side of the tray facing toward you.
3. Determine the side of the instrument on which to place your waste container and then locate the corresponding right or left drain tube hole in the top.

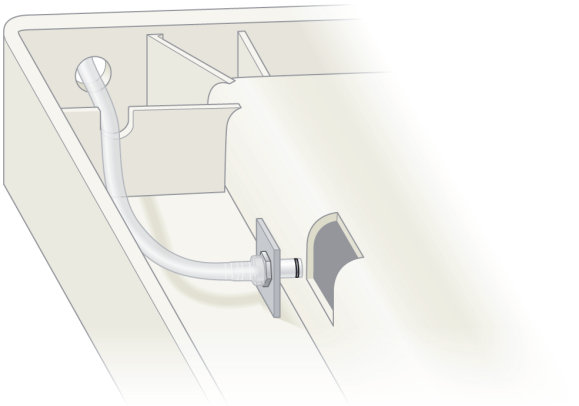


4. Uncoil the drain tube and insert it through the drain hole on the side of the top.

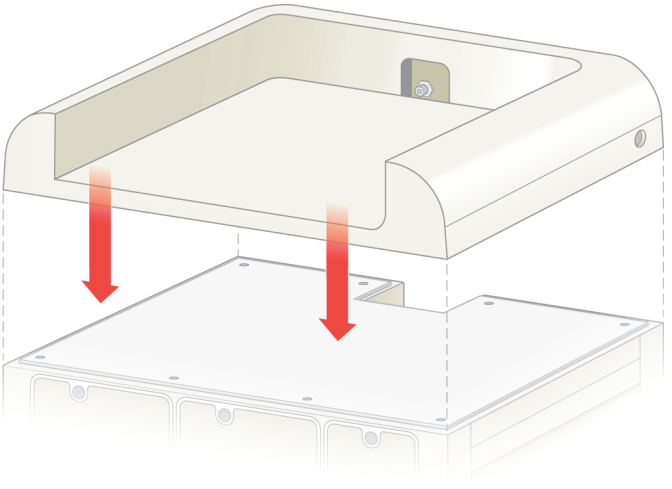
Caution: Ensure that no kinks are visible in the tube before connecting it to the connector.

5. Grasp the interior end of the tube and push it onto the drain connector as far back as possible to secure it in position.

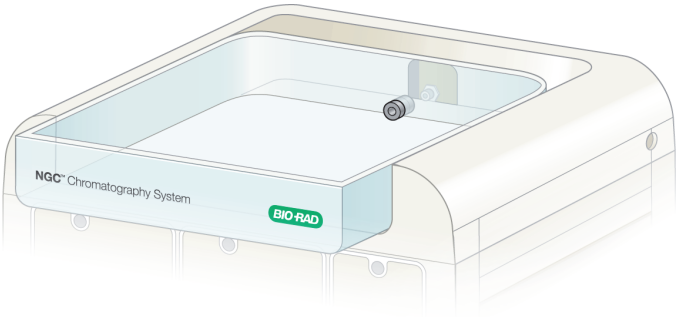
   The tube should rest in the interior notch and be positioned so that it bends according to its natural coil.



6. Turn the top right side up and place it on the NGC instrument.



7. Place the buffer tray on the top of the instrument and slide it all the way back until the black gasket is securely fixed to the front of the drain connector.



Installing the pH Probe in the pH Module

Note: This procedure assumes that the pH module is already installed in your system and the tubing is already connected to the appropriate positions.

The pH probe is packaged in storage solution to protect it during shipping.

To install the pH probe

1. Remove the cap from the pH valve flow cell.
2. Add a small amount of water (2 ml) to the pH valve flow cell.
3. Remove the pH probe from the storage solution.
4. Inspect the probe to determine if the air bubble in the stem has moved into the bulb area.

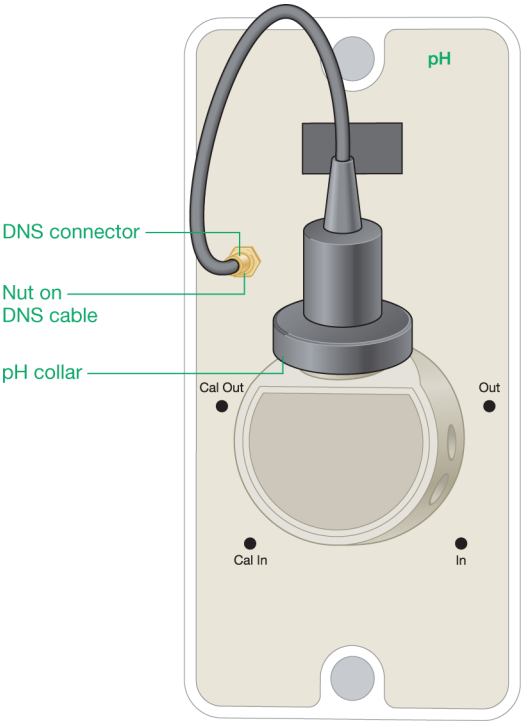
   Tip: If bubbles are visible in the bulb area, hold the electrode by the top cap and shake downward to move the bubbles into the stem.
5. Carefully remove the plastic cap from the pH probe.
6. Inspect the pH probe and ensure that the O-ring is in place on the body.
7. Insert the pH probe into the top of the pH flow cell.
8. Slide the collar over the pH probe onto the pH valve flow cell and carefully hand-tighten the collar until it is snug.

   Caution: Do not overtighten the collar. Overtightening will break the glass pH probe.
9. Connect the pH probe cable to the DNS connector on the pH valve module.

   Tip: If a small amount of liquid drips from the flow cell during installation, wipe it off with a paper towel.

10. Start the NGC instrument.

    The following figure shows the pH probe installed in the flow cell.



11. Calibrate the pH monitor.

    Note: See the NGC Chromatography Systems and ChromLab Software User Guide for information about calibrating the pH monitor.

Attaching an Expansion Tier to the NGC Instrument

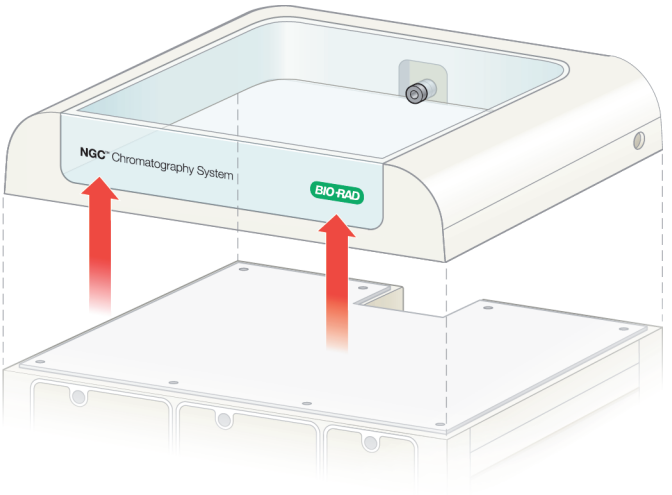
WARNING! Disconnect power to the NGC instrument before attaching an expansion tier. Do not attempt to service any component on the NGC instrument unless noted in this manual. Contact Bio-Rad for service requests.

To attach the connector cable, you will need access to the back of the NGC instrument. If necessary, pull the NGC instrument away from the wall and rotate the instrument to gain access.

Important: If you are adding a fourth expansion tier, you must attach it to an already attached third tier. The third and fourth tiers are not interchangeable. Ensure that the third tier is installed on the NGC instrument before attaching the fourth tier.

To attach an expansion tier to the NGC instrument

1. On the touch screen, select Shut Down on the dropdown menu to exit ChromLab and shut down the NGC instrument.
2. Remove all tubing lines to sample and buffer bottles and remove any bottles from the buffer tray.
3. Lift the top off the NGC instrument and place it on the lab bench.



Tip: The buffer tray can remain inside the top.

4. Locate the package that contains the expansion tier and 52" (1.32 m) connector cable.

   Important: The cables that ship with third and fourth tiers are not interchangeable. You must use the cable that ships with the expansion tier. Inserting a third tier cable into the fourth tier connector ports will damage the cable and the ports.

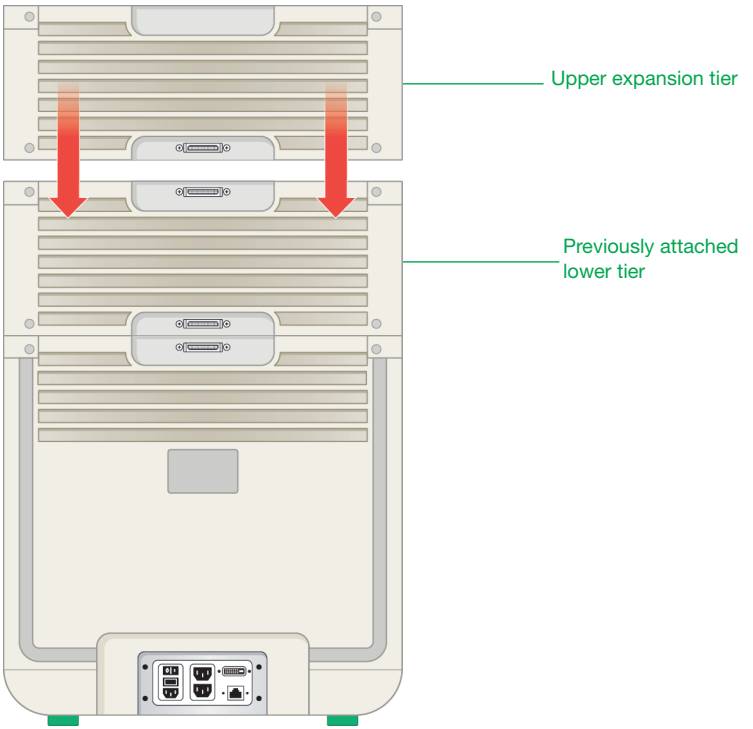
   - The catalog number for the 25" (63.5 cm) second-to-third tier connector cable is #100-24878.
   - The catalog number for the 52" (1.32 m) third-to-fourth tier connector cable is #100-24892.

5. Carefully remove the tier from its packaging material.

6. Place the expansion tier on top of the already installed tier.

   Tip: If your NGC instrument is on a lab bench, consider using a step stool to place the fourth tier onto the third tier.

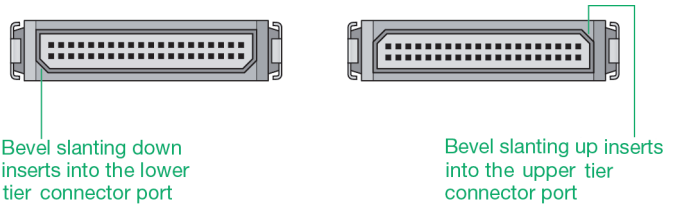
   Tip: Although the images in this section show how to attach the fourth expansion tier to an already installed third tier, the procedure for attaching a third tier to a second tier is the same. These images are examples.



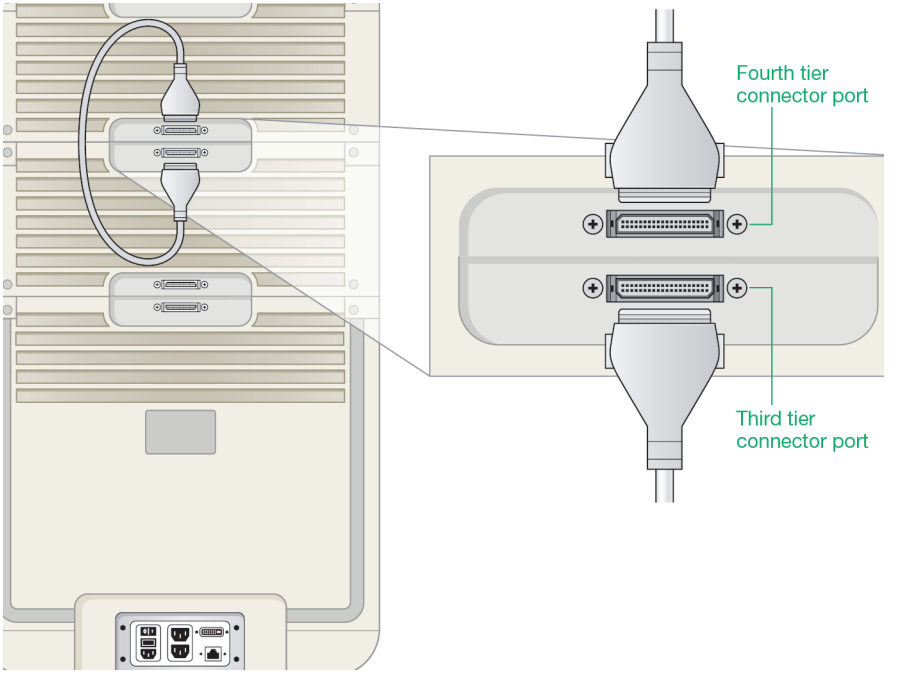
7. Locate the connector cable that ships with the expansion tier.

8. View the connector ends. Each end is beveled. The direction of the bevel determines the tier into which to insert the connector:

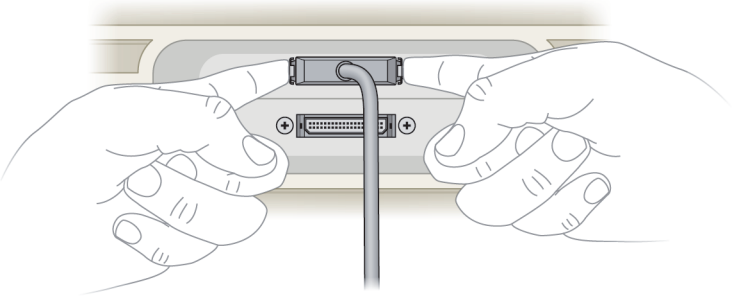
   - The end with the bevel slanting up inserts into the upper tier's connector port.
   - The end with the bevel slanting down inserts into the lower tier's connector port.



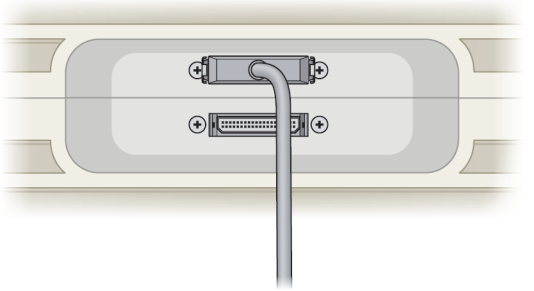
For example:



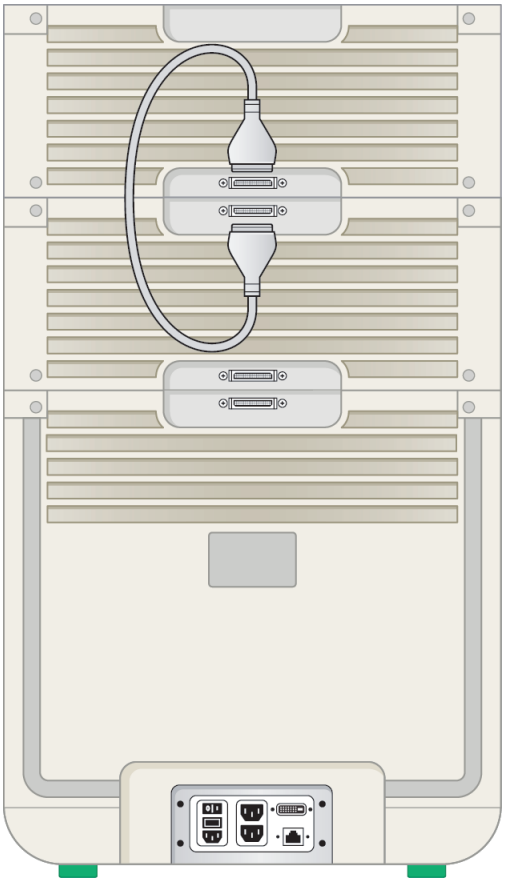
9. Firmly press the clips inward and insert the appropriate connector into the upper tier's connector port.



Tip: You hear a click when the connector is properly seated.



10. Insert the other connector into the lower tier's connector port.



11. Place the top, with the buffer tray, on top of the NGC instrument and place the buffer bottles into the buffer tray.

12. Insert tubing lines into the sample and buffer bottles.

13. Perform the following tasks:

Task:	Refer to the section:
Insert modules into the new tier	Inserting Additional Modules on page 51
Plumb the system	Plumbing NGC Systems on page 103
Start the instrument	Powering on the NGC Instrument and Peripherals on page 85
Prime the system	Priming and Purging the System on page 127
Calibrate the system	Calibrating the Instrument on page 148

Inserting Additional Modules

WARNING! Disconnect power to the NGC instrument before inserting or removing any module. No user-serviceable parts are inside any component unless noted in this manual. Refer servicing questions to Bio-Rad service personnel.

WARNING! To reduce the chance of liquid seeping into the instrument, all open bays must be filled with at least an empty module. The NGC instrument will not operate if it detects a slot without a module inserted.

To insert or reposition modules on the NGC instrument

1. Ensure that the NGC instrument is powered off.
2. Loosen the screws on the front of the module cover or covers.
3. Firmly grasp both captive screws and pull the module forward out of its bay.

   The following image shows an empty bay.

4. Store the module and the screws in a safe place for future use.

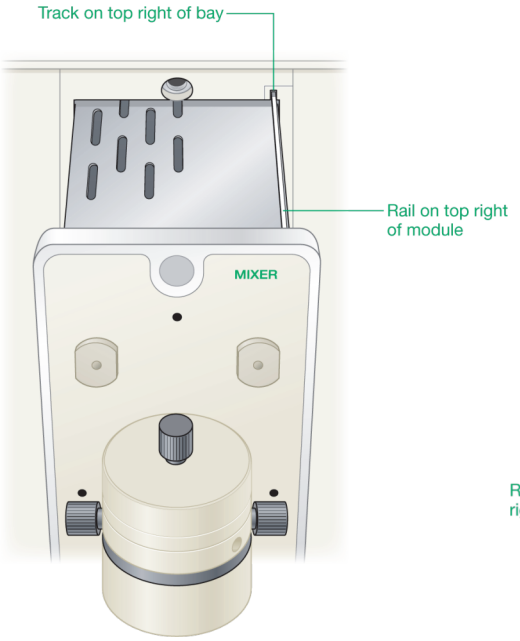
5. (Optional) Convert the bay to a single-wide bay or a double-wide bay.

   See Converting Bays to Fit Modules on page 53.

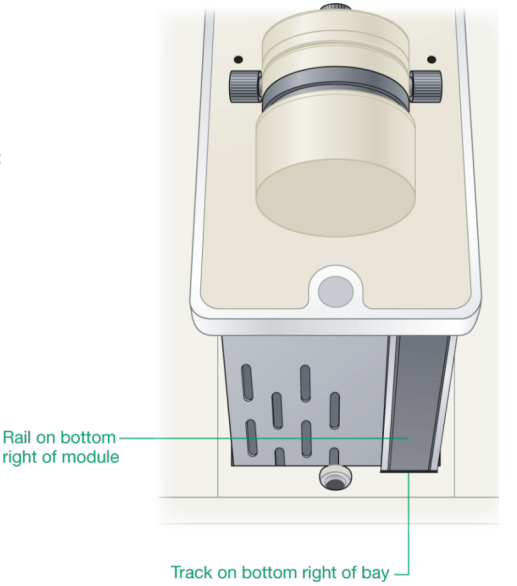
6. Locate the module that you plan to install and remove it from its packaging.
7. The frame of the bay has tracks on the top and bottom of the right side. The module has guide rails on the top and bottom right side.

   Align the rails on the module with its track in the bay to properly guide it into position.

Top of Module



Bottom of Module



8. Place the module into the open bay and gently slide it in as far as it will go.

   Note: Each module has an alignment pin on the back to ensure that it aligns correctly with the main communication board.

9. Ensure that the screw holes on the module align with the holes on the bay.

10. Insert the screws that shipped with the module into the screw holes.

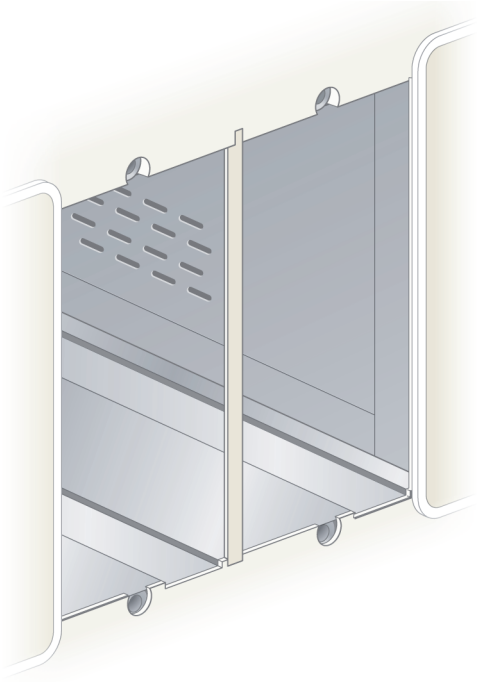
Caution: Do not overtighten the screws.

11. Tighten the screws on the front of the module.

Converting Bays to Fit Modules

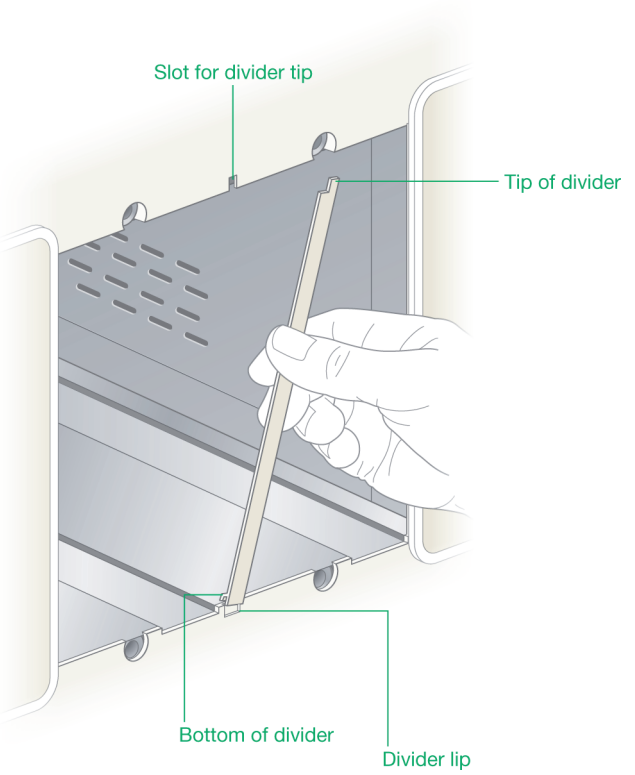
Some modules fit into single-wide bays while others require double-wide bays (such as the system and sample pump modules and the UV and UV/Vis detector modules). Bays can be converted from one size to the other by adding or removing the center divider.

The following image shows two adjacent, empty, single-wide bays.



To convert a single-wide bay to a double-wide bay

1. Complete steps 1–4 in the section To insert or reposition modules on the NGC instrument on page 51.
2. Gently lift the divider upward off of the lip to unhook it and then pull it out of the instrument.



3. Store the divider in a safe place for later use.
4. Complete steps 6–11 in the section To insert or reposition modules on the NGC instrument.

To convert a double-wide bay to a single-wide bay

1. Complete steps 1–4 in the section To insert or reposition modules on the NGC instrument on page 51.
2. Locate a plastic center divider.
3. Insert the top of the divider into its slot.
4. Gently bend the divider and slide the bottom of the divider up onto the lip.
5. Complete steps 6–11 in the section To insert or reposition modules on the NGC instrument.

Connecting Peripheral Equipment

This section includes information about:

- Connecting the NGC Fraction Collector
- Connecting the BioFrac Fraction Collector
- Connecting Column Clamps to the NGC Instrument
- Connecting a Keyboard or Mouse
- Connecting the Air Sensors
- Connecting the SIM to the NGC Instrument

If you do not plan to connect these components to the NGC system, you can skip this section.

Connecting the NGC Fraction Collector

Tip: For information about setting up and using the NGC FC, see the NGC Fraction Collector Instrument Guide.

The NGC FC requires a USB cable to connect to the NGC instrument. Bio-Rad supplies this cable with the NGC FC instrument. ChromLab detects the fraction collector by way of the USB cable.

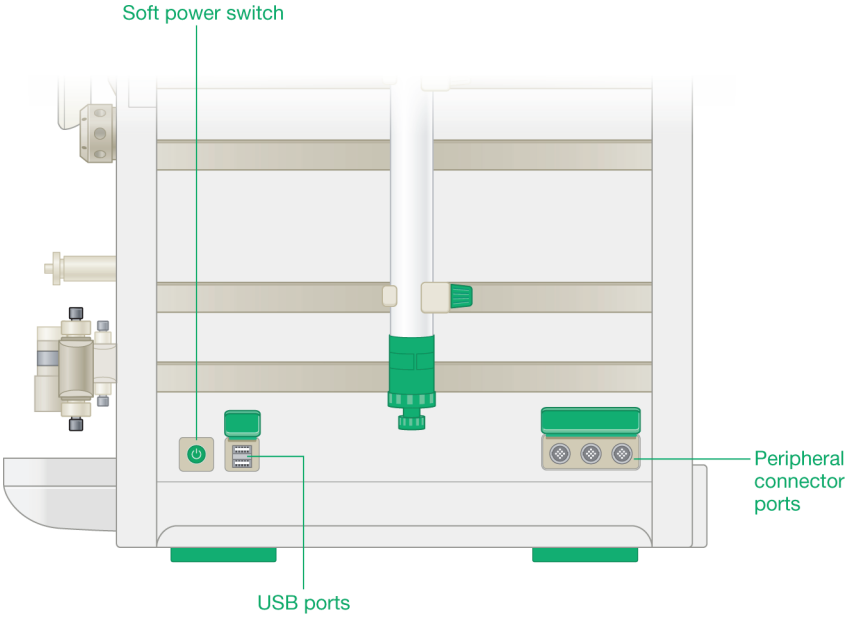
To connect the NGC FC to the NGC instrument

1. Ensure that the NGC instrument and the NGC FC are powered off.
2. Locate the USB port on the back of the NGC FC.
3. Locate USB cable that ships with the NGC FC.

   Important: You must use the USB cable that ships with the NGC FC.

4. Insert one end of the USB cable into the USB port on the back of the NGC FC.

5. Insert the other end of the cable into one of the USB ports on the NGC instrument.



6. Power on the instruments:

   a. Power on the NGC FC first.

   b. Press the soft power switch on the NGC instrument to power it on.

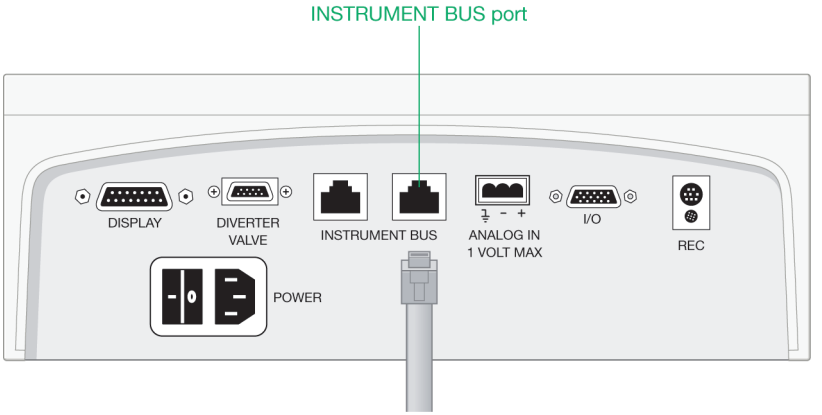
Connecting the BioFrac Fraction Collector

Tip: For information about setting up and using the fraction collector, see the BioFrac Fraction Collector User Guide.

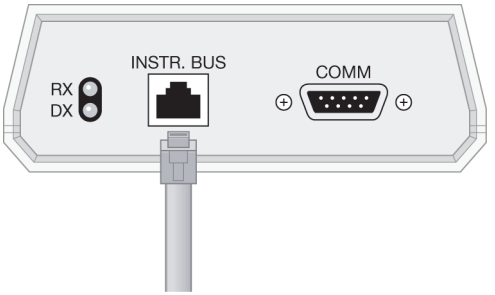
The BioFrac fraction collector requires the communication adapter and its cable to connect to the NGC instrument. ChromLab detects the fraction collector by way of the communication adapter.

To connect the BioFrac fraction collector to the NGC instrument

1. Ensure that the NGC instrument and the fraction collector are powered off.
2. Locate the connector port marked INSTRUMENT BUS on the back of the BioFrac fraction collector.
3. Insert system cable 17 that ships with the fraction collector into an INSTRUMENT BUS connector port.

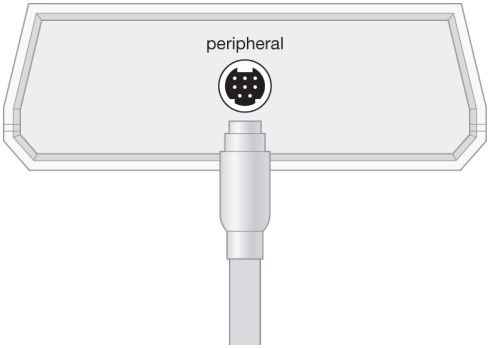


4. Insert the other end of the cable into the INSTR. BUS connector on the back of the communication adapter.

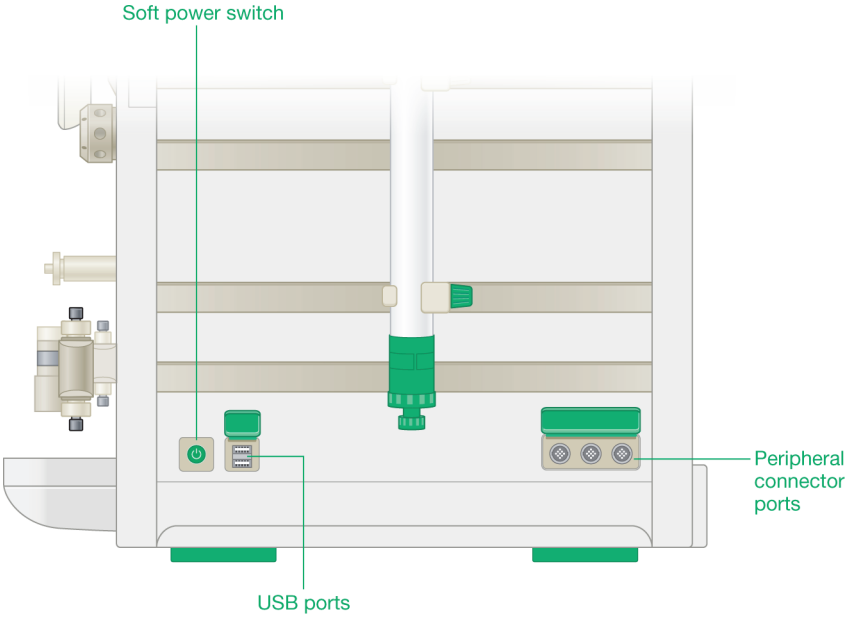


Tip: The RX and DX diodes are communication indicators. You see the lights flash as data transfer between the fraction collector and the NGC instrument. The COMM port is not used to connect to the fraction collector.

5. Locate the peripheral cable that ships with the communication adapter.
6. Insert one end of the peripheral cable into the peripheral port on the communication adapter.



7. Insert the other end of the cable into one of the peripheral ports on the NGC instrument.



8. Power on the instruments:

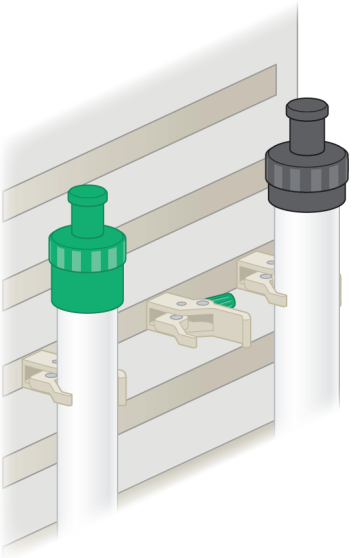
   a. Power on the BioFrac fraction collector first.

   b. Press the soft power switch on the NGC instrument to power it on.

Connecting Column Clamps to the NGC Instrument

The NGC instrument has indented metallic strips on both the right and left sides on which to mount column clamps, air sensors, and the fittings tightener. The column clamps can be placed at any position on the strips. The column clamps are adjustable and can accept a variety of column sizes up to 35 mm in diameter.

Tip: For long columns use two column clamps to keep the columns from tipping.



Caution: Do not overtighten the clamps. Glass columns can shatter if the clamps are overtightened.

Connecting Tubing to the Columns

Note: Ensure that the system has been purged of air and that the tubing is filled with buffer before connecting the columns.

To connect tubing to the columns

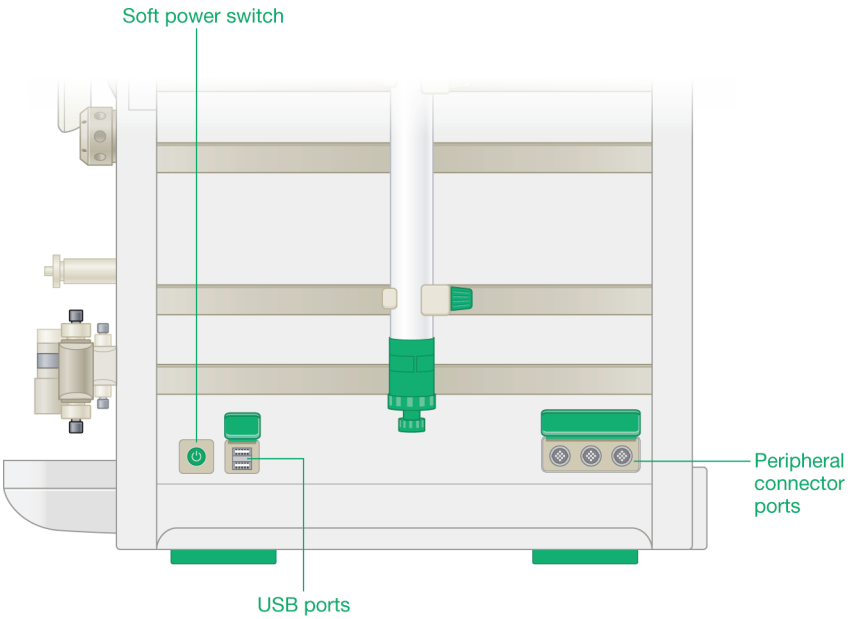
1. Connect tubing from one of the following modules to the top of the column:
   - Sample inject valve column port
   - Column switching valve inlet port (1–5)

   Note: For best air-free connection ensure that the tubing is dripping buffer at a flow rate of 0.5–1 ml/min. Fill the top of the column with buffer before inserting and tightening the fitting.
2. Remove the plug from the bottom of the column.

3. Connect the tubing from one of the following modules to the bottom of the column:
   - UV monitor
   - Column switching valve outlet port (1–5)

Connecting a Keyboard or Mouse

The NGC systems can be controlled using the keyboard on the touch screen or by using a USB-connected keyboard and mouse. You can connect a keyboard and mouse to any of the four USB ports located on the right and left sides of the NGC instrument.



Connecting the Air Sensors

The system supports up to two air sensor modules and up to eight air sensors. The air sensor module has a magnetic backing and can attach to the side of the NGC instrument. Each module can contain up to four air sensors. The system detects the number of air sensors that are attached to the instrument.

The air sensors can be set to detect air in lines connected to the system pumps to detect end of buffer. They can also be set to detect air in lines connected to the sample pump to detect end of sample.

Two air sensors are available that differ in their internal diameter.

- Large air sensors connect to 1/8" ID FEP tubing
- Smaller air sensors connect to 1/16" ID PEEK tubing

Note: The air sensor module accommodates both sizes simultaneously.

The air sensors can be inserted into the ports on the air sensor module. ChromLab detects the presence or absence of air sensors in the module. If you have fewer than four air sensors on the module, you must cover the unoccupied ports with a protective blank cover that is provided with the module to prevent liquid from entering into the module's electronic circuitry.

Caution: All air sensors connected to the air sensor module must be filled with liquid and devoid of air. A connected air sensor that is not plumbed and primed can trigger an air-bubble sensing event, which causes the pumps to stop and the blue air sensor LEDs to turn on.

Air Sensor Tubing Length and Bubble Size

The response of the air sensor module is highly dependent on the bubble size and flow rate, and requires a minimum tubing length between the sensor outlet and the pump inlet. Table 6 lists recommended tubing lengths for various flow rates and bubble sizes.

Table 6. Recommended air sensor tubing lengths

Flow Rate	Bubble Size	1/8" ID FEP Tubing Length (air sensor to pump inlet)
1 ml/min	15–25 µl	≥6"
5 ml/min	50–100 µl	≥6"
10 ml/min	200 µl	≥6"
100 ml/min	1.05–1.4 ml	≥42"

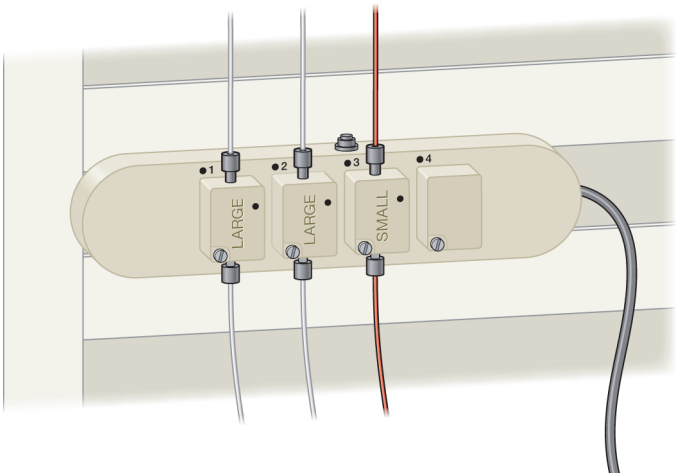
Attaching and Activating Air Sensors

This section explains how to attach the air sensor module and the air sensors. It also explains how to activate the air sensors after they are attached.

Note: Bio-Rad recommends that all buffers be filtered and degassed prior to use.

To attach the air sensor module and air sensors

1. Ensure that the NGC instrument is powered off.
2. Attach the air sensor module to one of the indented metallic strips on the side of the instrument.



3. Insert the connector cable on the air sensor module into one of the peripheral connector ports on the side of the NGC instrument.
4. To connect an air sensor to the sample pump:
   a. Connect the tubing from the sample container to one port on the air sensor in the air sensor module.
   b. Connect the tubing from the other port on the air sensor to the inlet port of the sample pump.

5. To connect an air sensor to a system pump:

    a. Connect tubing from the buffer bottle or from the outlet port on the one of the buffer inlet valves to one port on the air sensor.

    b. Connect tubing from the other port on the air sensor to the inlet port on the corresponding system pump.

6. To connect air sensors to the buffer blending valve:

    a. Connect tubing from each buffer bottle to one port on each air sensor that will be used.

    b. Connect tubing from the other port on each air sensor to the inlet ports on the buffer blending valve.

    Alternatively you can attach tubing from the outlets A and B of the buffer blending valve to the top of the air sensors. Connect the ports from the bottom of each air sensor to the inlets of system pumps A and B, respectively. In this setup, although the air will be prevented from entering the system pumps and the system will react to end of buffer, the system will not distinguish which of the four ports needs replenishing.

To activate the air sensors

1. Start ChromLab.

    The green LEDs on the air sensor module should turn on.

2. Select File > System Settings to open the System Settings dialog box.

3. Select the Air Sensors tab.

    By default, only the air sensors that the system detects are enabled. The other sensors are disabled.

4. For each air sensor that you want activate, select its checkbox and from its dropdown list choose either Sample to detect end of sample or Buffer to detect end of buffer.

5. Click OK.

Connecting External Devices to the NGC Instrument

Tip: If you do not plan to connect the C-96 autosampler or other external devices to the NGC instrument you can skip this section.

This section explains how to connect the signal import module (SIM) to the NGC instrument, and how to connect external devices to the SIM.

- For information about connecting the C-96 autosampler to the SIM, see Appendix C, Connecting the C-96 Autosampler to NGC Systems on page 171.
- For information about connecting the SIM to an NGC instrument, see Connecting the SIM to the NGC Instrument on page 68.
- For information about connecting other external devices to the SIM, see Connecting External Devices to the SIM on page 70. Next, see the chapter System Controls in the NGC Chromatography Systems and ChromLab Software User Guide to enable the components.
- For information about installing and setting up an external device, see its installation documentation.

Controlling Programmed Functions via Transistor-to-Transistor Logic

You can control a function of an external device or receive function information from a device via the SIM. Using the SIM's transistor-to-transistor logic (TTL), the NGC instrument can mark when a function occurred on an external device through the SIM's DIGITAL IN port, or send commands to an external device through its DIGITAL OUT port.

For example, you can connect a C-96 autosampler to the SIM enabling NGC systems to provide automated, accurate, and reproducible sample injections. Connecting the autosampler to the SIM's DIGITAL OUT and DIGITAL IN ports enables the NGC instrument to inform the autosampler when to begin its injection cycle and to mark when the autosampler injects a sample.

Importing Analog Signals to the NGC Instrument

You can import analog (voltage) signal from up to two external devices and convert it to digital NGC data via the SIM. The SIM imports and converts the signal to the appropriate trace units through its SIM 1 and SIM 2 ports. When data import is enabled (through System Settings in ChromLab), the details appear in the chromatogram's legend, the trace appears on the chromatogram, and the data can be analyzed in the Evaluation window.

Exporting Digital Data from the NGC Instrument

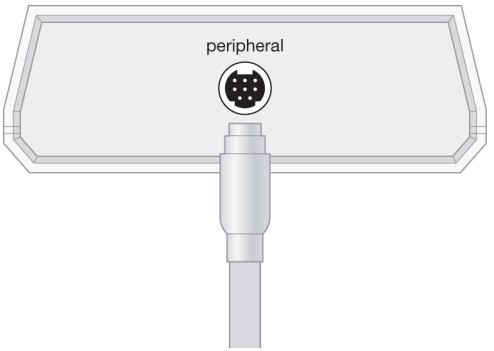
You can convert digital NGC data to analog voltage via the SIM and output the voltage to an external recording device, such as a light scattering detector. The SIM converts and outputs NGC trace information as voltage through its digital-to-analog converter (DAC) ports. By connecting a trigger wire to terminal 2 on the DIGITAL OUT connector, the SIM can send a signal to the device triggering it to start measuring data. Voltage from port 2 changes from High (5 V) to Low (0 V) when sample injection starts and returns to High when the injection stops.

When analog output is enabled (through System Settings in ChromLab), the external device can receive the converted trace information.

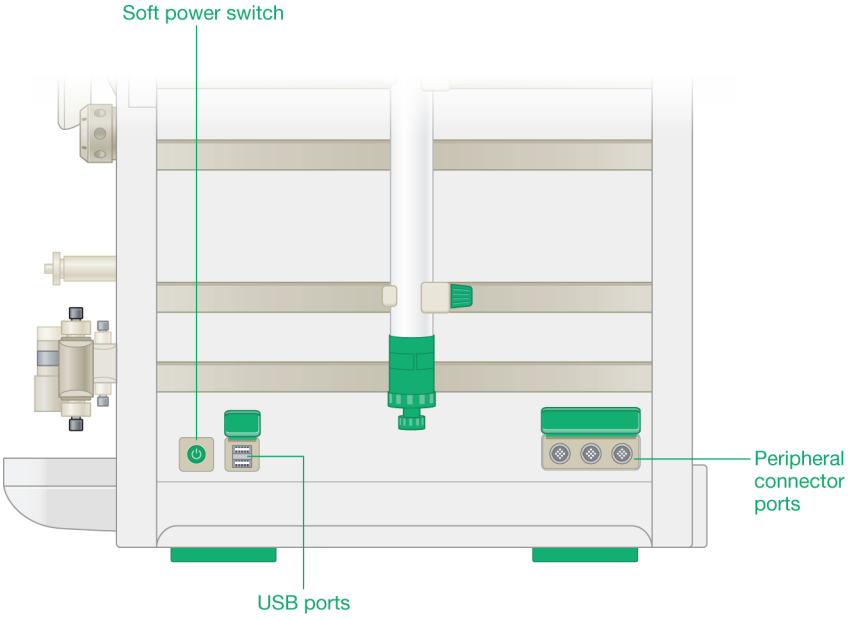
Connecting the SIM to the NGC Instrument

To connect the SIM to an NGC instrument

1. Locate the peripheral cable that ships with the SIM.
2. Insert one end of the peripheral cable into the peripheral port on the SIM.



3. Insert the other end of the cable into one of the peripheral connector ports on the side of the NGC instrument.



Connecting External Devices to the SIM

WARNING! These procedures require you to work with exposed wires. Ensure that your systems are powered off and unplugged before performing this task.

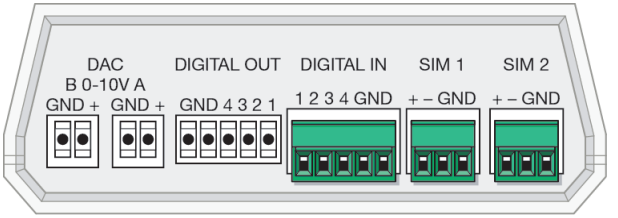
This section explains how to connect different external devices to the SIM. Before connecting the device, locate the connector ports that you will use on the back of the SIM. Notice that the terminals differ for different devices:

- To import analog signals to the NGC instrument, connect the external device to either the SIM 1 or SIM 2 ports. See the section To connect an external detector to the SIM 1 and SIM 2 ports that follows.
- To export digital signals from the NGC instrument, connect the external device to the DAC A port. Optionally, to trigger the external device to start measuring data from the NGC instrument, connect a trigger wire to the DIGITAL OUT port. See the section To connect an external device to the DAC A and DIGITAL OUT ports on page 75.

Tip: The SIM ships with its connectors inserted into their ports.

To connect an external detector to the SIM 1 and SIM 2 ports

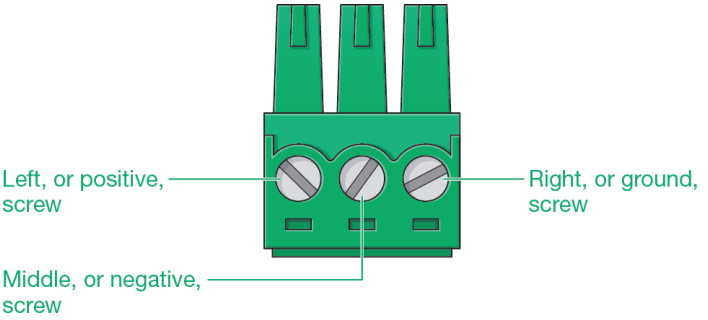
1. On the back of the SIM, firmly grasp the green SIM 1 or SIM 2 connector and pull it straight out of its port.



2. Locate the green flathead screwdriver included in the SIM's accessory kit.

3. Loosen all three screws on the top of the connector.

   Tip: These screws adjust the terminals that hold the wires in place. The screws do not dislodge from the connector.

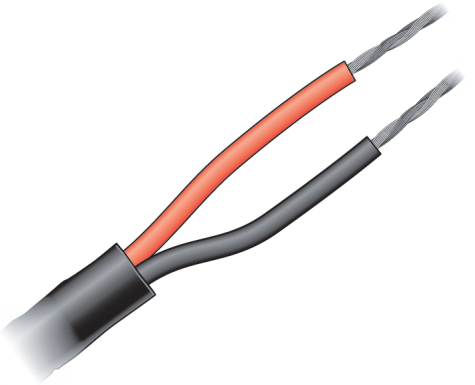


4. Locate the analog output cable that ships with your detector.
5. If connectors are attached to both ends of the cable, remove the connector that does not insert into your detector.

   Tip: Alternatively, contact the manufacturer for a suitable cable.

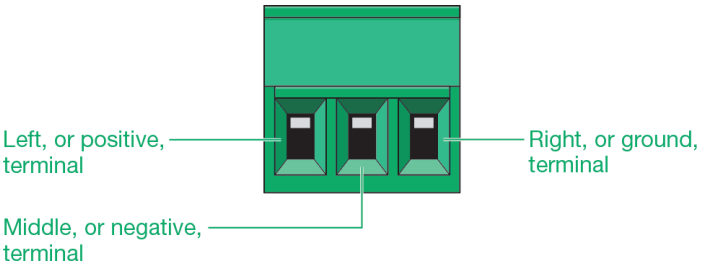
6. If necessary, strip the plastic wire coating off the wires so that they are exposed.
7. Obtain a small piece of 20–24 AWG negative wire.
8. Bend the wire into a U shape and strip the plastic coating off both ends to create a jumper wire.

9. On the analog output cable, determine the positive and negative wires.

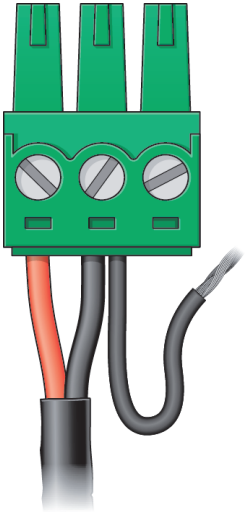


10. Insert the positive wire into the left terminal on the connector and tighten the screw.

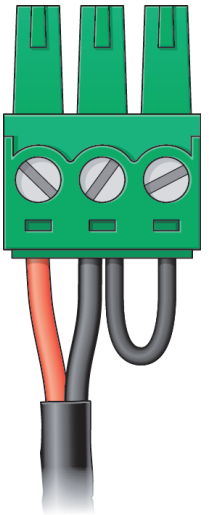
    Note: Take care not to overtighten or fray the wire.



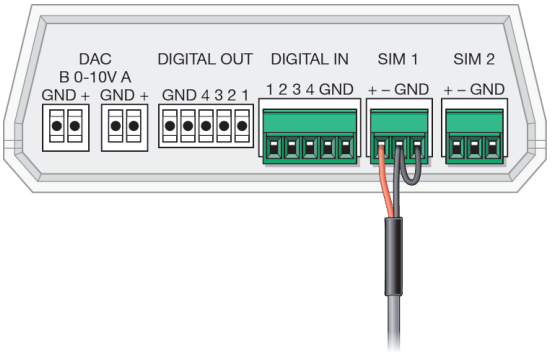
11. Insert the negative wire and one end of the jumper wire into the middle terminal on the connector and tighten the screw.



12. Insert the other end of the jumper wire into the right, or ground, terminal on the connector and tighten the screw.



13. Insert the connector into the SIM 1 or SIM 2 port on the back of the SIM.

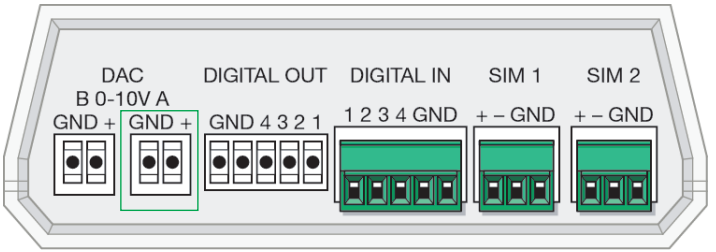


14. Refer to the chapter System Controls in the NGC Chromatography Systems and ChromLab Software User Guide for information about how to enable signal import from the device.

To connect an external device to the DAC A and DIGITAL OUT ports

1. On the back of the SIM, firmly grasp the DAC A connector and pull it straight out of its port.

   Note: ChromLab supports solely the DAC A port. When connecting an analog instrument, use the DAC port on the right (DAC A).



2. (Optional) If you want the NGC instrument to trigger the device to start measuring data, also remove the DIGITAL OUT connector and perform the steps that follow.
3. Locate the green flathead screwdriver included in the SIM's accessory kit.
4. Loosen the positive, ground, and terminal 2 screws on the connectors.

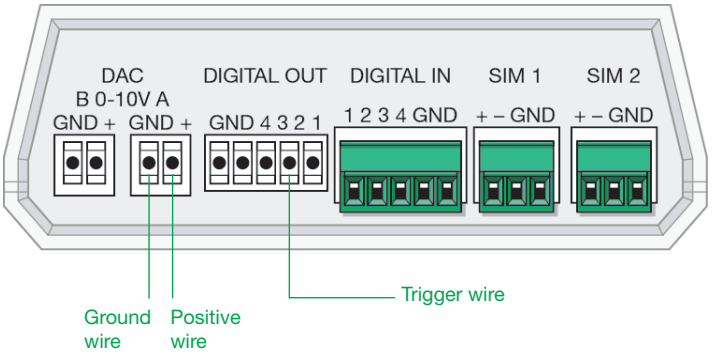
   Note: Terminal 1 on the DIGITAL OUT connector is reserved for the autosampler. Do not insert the trigger wire into terminal 1. Terminal 2 is the second screw from the right.

5. Locate the output cable that ships with your DAC device.
6. If connectors are attached to both ends of the cable, remove the connector that does not insert into your device.

   Tip: Alternatively, contact the manufacturer for a suitable cable.

7. If necessary, strip the plastic wire coating off the wires so that they are exposed.
8. Determine the positive, ground, and trigger wires on the cable.

9. Insert the positive and ground wires into the appropriate terminals on the DAC A connector and tighten the screws, taking care not to fray the wires.
10. Insert the trigger wire into terminal 2 on the DIGITAL OUT connector and tighten the screw, taking care not to fray the wire.

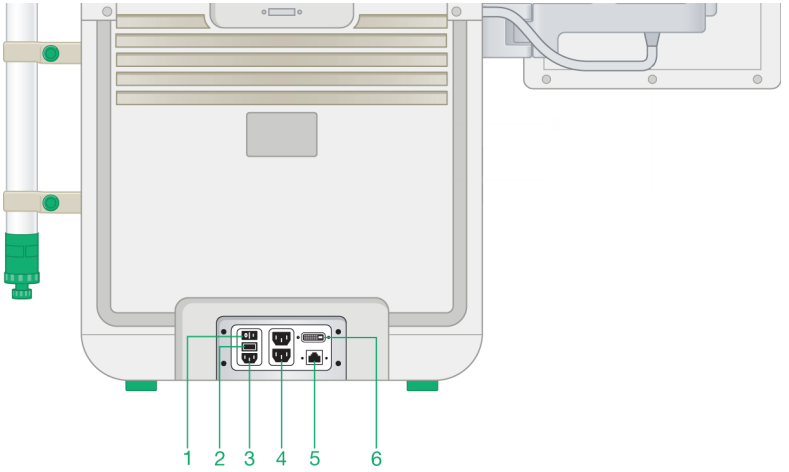


11. Insert the connectors into their ports on the back of the SIM.
12. Refer to the chapter System Controls in the NGC Chromatography Systems and ChromLab Software User Guide for information about how to enable signal output to the device.

Connecting the Power and Communication Cables

The power sockets and communication ports for the NGC system are located on the back of the instrument. Because the back of the instrument will be very close to the back of the standard cold cabinet, it is recommended that you connect the power and communication cables before lifting the instrument into the cabinet.

Note: The Cat 6 ethernet cable to connect the NGC instrument to the computer running ChromLab software is approximately 10' (3.0 m) in length.



LEGEND

1	Power on/off switch	2	Fuse cover
3	Power inlet port	4	Power outlet ports
5	Ethernet connection port	6	Touch screen connection port

To connect the power and communication cables

1. If you have not already done so, insert the end of the touch screen cable into the touch screen connection port on the back of the instrument.
2. Insert the Cat 6 (or higher) cable into the ethernet port on the back of the instrument.
3. (Optional) Connect the power cords for any peripheral instruments into the power outlet ports.
4. Connect the power cable to the power inlet port.
5. If installing the NGC instrument into a standard cold cabinet, direct the following cables through the access port on the side of the cabinet:
   - Touch screen cable
   - Ethernet cable
   - Power cable (if your cabinet does not have a power outlet)
6. Press the I/O power switch to the On position.

Caution: The weight of the NGC instrument varies from moderate to heavy depending on the system. Take care when lifting the instrument into the cold cabinet. To reduce the risk of personal injury or damage to the instrument, three or more people should perform this task.

7. If installing the NGC instrument into a standard cold cabinet:
   a. Lift the instrument into position.
   b. Connect the power cable to the power outlet.

Connecting the NGC System to the ChromLab Computer

Note: Ensure that the ChromLab computer and the NGC instrument are powered off before beginning this task.

You can connect the NGC system to the ChromLab computer in one of two ways:

- Direct cable connection using a Cat 6 ethernet cable
- Network connection through your network infrastructure

Establishing a Direct Cable Connection

Tip: You should have already inserted the Cat 6 ethernet cable into the port at the back of the NGC instrument. See To connect the power and communication cables on page 78.

If the ChromLab computer has two network adapters and you are establishing a direct connection to the NGC instrument, you can use the second adapter to connect the computer to your company's network.

To establish a direct cable connection

▶ Insert the loose end of the Cat 6 ethernet cable into one of the ethernet connection ports on the computer on which you plan to install ChromLab.

Note: The network adapter that is used to connect the NGC instrument needs to be configured to use TCP/IP 4.0 with dynamic host configuration protocol (DHCP). For information about configuring the network adapter, see Configuring the Network Adapter for Direct Connection on page 160.

Establishing a Network Connection

When establishing a connection between the NGC system and the ChromLab computer through your network infrastructure, ensure that they are both on the same subnet. A DHCP server is required so that the system receives an IP address.

Note: The DHCP server should be configured to always assign the same IP address to the system. See your network administrator for more information.

Tip: You should have already inserted the Cat 6 ethernet cable into the port at the back of the NGC instrument. See To connect the power and communication cables on page 78.

To establish a network connection

- Insert the loose end of the Cat 6 ethernet cable into the network connection router or hub.

4 Installing ChromLab Software

This chapter explains how to install ChromLab software on your computer.

The ChromLab installation wizard determines whether the required versions of .NET and SQL Server Express are installed. If not, the wizard installs them before installing ChromLab.

The wizard also installs and configures the ChromLab database.

After you install ChromLab, you will configure the NGC system to use the software. You might also set the delay volume for your system. This chapter explains these tasks.

Installing ChromLab Software

Important (For 64-bit operating systems only): The ChromLab installer installs Microsoft SQL Server 2014 Express on the ChromLab computer. Upgrading to or installing SQL Server 2014 Express requires you to reboot your computer several times during the installation process. You will be prompted to do so.

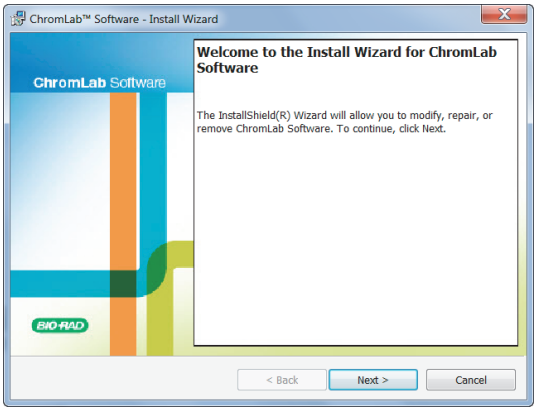
Notes: If you are upgrading ChromLab on a computer running the Windows 32-bit operating system, the ChromLab installer does not install or upgrade to SQL Server 2014 Express. Your ChromLab database will remain on SQL Server 2008 Express.

Although you can upgrade an existing version of ChromLab to version 6.1 on a computer running the Windows 32-bit operating system, you cannot perform a new installation of ChromLab 6.1 on a 32-bit operating system.

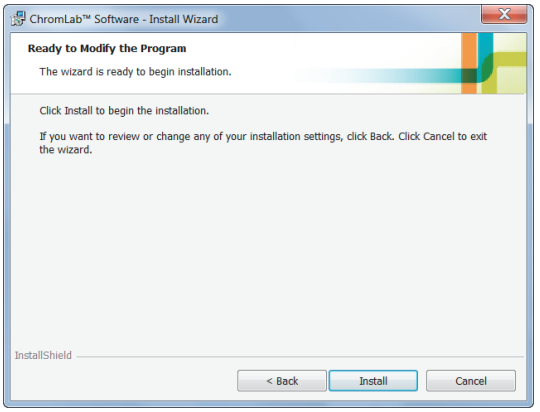
To install ChromLab software

1. Insert the ChromLab Software USB in an available USB drive.

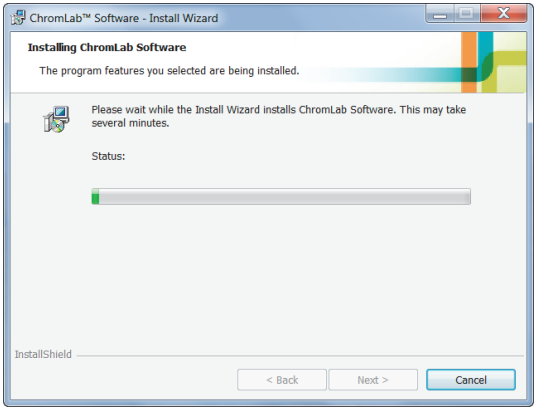
   The ChromLab installer automatically launches.



2. On the Welcome screen, click Next.
3. Accept the license agreement and click Next.
4. On the Ready to Install the Program screen, click Install.



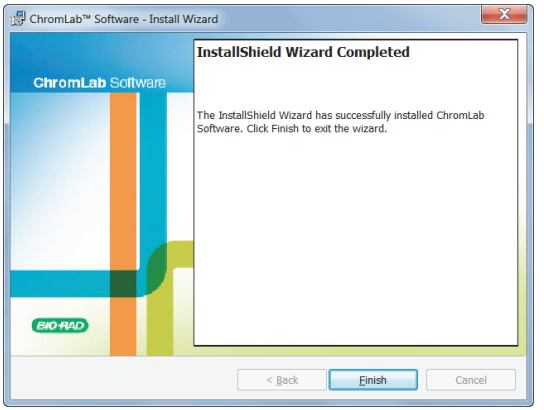
The wizard installs ChromLab.



Note: Installing ChromLab can take several minutes.

Important: If the required version of SQL Server Express is not installed, the installer will install the software. You will be prompted to restart the ChromLab computer to complete the installation.

5. When the installation is complete, click Finish to exit the wizard.



Establishing the Connection Between ChromLab Software and the NGC Systems

Verify that you completed the following tasks:

- Connected the touch screen to the NGC instrument
- Connected all required peripheral equipment including:
  - NGC Fraction Collector (NGC FC)
  - BioFrac fraction collector
  - Air sensor module (if used)
  - C-96 autosampler (if used)
- Connected the NGC instrument to the ChromLab computer
- Installed ChromLab on the ChromLab computer

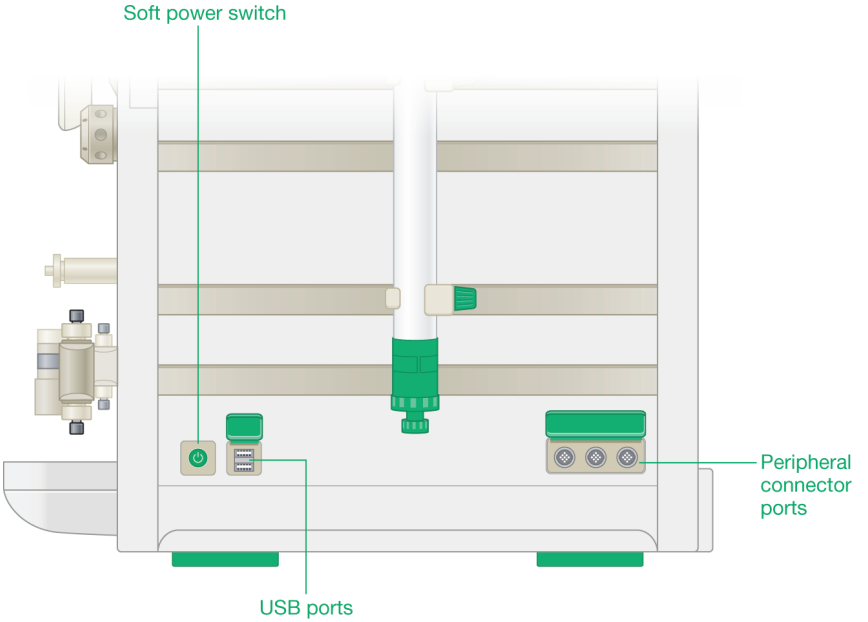
Powering on the NGC Instrument and Peripherals

1. Connect a power cable to the power outlet on the back of the NGC instrument and to the main power outlet.
2. Press the power switch on the back of the NGC instrument to the ON position.
3. Power on the attached peripheral equipment, specifically:
   - NGC FC

     Note: You must power on the NGC FC before powering on the NGC system so that the fraction collector is recognized during system setup.
   - BioFrac fraction collector

     Note: You must power on the BioFrac fraction collector before powering on the NGC system so that the fraction collector is recognized during system setup.
   - C-96 autosampler (if used)

4. Press the soft power button on the side of the NGC instrument to power on the system.



Setting the System Name

The tasks in this section are performed on both the ChromLab computer and the NGC instrument's touch screen.

On the NGC system

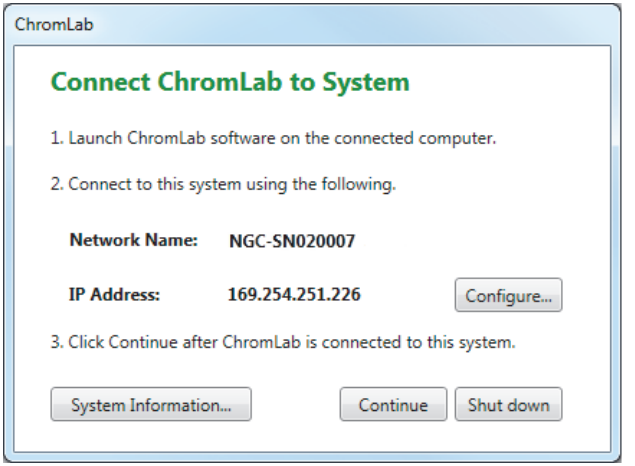
1. When ChromLab Touch loads on the touch screen, you are prompted to provide a name for the NGC instrument. By default, the name is NGC.

   This is the name that appears on the ChromLab Home screen when it connects to the NGC system. This is also the name that appears on the run reports to identify the system on which the run was generated.

   You can use any alphanumeric or special characters. However, you are limited to a maximum of ten characters.

2. Touch or click OK.

   The ChromLab connection information dialog box appears. This dialog box explains how to connect the ChromLab computer to the NGC instrument. Follow the instructions provided on the connection dialog box.

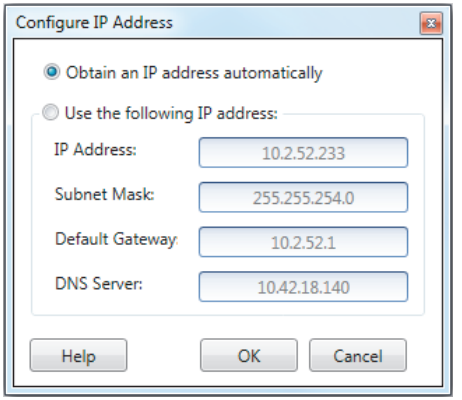


3. (Optional but strongly recommended) From this dialog box you can set a static IP address for the NGC instrument.

   Important: The NGC system must restart to apply the changes.

   a. Click Configure.

      The Configure IP Address dialog box appears.



   b. Select Use the following IP address and provide the IP address, subnet mask, default gateway, and DNS server details specific to your site.

      Tip: See your system or network administrator for the appropriate IP settings.

      - IP address — the specific numeric address for the NGC system
      - Subnet mask — the numeric filter used to define the subnet to which the IP address belongs
      - Default gateway — (optional, required if you plan to install the ChromLab database on a separate subnet or access the NGC system from ChromLab computers that are on another subnet) this is the IP address of the node that allows communication between the subnets
      - DNS server — the IP address of the node that translates a server name to its IP address

c. Click OK.

   ChromLab displays a message explaining that the NGC system must restart.

d. Click Yes to save the changes and restart the system.

   The system restarts and the touch screen displays the ChromLab connection information dialog box.

4. Write down either the Network Name or the IP Address. You will need one of these values when you start ChromLab on the PC.

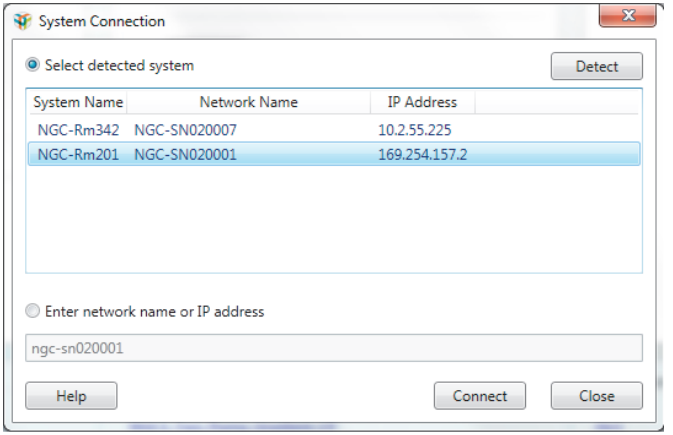
   Important: Do not click Continue at this time.

   Note: The following section is performed on the ChromLab computer.

On the ChromLab Computer

1. Start ChromLab.

   The System Connection dialog box appears. ChromLab detects the NGC systems available on the same sub-network or those systems that are directly connected to the computer. The system name, network name, and IP address of each available system appear in the table.



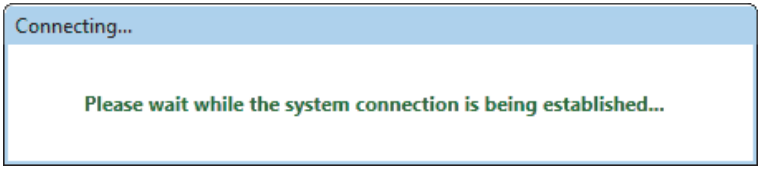
   Note: If your system does not appear in the table, click Detect to refresh the list. ChromLab searches the network for available NGC systems and refreshes the list.

2. In the System Connection dialog box, do one of the following:

   - Select a name in the list of detected systems and click Connect.
   - Select the appropriate radio button, enter the system's name or IP address and click Connect.

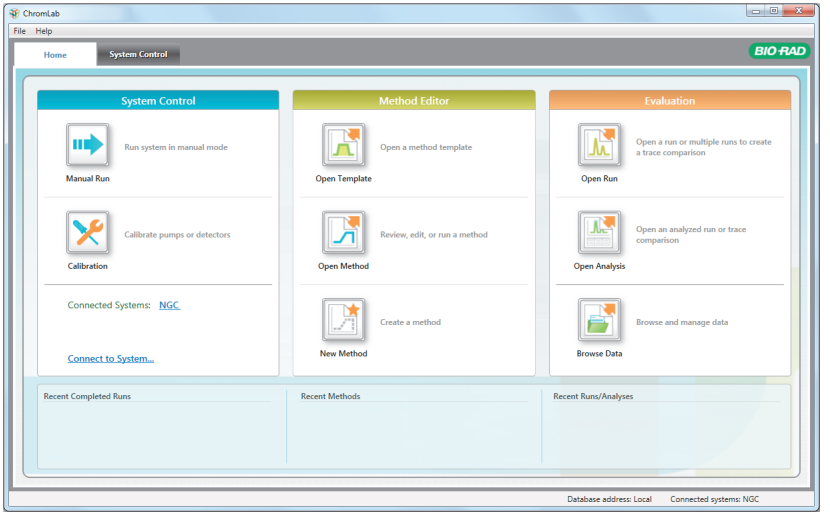
     Tip: This is the information that you noted on ChromLab Touch in step 4 on page 90. The IP address for an NGC instrument that is directly connected to the ChromLab computer begins with the number sequence 169.254.

3. On the NGC instrument you see that the system is attempting to connect to the ChromLab computer.

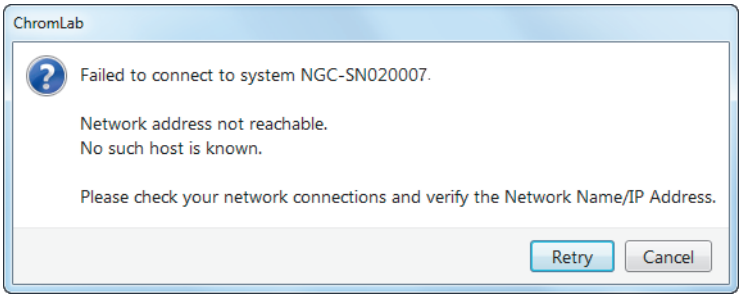


4. When ChromLab successfully connects to the instrument, you see Connected Systems: <System_name> at the bottom of the System Control pane.

Tip: The connected system also appears in the right corner of the status bar.



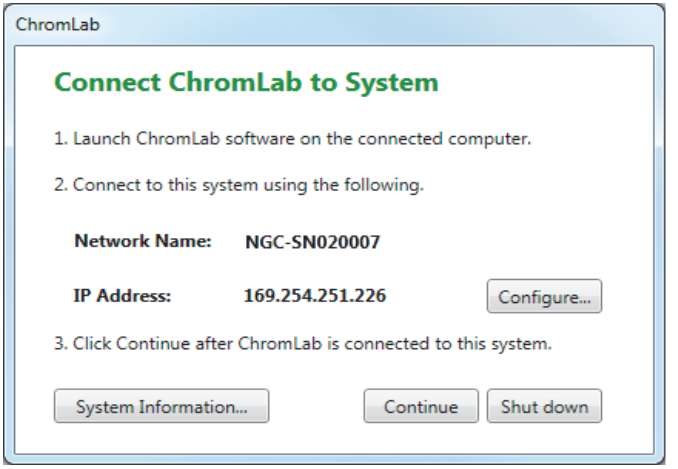
If the connection fails, the following error message appears:



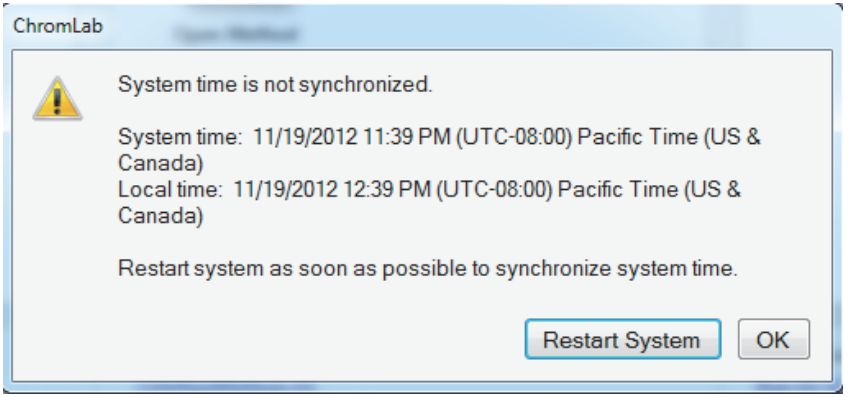
There are several possible causes for connection to fail. See Appendix B, Troubleshooting ChromLab Software Installation for more information and possible solutions.

On the NGC Instrument

▶ On the touch screen click Continue.



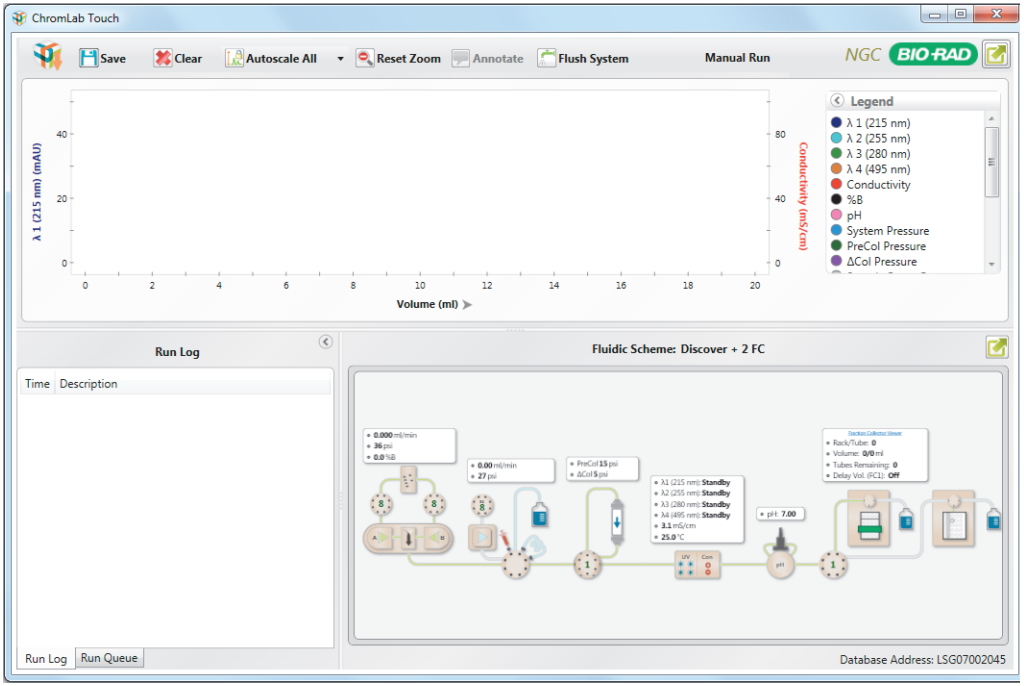
Note: You might see a dialog box indicating that the system time is not synchronized to the computer time.



Click Restart System to synchronize the system time with the ChromLab computer time.

Tip: This is a one-time action. After the system time and the ChromLab computer time are synchronized, the ChromLab computer manages the system time.

When ChromLab successfully establishes a connection you see the fluidic scheme for the configured NGC system on the touch screen.



Setting Delay Volume

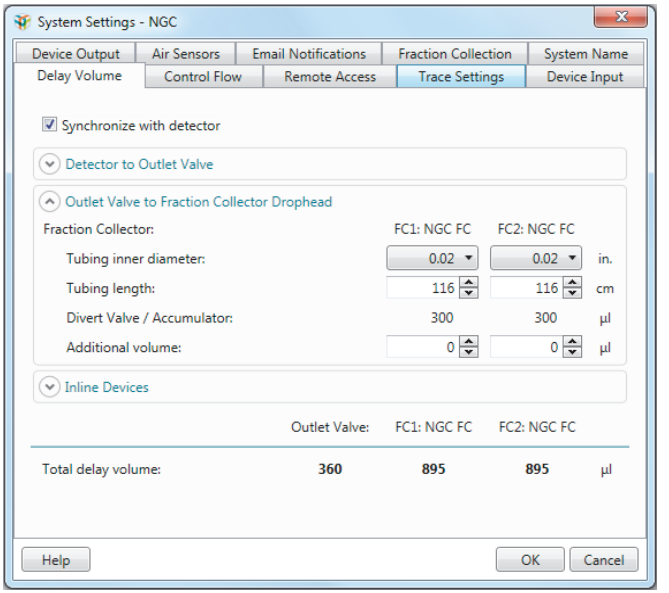
The delay volume is the volume of fluid in the path between the UV or UV/Vis detector and the fraction collector drophead. The system is typically plumbed with a fixed length of tubing and a defined set of detectors (such as the conductivity monitor and pH detector) between the UV or UV/Vis detector and the fraction collector. The length of tubing and the volume of the flow cells between the UV or UV/Vis detector and the drophead define the delay volume. Setting the delay volume causes the fraction collector to wait for the sample to travel from the UV or UV/Vis detector to the drophead before it starts to collect sample fractions.

In order to accurately predict which fraction collector tube or outlet container contains the peak of interest, you have to account for the time it takes for the volume of fluid to travel from the UV or UV/Vis detector to the container. Because the tubing length and flow cells between the detector and the fraction collector drophead do not change often, you can set the delay volume when you install ChromLab. You can change the delay volume when you change the tubing length or add other detectors along the flow path.

For more information about delay volume and event markers, see the online help or the NGC Chromatography Systems and ChromLab Software User Guide.

To set the delay volume

1. In ChromLab, select File > System Settings to open the System Settings dialog box.
2. Choose the Delay Volume tab.



3. Select Synchronize with detector.
4. If your system includes an outlet valve, expand Detector to Outlet Valve and specify the inner diameter of the tubing and the required tubing length between the UV outlet port and the outlet valve.
5. In Outlet Valve to Fraction Collector to Drophead, specify the required tubing length and inner diameter of the tubing in use.

Tubing Color	Inner Diameter
Orange	0.02" (0.5 mm)
Green	0.03" (.75 mm)
Clear	0.062" (1.6 mm)

Tip: If you change the length of the tubing, enter the appropriate values in Additional volume.

6. Expand Inline Devices and select or clear the next four checkboxes, depending on whether these modules are present on your system.

   Note: If a pH detector module is present on your system and you select the checkbox to include its cell volume, determine whether the detector is set to Inline or Bypass mode and select the appropriate radio button.

7. The system calculates the delay volume for each fraction collector and the outlet valve based on your specifications and displays the results in µl at the bottom of the dialog box.

   Click OK to save the changes and close the dialog box.

Setting Up Remote Access Connection

You can access the NGC instrument from your home, your desk, or anywhere else as long as you have access to the IP address of the NGC instrument. Remote access gives you full control of the NGC instrument via ChromLab Touch software as if you were physically present.

Remote access requires the use of a VNC viewer, which employs VNC technology, an open standard. A variety of VNC viewers are available free on the web. You can download a VNC viewer for the kind of device you want to use—for example, another computer, a tablet, or a smart phone—to access the NGC instrument remotely. Install the viewer before attempting to gain remote access.

Important: Install the viewer before attempting to gain remote access.

Note: To change the VNC password, contact Bio-Rad Customer Support.

To access the NGC system remotely

1. In ChromLab, select File > System Settings to open the System Settings dialog box.
2. Choose the Remote Access tab.
3. Select Enable VNC service for remote screen sharing.
4. Open the VNC viewer and enter the details for the following settings:
   - Network name —the name of the system.
   - IP address — the IP address of the system.
   - Port No. — 5900

   Password — ngc

5 Plumbing and Priming the NGC Chromatography Systems

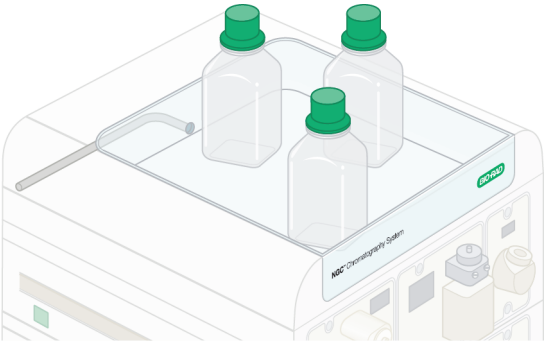
With the exception of the inlet tubing, waste lines, and column, the NGC systems ship preassembled and preplumbed with the modules necessary to perform gradient separations. The systems require minimal postinstallation setup to prepare them to run simple gradient separations. This chapter explains how to plumb and prime your system after you have installed it and the ChromLab software.

Preparing the Buffer and Waste Bottles

Before you plumb and prime the NGC instrument, prepare buffer and waste bottles.

Buffer Bottles

Place buffer bottles on the bench next to the instrument, or in the buffer tray on top of the instrument. The tray can accommodate up to six 1 L bottles.



Waste Bottles

Place the waste bottles on top of the bench or on the floor below the instrument. Ensure that the waste containers are large enough to hold all buffer that will flow into them. Empty the waste bottles regularly.

Important: Do not place waste bottles on top of the instrument.

Plumbing NGC Systems

Several plumbing tasks are required for all instrument configurations. Other tasks are specific to the configuration. This section explains how to plumb each instrument configuration.

General Guidelines for Tubing Sizes

The NGC instrument uses three sizes of tubing. Use the information in Table 7 to select the appropriate tubing.

Table 7. NGC tubing sizes

Use	Tubing Dimensions	Tubing Material	Fittings	Vol/cm
Prepump	1/8" OD x 0.062" ID (3.2 mm OD x 1.6 mm ID)	Clear PTFE	Super flangeless for 1/8" (3.2 mm) OD tubing	20 µl
Postpump with F10 pump head	1/16" OD x 0.020" ID (1.6 mm OD x 0.51 mm ID)	Orange PEEK	Super flangeless for 1/16" (1.6 mm) OD tubing	2 µl
Postpump with F100 pump head	1/16" OD x 0.030" ID (1.6 mm OD x 0.76 mm ID)	Green PEEK	Super flangeless for 1/16" (1.6 mm) OD tubing	4.5 µl

Note: When plumbing the system, keep tubing lengths to a minimum. Also, all fittings should be finger tight. Do not overtighten, or you risk damaging the connection. Bio-Rad offers tubing clips of different sizes in the accessories kit. For outlet tubing longer than 6", attach a tubing clip in close proximity to the fitting to keep tubing in place in the event that it detaches from the fitting.

Plumbing All NGC Systems

Tip: Bio-Rad recommends inserting a Delrin or Tefzel 1/4–28 flat-bottom plug, included in the fittings kit, into unused valve ports to prevent particles from entering the valve.

Table 8 lists the tasks for plumbing all NGC systems. The tasks are explained in detail in the sections that follow.

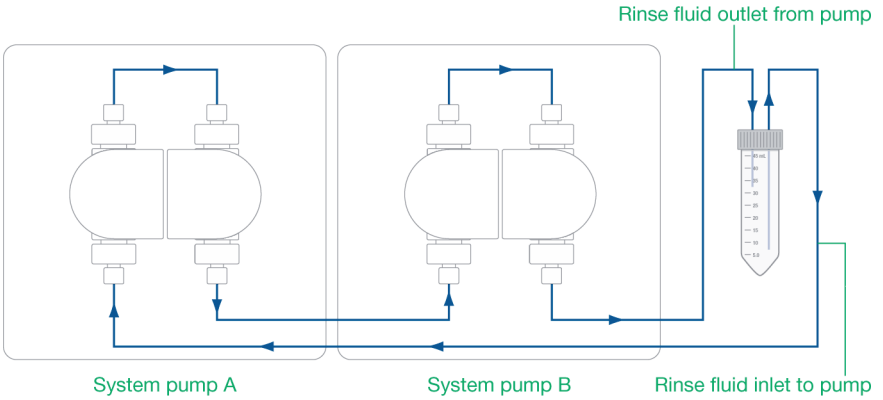
Table 8. Plumbing tasks for all NGC systems

	Task
1.	Inlet tubing to the pump head wash port on system pump A
2.	Pump head wash priming line to the pump head wash port on system pump B
3.	1/4-28 union to the priming line on system pump B
4.	Pump head wash inlet to the 1/4-28 union attached to the pump head wash priming line on system pump B
5.	On the sample inject valve: ■ Sample loop ■ Injection port ■ Waste lines (2)
6.	Tube #2 from the outlet on the conductivity flow cell to the inlet on the 20 psi backpressure regulator

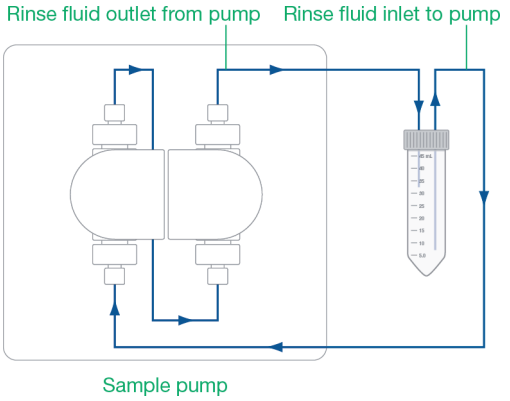
Plumbing the System Pumps Wash Lines

All configurations ship with the pump wash system preplumbed except for the inlet and outlet tubing for the pump head wash. Plumbing the inlet and outlet tubing is specific to the type of pump (system pump configuration or sample pump). The following images show a detailed view of the connectivity and flow direction of the rinse solution through the tubing segments for the system pumps and the sample pump.

System Pumps Wash Flow



Sample Pump Wash Flow

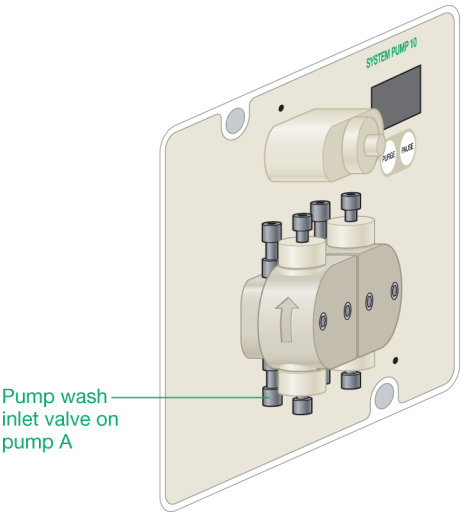


To plumb and prime the system pump wash lines

1. Mount a pump head wash tube holder to the right or left side of the instrument in either the upper or lower rack slots.
2. Fill a 50 ml tube with 20% isopropanol (IPA) and insert it in the tube holder.

   Tip: You can use 20% ethanol as an alternative.

3. Connect inlet tubing to the pump wash inlet port (left rear port) on system pump A.



4. Immerse the other end of the pump A wash inlet tubing in the tube of 20% IPA.
5. Connect the pump head wash priming tubing to the outlet (right rear port) on system pump B.
6. Locate a 1/4-28 female to female luer adapter in the fittings kit and connect it to the pump head wash priming tubing.
7. Connect a 1/4-28 union to a second inlet tubing. You will use the inlet tubing as the outlet line for system pump B.

   Tip: Set the inlet tubing with the attached union aside. Keep it close by, as you will attach it to the pump head wash tubing in step 11.

8. Attach a 30 ml syringe to the 1/4-28 female to male luer adapter.
9. Withdraw the plunger on the syringe until liquid is visible in the syringe.
10. Detach the luer adapter and syringe from the pump head wash priming tubing on pump B.
11. Locate the second inlet tubing with the 1/4-28 union that you set aside in step 7.
12. Connect the union to the pump head wash priming tubing on system pump B.
13. Immerse the other end of the inlet tubing in the tube of 20% IPA.

To plumb the sample pump

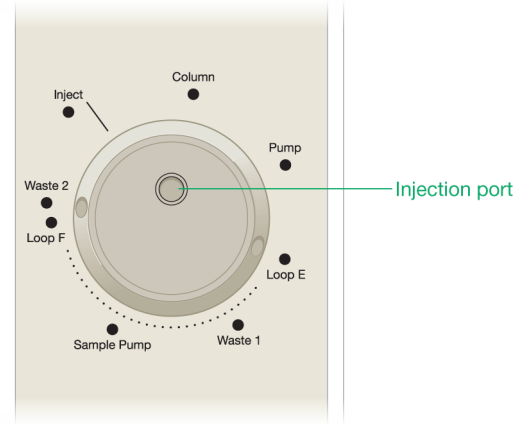
Perform the steps in the section To plumb and prime the system pump wash lines on page 106 with the following exception:

- Attach the inlet tubing to the left rear port on the sample pump, and the pump head wash priming tubing to the right rear port.

Plumbing the Sample Inject Valve

To plumb the sample inject valve

1. Connect waste tubing to waste ports Waste 1 and Waste 2 on the sample inject valve.
2. Connect an injection port to the center of the sample inject valve.



3. Connect the sample loop to ports Loop E and Loop F on the inject valve.

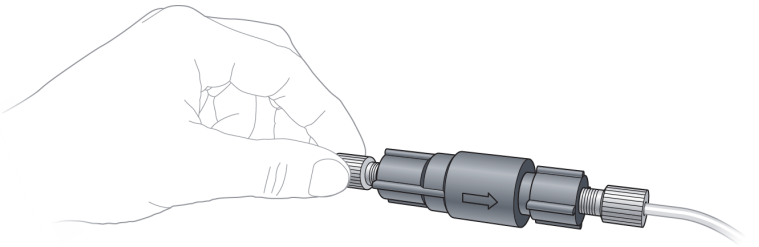
Attaching the Backpressure Regulator

If your column requires a high backpressure, install the backpressure regulator.

To attach the backpressure regulator

1. Connect Tube #2 to the top of the conductivity monitor.
2. Connect the other end of Tube #2 to a 20 psi backpressure regulator.

   Note: The backpressure regulator has a raised arrow on its side. Ensure that the arrow on the regulator points in the direction of the flow.



Plumbing the NGC Quest System

Table 9 lists the tasks for plumbing the NGC Quest system. The tasks are explained in detail in the sections that follow.

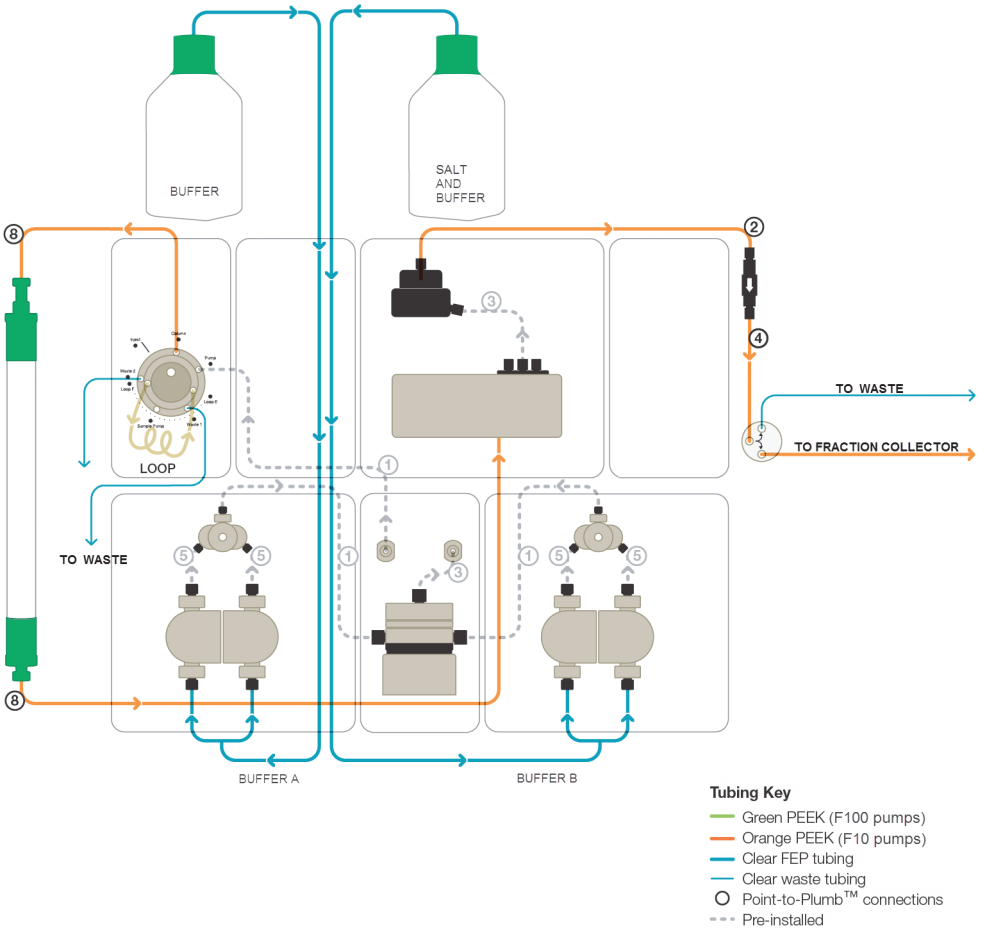
Note: Ensure that you complete the plumbing tasks in the section Plumbing All NGC Systems on page 104 before continuing.

Table 9. Plumbing tasks for the NGC Quest system

	Task
1.	Inlet tubing to the system pump A inlet manifold
2.	Inlet tubing to the system pump B inlet manifold
3.	Connect one of the following: ■ Tube #4 from the 20 psi backpressure regulator to the lower port on the inlet side of the NGC Fraction Collector (NGC FC) magnetic union ■ Tube #4 from the 20 psi backpressure regulator to the Common inlet port on the BioFrac fraction collector diverter valve

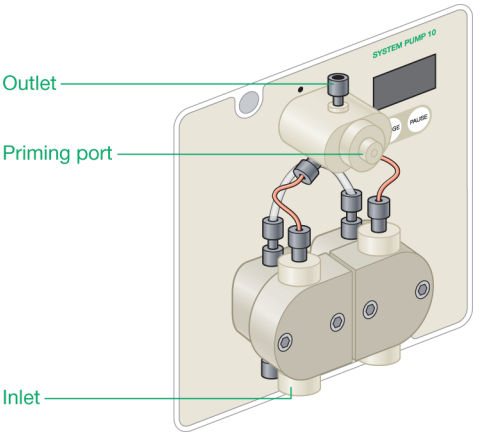
The figure on page 111 shows the Point-to-Plumb connections for the NGC Quest system.

NGC Quest Point-to-Plumb Connections



To plumb the system pumps

1. Connect inlet tubing to the inlet manifold of system pump A.



2. Connect inlet tubing to the inlet manifold of system pump B.
3. Immerse the open ends of both inlet tubing in a bottle of degassed, deionized water.

To plumb the fraction collector

1. Connect one end of Tube #4 to the open end of the 20 psi backpressure regulator that you connected to the conductivity monitor in step 2 on page 109.
2. Connect the other end of Tube #4 to one of the following:
   - The lower port on the inlet side of the NGC FC magnetic union
   - The Common port on the BioFrac fraction collector diverter valve

Plumbing the NGC Scout System

Table 10 lists the tasks for plumbing the NGC Scout system. The tasks are explained in detail in the sections that follow.

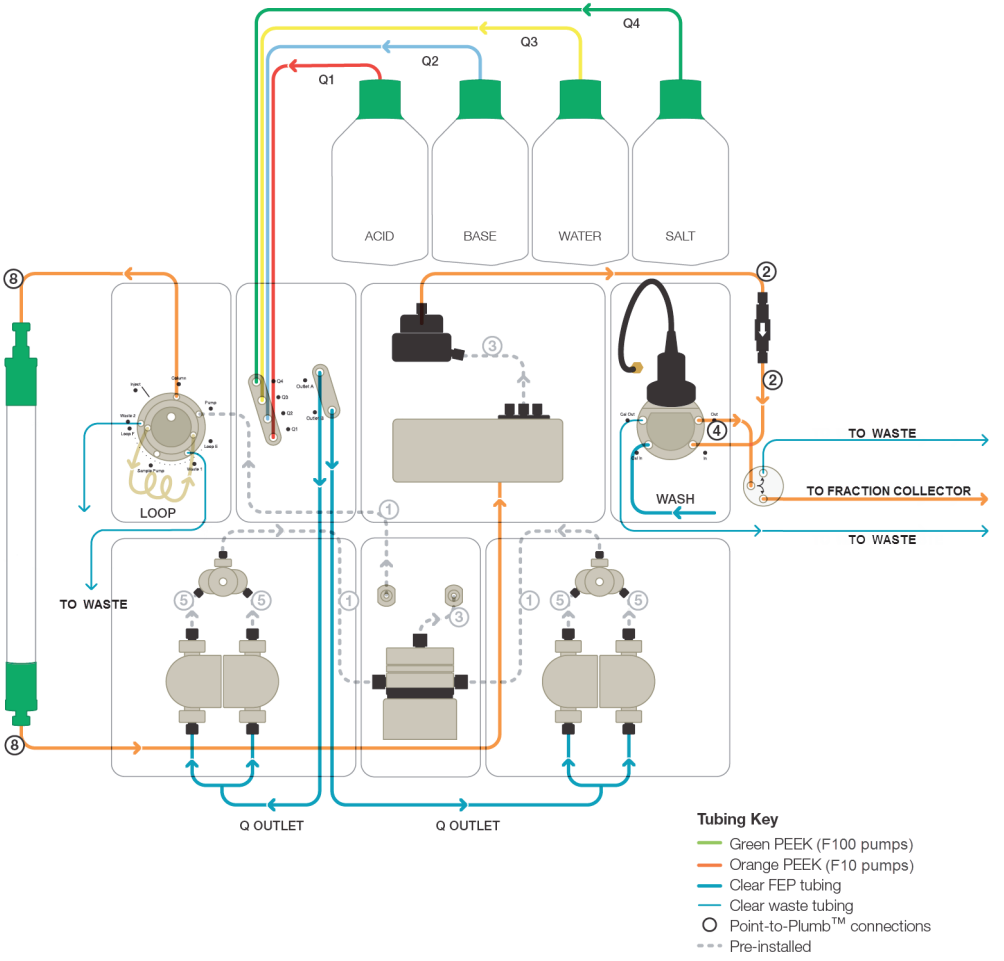
Note: Ensure that you complete the plumbing tasks in the section Plumbing All NGC Systems on page 104 before continuing.

Table 10. Plumbing tasks for the NGC Scout system

	NGC Scout
1.	Inlet tubing to ports Q1–Q4 on the buffer blending valve
2.	Waste tubing to the calibration outlet port (Cal Out) on the pH valve
3.	Pump head wash priming line to the calibration inlet port (Cal In) on pH valve
4.	Tube #2 from the 20 psi backpressure regulator to the inlet port on the pH valve
5.	Connect one of the following: ■ Tube #4 from the outlet port on the pH valve to the lower port on the inlet side of the NGC FC magnetic union ■ Tube #4 from the outlet port on the pH valve to the Common inlet port on the BioFrac fraction collector diverter valve

The figure on page 114 shows the Point-to-Plumb connections for the NGC Scout system.

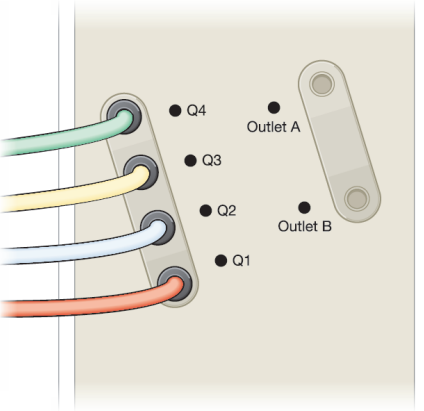
NGC Scout Point-to-Plumb Connections



To plumb the buffer blending valve

▶ Connect the inlet tubing to ports Q1–Q4 on the buffer blending valve.

Note: The buffer inlet tubing is color-coded to identify the different buffer solutions.

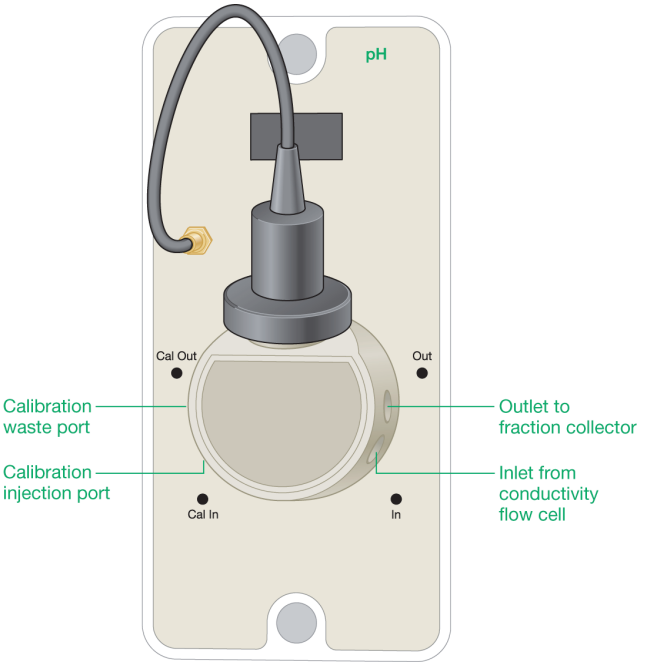


The color scheme for the tubing and ports is defined as follows:

Tubing color	Port	Solution
Green	Q4	High salt buffer
Yellow	Q3	Water
Blue	Q2	Buffer base
Red	Q1	Buffer acid

To plumb the pH valve

1. Connect the pump head wash priming tubing to the Cal In port on the pH valve.
2. Connect waste tubing to the Cal Out port on the pH valve.



3. Immerse the open end of the waste tubing in the waste container.
4. Connect Tube #2 from the 20 psi backpressure regulator that you connected in step 2 on page 109 to the inlet port (In) on the pH valve.
5. Connect one end of Tube #4 to the outlet port (Out) on the pH valve.
6. Connect the other end of Tube #4 to one of the following:
   - The lower port on the inlet side of the NGC FC magnetic union
   - The Common inlet port on the BioFrac fraction collector diverter valve

Tip: To clean the pH valve, immerse the outlet lines into a waste container and the inlet lines into cleaning solution. Perform the system wash step in ChromLab as explained in the section System CIP (Clean in Place) — Storage Parameters in the NGC Chromatography Systems and ChromLab Software User Guide.

Plumbing the NGC Discover System

Table 11 lists the tasks for plumbing the NGC Discover system. The tasks are explained in detail in the sections that follow.

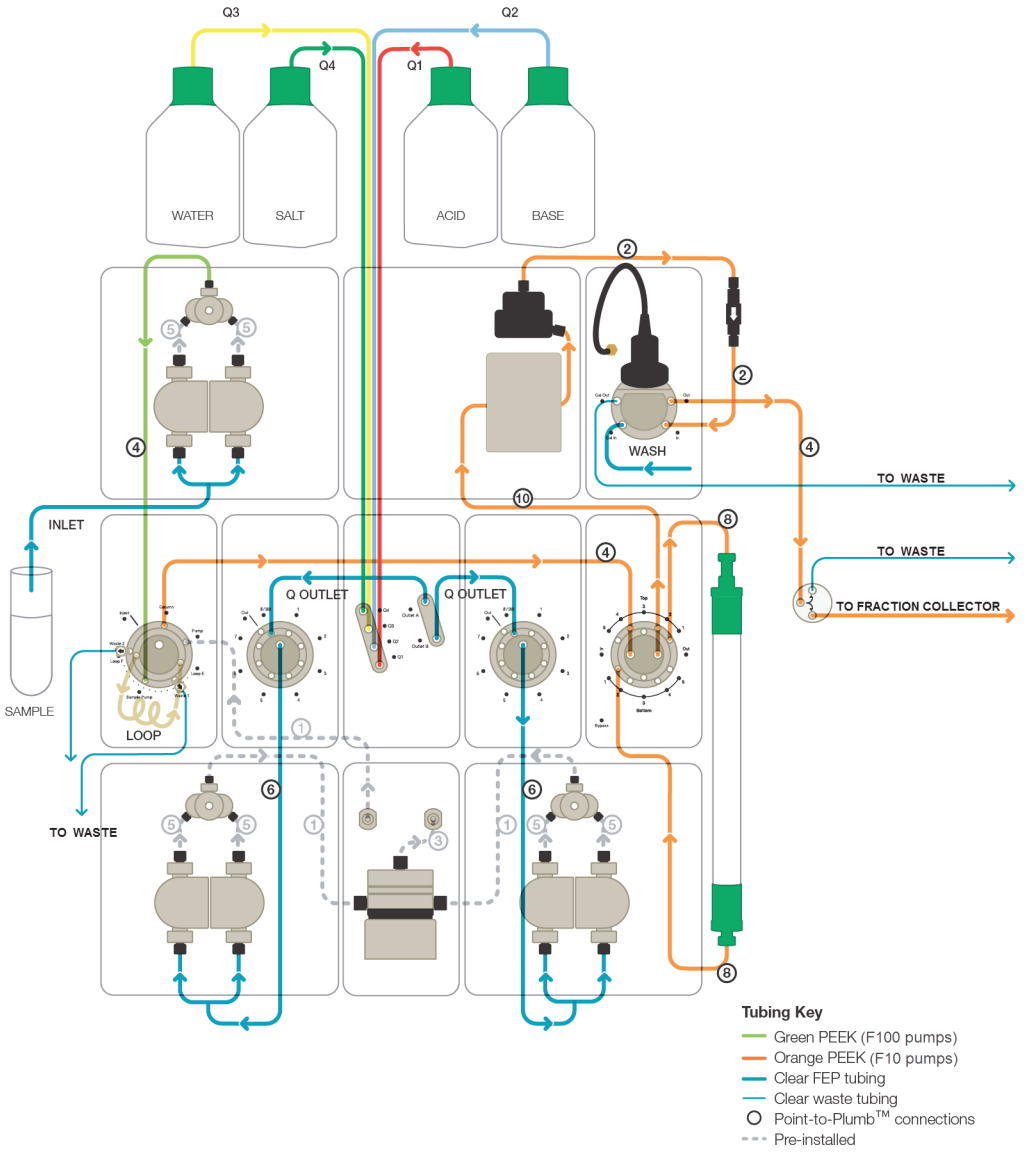
Note: Ensure that you complete the plumbing tasks in the section Plumbing All NGC Systems on page 104 before continuing.

Table 11. Plumbing tasks for the NGC Discover system

	Tasks
1.	Inlet tubing to the left pump head wash port on the sample pump
2.	Pump head wash priming line to the right pump head wash port on the sample pump
3.	1/4-28 union to the pump head wash priming line on the sample pump
4.	Inlet tubing to the other end of the 1/4-28 union on the sample pump
5.	Inlet tubing to ports Q1–Q4 on the buffer blending valve
6.	Inlet tubing to the remaining ports on the buffer inlet valves
7.	Inlet tubing to the inlet manifold on the sample pump
8.	Waste tubing to the Cal Out port on the pH valve
9.	Priming line to the calibration inlet port (Cal In) on the pH valve
10.	Tube #2 from the 20 psi backpressure regulator to the inlet of the pH valve
11.	Connect one of the following: ■ Tube #4 from the outlet port on the pH valve to the lower port on the inlet side of the NGC fraction collector magnetic union ■ Tube #4 from the outlet port on the pH valve to the Common inlet port on the BioFrac fraction collector diverter valve

The figure on page 118 shows the Point-to-Plumb connections for the NGC Discover system.

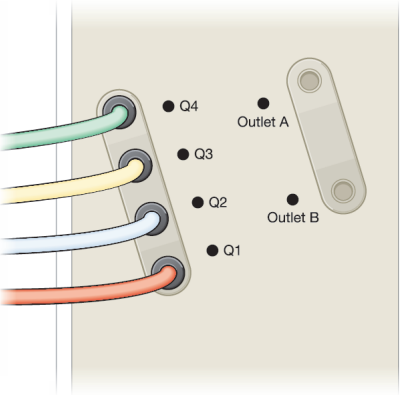
NGC Discover Point-to-Plumb Connections



To plumb the buffer blending valve

▶ Connect the inlet tubing to ports Q1–Q4 on the buffer blending valve.

Note: The buffer inlet tubing is color-coded to identify the different buffer solutions.

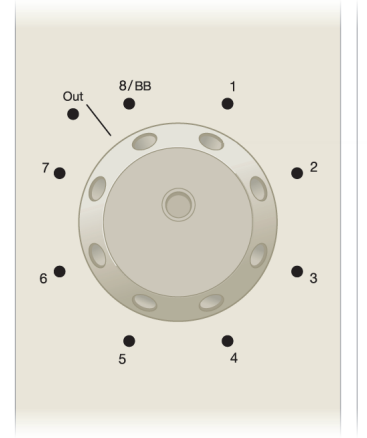


The color scheme for the tubing and ports is defined as follows:

Tubing color	Port	Solution
Green	Q4	High salt buffer
Yellow	Q3	Water
Blue	Q2	Buffer base
Red	Q1	Buffer acid

To plumb the buffer inlet valves

1. Connect tubing from Outlet A on the buffer blending valve to port 8/BB on buffer inlet valve A.
2. Connect tubing from Outlet B on the buffer blending valve to port 8/BB on inlet valve B.



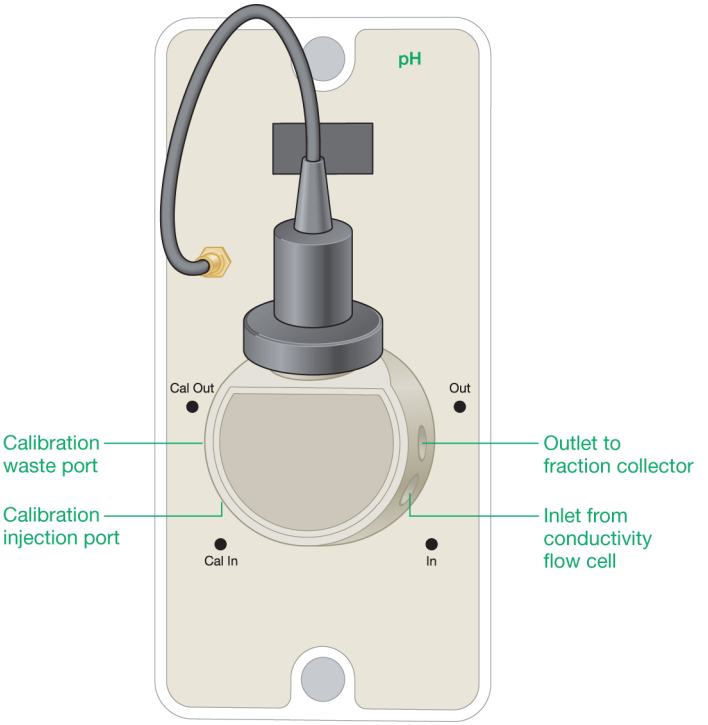
3. Connect tubing from the Out port on inlet valve A to the inlet manifold of system pump A.
4. Connect tubing from the Out port on inlet valve B to the inlet manifold of system pump B.
5. (Optional) Connect inlet tubing to ports 2–7 on both buffer inlet valves A and B.

To plumb the sample pump

1. Connect inlet tubing to the sample pump inlet manifold.
2. Immerse the other end of the inlet tubing in a bottle of degassed, deionized water.
3. Connect outlet tubing to the Sample Pump port on the sample inject valve.

To plumb the pH valve

1. Connect the pump head wash priming tubing to the Cal In port on the pH valve.
2. Connect waste tubing to the Cal Out port on the pH valve.



3. Immerse the other end in the waste container.
4. Connect Tube #2 from the 20 psi backpressure regulator that you connected in step 2 on page 109 to the inlet port (In) on the pH valve.
5. Connect one end of Tube #4 to the outlet port (Out) on the pH valve.
6. Connect the other end of Tube #4 to one of the following:
   - The lower port on the inlet side of the NGC FC magnetic union
   - The Common inlet port on the BioFrac fraction collector diverter valve

Plumbing the NGC Discover Pro System

Table 12 lists the tasks for plumbing the NGC Discover Pro system. The tasks are explained in detail in the sections that follow.

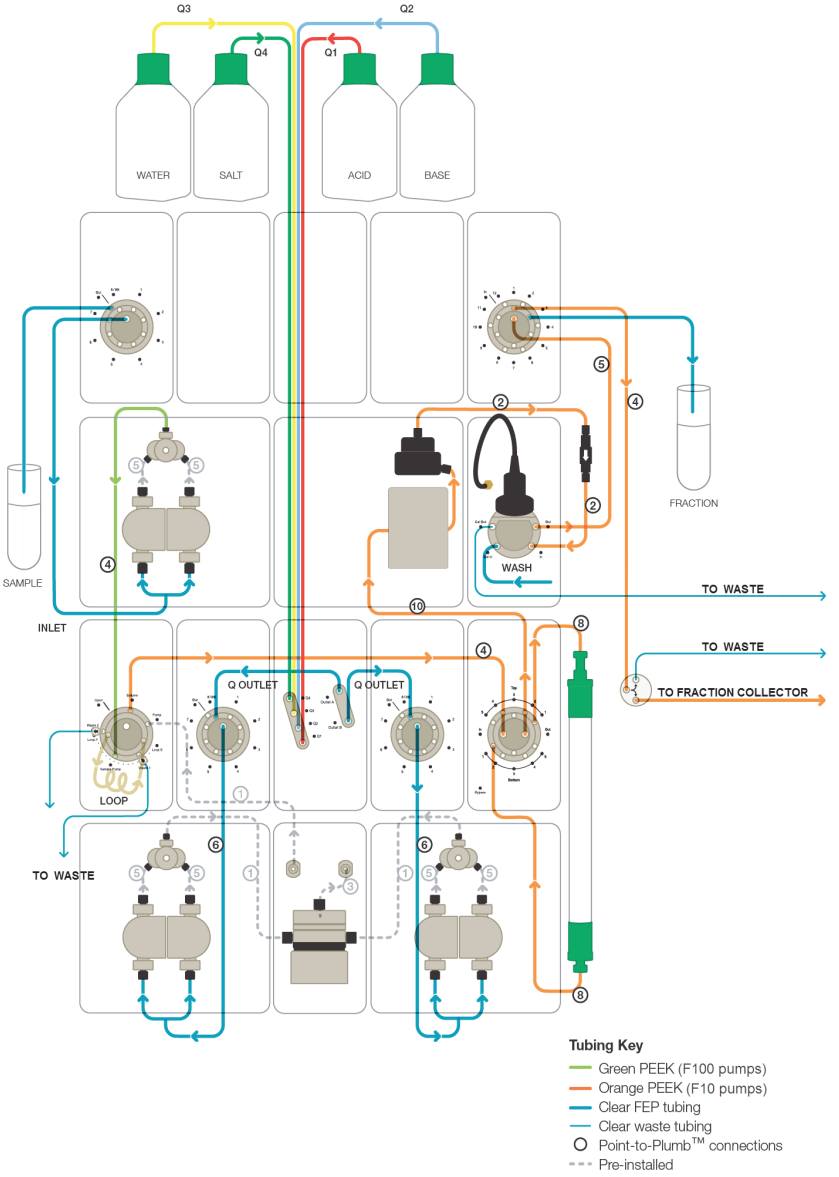
Note: Ensure the you complete the plumbing tasks in the sections Plumbing All NGC Systems on page 104 and Plumbing the NGC Discover System on page 117 before continuing.

Table 12. Plumbing tasks for the NGC Discover Pro system

	Tasks
1.	Tube #6 between the outlet port on the sample inlet valve and the inlet port on the sample pump **Note:** Remove the inlet tubing from the sample pump inlet manifold if it is installed.
2.	Connect one of the following: ■ Tube #4 from O1 Port 1 to the lower port on the inlet side of the NGC FC magnetic union ■ Tube #4 from O1 Port 1 to the Common inlet port on the BioFrac fraction collector diverter valve ■ Waste tubing to O1 Port 1
3.	Inlet tubing to the remaining ports on the sample inlet valve See the section Plumbing Sample Inlet Valves on page 124.
4.	Outlet tubing to the remaining ports on the outlet valve See the section Plumbing Outlet Valves on page 125.

The figure on page 123 shows the Point-to-Plumb connections for the NGC Discover Pro system.

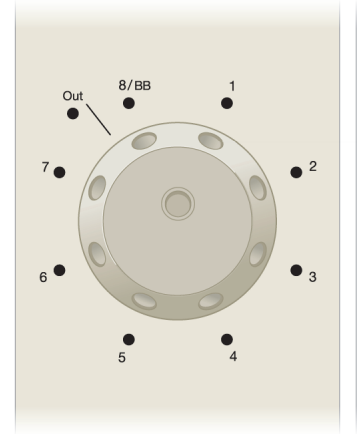
NGC Discover Pro Point-to-Plumb Connections



Plumbing Sample Inlet Valves

Each sample inlet valve module includes all necessary tubing. The inlet tubing is approximately 5' (1.5 m) in length. Determine the length of inlet tubing you need and cut the tubing to the appropriate length.

Note: NGC inlet valves can be used for buffer or sample selection.



To plumb the sample inlet valves

1. If your system has only one sample inlet valve:
    a. Connect tubing from the Out port on the sample inlet valve to the sample pump inlet manifold.
    b. Connect inlet tubing to ports 1–8 as needed.

2. If your system has two sample inlet valves:

    a. Connect tubing from the Out port on sample inlet valve 1 (S1) to the sample pump inlet manifold.

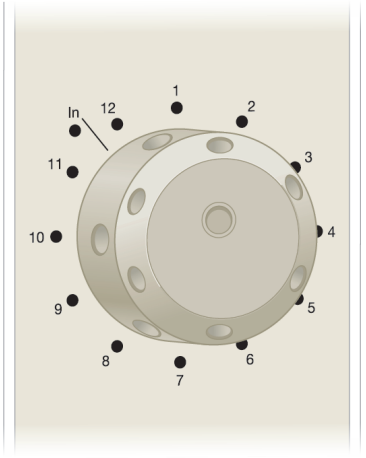
    b. Connect tubing from the Out port on sample inlet valve 2 (S2) to port 8 on S1.

    c. Connect inlet tubing to ports 1–7 on S1 and to ports 1–8 on S2 as needed.

3. Immerse the inlet tubing in sample containers.

Plumbing Outlet Valves

Each outlet valve module includes all necessary tubing. The tubing is approximately 5' (1.5 m) in length. Determine the length of tubing you need and cut it to the appropriate length.



To plumb the outlet valves

1. If your system has only one outlet valve:

    a. Connect tubing from the Out port on the conductivity monitor or pH monitor to the In port on the outlet valve (O1).

b. (Optional) Connect one of the following:

- Tube #4 from O1 Port 1 to the lower port on the inlet side of the NGC FC magnetic union
- Tube #4 from O1 Port 1 to the Common inlet port on the BioFrac fraction collector diverter valve
- Waste tubing to O1 Port 1 and immerse in a waste container

c. Connect outlet tubing to the remaining ports as needed.

2. If your system has two outlet valves:

a. Connect tubing from the Out port on the conductivity monitor or pH monitor to the In port on O1.

b. (Optional) Connect one of the following:

- Tube #4 from O1 Port 1 to the lower port on the inlet side of the NGC FC magnetic union
- Tube #4 from O1 Port 1 to the Common inlet port on the BioFrac fraction collector diverter valve
- Waste tubing to O1 Port 1 and immerse in a waste container

c. Connect tubing from port 12 on O1 to the In port on outlet valve 2 (O2).

d. Connect outlet tubing to all remaining outlet ports as needed.

3. Immerse the outlet tubing in fraction collection containers.

Priming and Purging the System

This section explains how to prime your system before running the pumps, and how to purge your system of air bubbles or rapidly exchanging buffer solutions.

Note: This section assumes that you primed the wash system when you plumbed the system. See Plumbing All NGC Systems on page 104 for more information.

Priming and purging tasks are specific to the NGC system. Table 13 lists the tasks associated with each system configuration. The tasks are explained in detail in the sections that follow.

Table 13. Priming and purging tasks for each NGC system configuration

NGC Quest	NGC Scout	NGC Discover
Prime and purge the inlet port on system pump A	Prime and purge Q1–Q4 on the buffer blending valve **Tip:** The inlet ports on system pumps A and B are primed and purged when the buffer blending valve is primed.	Prime and purge Q1–Q4 on the buffer blending valve **Tip:** The inlet ports on system pumps A and B are primed and purged when the buffer blending valve is primed.
Prime and purge the inlet port on system pump B		Prime and purge the buffer inlet valves A and B
		Prime and purge the sample pump

Priming and Purging the NGC Quest System

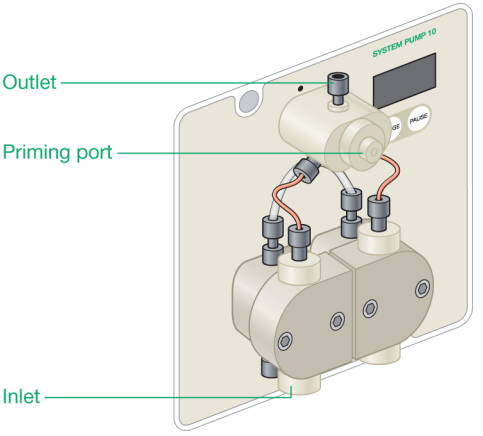
Caution: Before priming or purging the system, ensure that any attached columns are offline. The priming process occurs at a high flow rate and can significantly harm or destroy attached columns.

Priming and purging the NGC Quest system requires access to ChromLab. You can perform the steps on the NGC touch screen.

Important: The instrument's buffer lines cannot be primed when the system is under pressure. Before opening the priming port, turn the inject valve to Waste to release the system pressure.

To prime the system pumps

1. Immerse the inlet tubing for both system pumps A and B in a container of buffer or HPLC grade (filtered, degassed) or other high-quality water.
2. Insert a 30 ml syringe into the priming port on system pump A.
3. Turn the priming port valve counter-clockwise one full turn to open the seal.

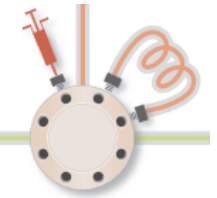


4. Slowly withdraw the plunger to withdraw liquid from the port until air no longer enters the syringe (approximately 10 ml) and all tubing is filled with liquid.
5. Turn the priming port valve clockwise to close the port.

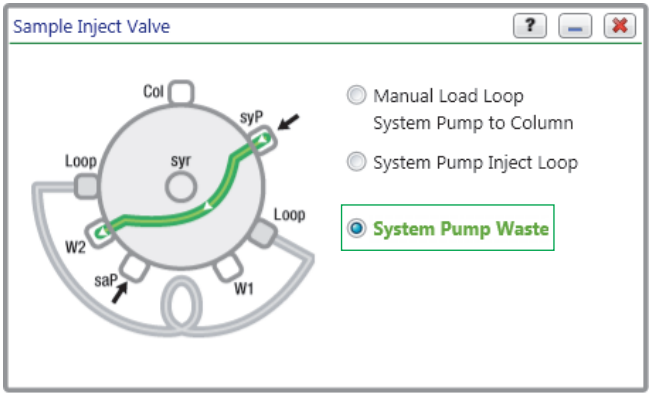
6. Remove the syringe from the priming port and discard the liquid into waste.
7. Repeat steps 2–6 for system pump B.

To purge the system pumps

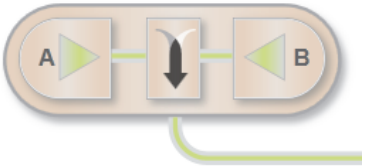
1. On the NGC touch screen, set the fluidic scheme to either NGC Quest or NGC Quest Plus.
2. In the fluidic scheme, touch or click the Sample Inject Valve module to open its dialog box.



3. Set the sample inject valve to System Pump Waste.



4. In the fluidic scheme, touch or click the System Pump module to open its dialog box.

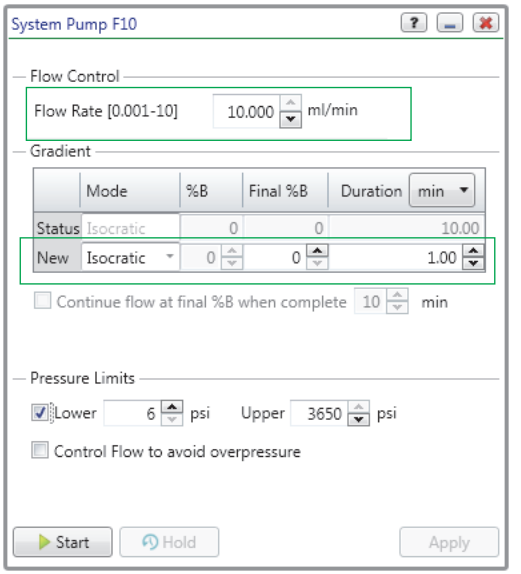


5. In the System Pump dialog box:

   a. Set Flow Rate to 10 ml/min.

   b. (Optional) Set Duration to at least one min.

   c. Click Start.



Priming and Purging the NGC Scout System

Priming the NGC Scout system is a manual procedure and involves priming the buffer blending valve starting from the Q4 port to Q1. Purging the NGC Scout system is an automated procedure and involves removing air from one or all buffer lines as well as the system pumps. Both procedures require access to ChromLab.

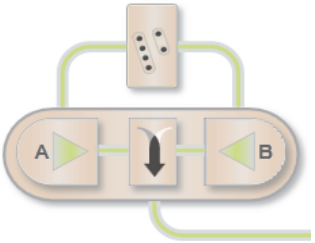
Tip: You can perform the steps on the NGC touch screen.

Priming the NGC Scout System

Note: This section assumes that you have not introduced buffer into the lines. If you have buffer in the lines and are purging the lines of small air bubbles, proceed to Purging the NGC Scout System on page 133.

To prime the buffer blending valve

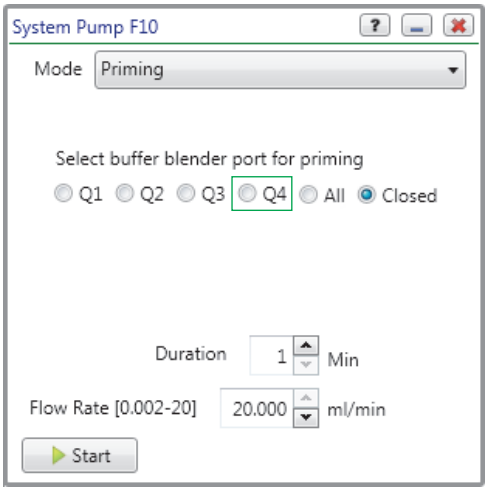
1. Immerse the inlet tubing for ports Q4–Q1 in their respective buffer containers. (See To plumb the buffer blending valve on page 115 for more information.)
2. Set the fluidic scheme to either NGC Scout or NGC Scout Plus.
3. In the fluidic scheme, touch or click the System Pump module to open its dialog box.



4. In the System Pump dialog box, select Priming in the Mode dropdown list.

   By default, all ports are closed. The Closed radio button is selected.

5. Select Q4 as the port to open and prime.

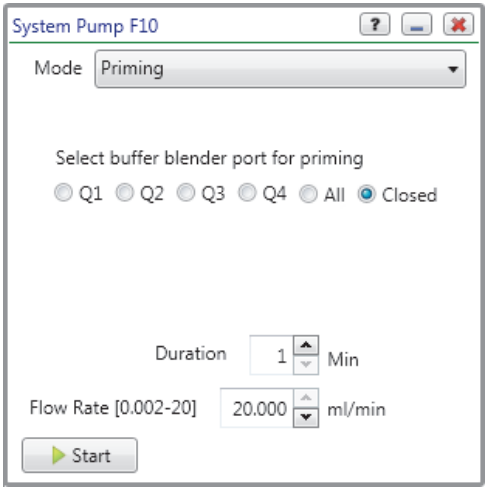


6. Insert a 30 ml syringe into the priming port on system pump A.
7. Turn the priming port valve counter-clockwise one full turn to open the seal.
8. Slowly withdraw the plunger to withdraw liquid from the port until air no longer enters the syringe (approximately 10 ml) and the tubing is filled with liquid.
9. Turn the priming port valve clockwise to close the port.
10. Remove the syringe from the priming port and discard the liquid into waste.
11. Repeat steps 6–10 for ports Q3–Q1.
12. To prime system pump B, select port Q3 and perform steps 6–10.

Purging the NGC Scout System

To purge the buffer blending valve

1. Open the System Pump dialog box and select Priming in the Mode dropdown list.



   - To purge an individual line of air bubbles, proceed to step 2 on page 133.
   - To purge all lines of air bubbles sequentially, proceed to step 3 on page 134.

2. To manually purge an individual line of air bubbles and fill it with buffer:
   a. Select a port to open.
   b. (Optional) Change the default flow rate.

      The default flow rate is set to 20 ml/min.

   c. Click Start.
   d. Repeat steps 2a–c for any other port to purge.

3. To purge all lines of air bubbles and fill them with buffer:

   a. Click All.

   b. (Optional) Change the default flow rate.

      The default flow rate is set to 20 ml/min.

   c. Click Start.

   The system pumps and the buffer blending valve start operating at the specified flow rate, exchanging the solution in the inlet lines and expelling any trapped bubbles, cycling sequentially through the ports Q1 to Q4. After the specified duration, the pumps stop momentarily while the blending valve switches to port Q3 in order to flush the lines with water before closing the valve. No change is allowed during this process for the specified duration.

   Note: You can stop the cycle before it completes by clicking Stop. In this case, ensure that all buffer lines are filled with the appropriate buffers before continuing.

Priming and Purging the NGC Discover System

Priming the NGC Discover system is a manual procedure and involves priming the buffer blending valve starting from the Q4 port to Q1 then the buffer inlet valve starting from buffer inlet A1. Purging the NGC Discover system is an automated procedure and involves removing air from one or all buffer lines as well as the buffer inlet valves and the system and sample pumps. Both procedures require access to ChromLab.

Tip: You can perform the steps on the NGC touch screen.

On the NGC Discover system you prime and purge the following modules:

- Buffer blending valve module
- Buffer inlet valves modules
- Sample pump module
- Sample inlet valve module (NGC Discover Pro series)

Priming the NGC Discover System

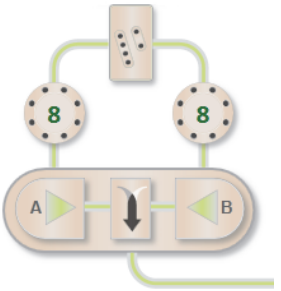
Note: This section assumes that you have not introduced buffer into the lines. If you have buffer in the lines and are purging the lines of small air bubbles, proceed to Purging the NGC Discover System on page 142.

Important: The instrument's buffer lines cannot be primed when the system is under pressure. If your system does not have a buffer blending valve, turn the inject valve to Waste to release the system pressure before opening the priming port.

To prime the buffer blending valve

1. Immerse the inlet tubing for ports Q4–Q1 in their respective buffer containers. (See To plumb the buffer blending valve on page 119 for more information.)
2. On the ChromLab computer or the touch screen, start ChromLab in Manual mode.
3. Set the fluidic scheme to NGC Discover.

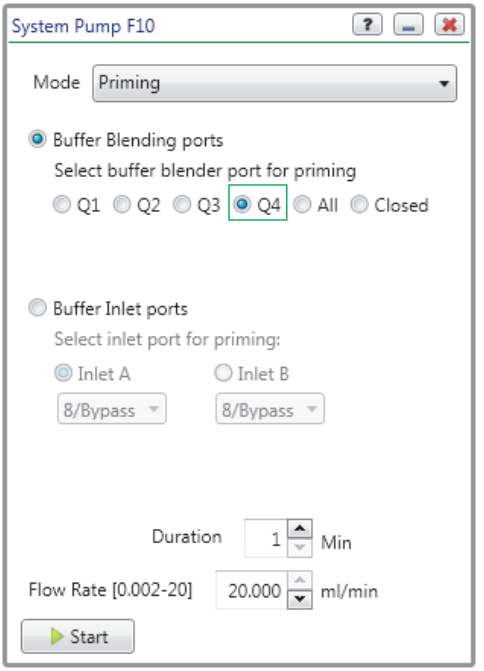
4. In the fluidic scheme, touch or click the System Pump module to open its dialog box.



5. In the System Pump dialog box, select Priming on the Mode dropdown list.

   Note: When in Priming mode, the sample inject valve switches the system pump flow to waste (W2). After the process is completed, the sample inject valve switches the system pump to manually load the column through the loop.

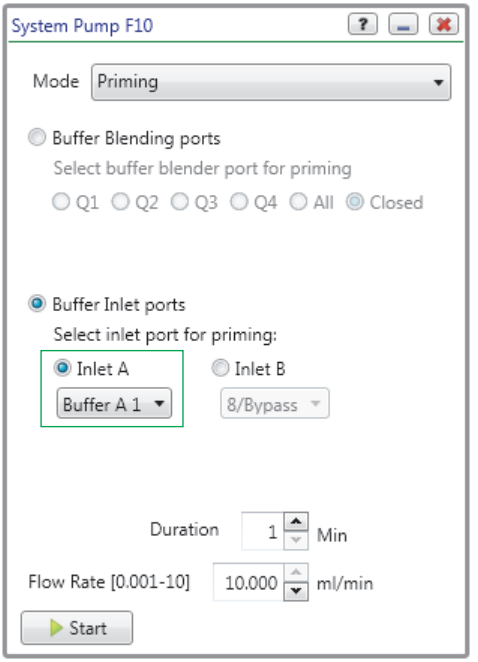
6. Select Q4 as the port to open and prime.



7. Insert a 30 ml syringe into the priming port on system pump A.
8. Turn the priming port valve counter-clockwise one full turn to open the seal.
9. Slowly withdraw the plunger to withdraw liquid from the port until air no longer enters the syringe (approximately 10 ml) and all tubing is filled with liquid.
10. Turn the priming port valve clockwise to close the port.
11. Remove the syringe from the priming port and discard the liquid into waste.
12. Repeat steps 7–11 for ports Q3–Q1.
13. To prime system pump B, select port Q3 and perform steps 7–11.

To prime the buffer inlet valves

1. Immerse the tubing for the inlet ports in their respective buffer containers.
2. On the NGC touch screen, open the System Pump dialog box.
3. In the System Pump dialog box, select the first inlet port to prime, for example Buffer A 1.

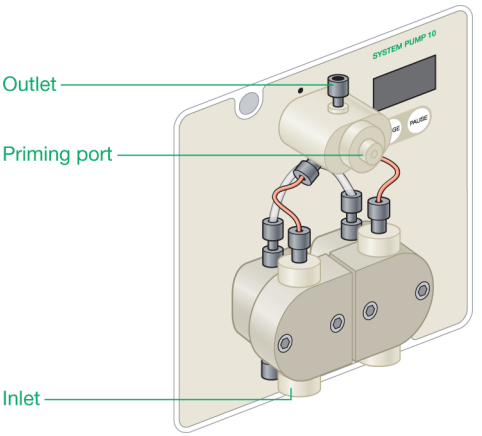


4. Insert a 30 ml syringe into the priming port on system pump A.
5. Turn the priming port valve counter-clockwise one full turn to open the seal.
6. Slowly withdraw the plunger to withdraw liquid from the port until air no longer enters the syringe (approximately 10 ml) and all the tubing is filled with liquid.
7. Turn the priming port valve clockwise to close the port.
8. Remove the syringe from the priming port and discard the liquid into waste.

9. Repeat steps 4–8 for the remaining buffer inlet ports.
10. To prime buffer inlet valve B, select buffer B1 and perform steps 3–9 on system pump B.

To prime the sample pump

1. Immerse the inlet tubing for the sample pump in the appropriate container.
2. Insert a 30 ml syringe into the priming port.
3. Turn the priming port valve counter-clockwise one full turn to open the seal.

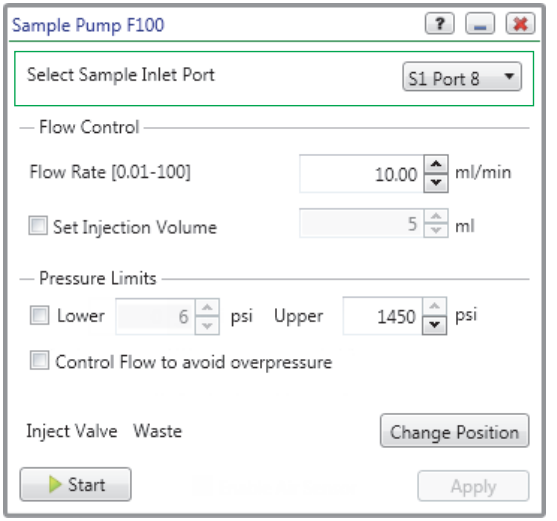


4. Slowly withdraw the plunger to withdraw liquid from the port until air no longer enters the syringe (approximately 10 ml) and all tubing is filled with liquid.
5. Turn the priming port valve clockwise to close the port.
6. Remove the syringe from the priming port and discard the liquid into waste.

To prime the sample inlet valve (if available)

1. Immerse the tubing for the inlet valve in the appropriate buffer container.
2. On the ChromLab computer or the touch screen, start ChromLab in Manual mode.
3. In the fluidic scheme, touch or click the Sample Pump module with the sample inlet valve to open its dialog box.

4. In the Sample Pump dialog box, select the first sample inlet port to prime.



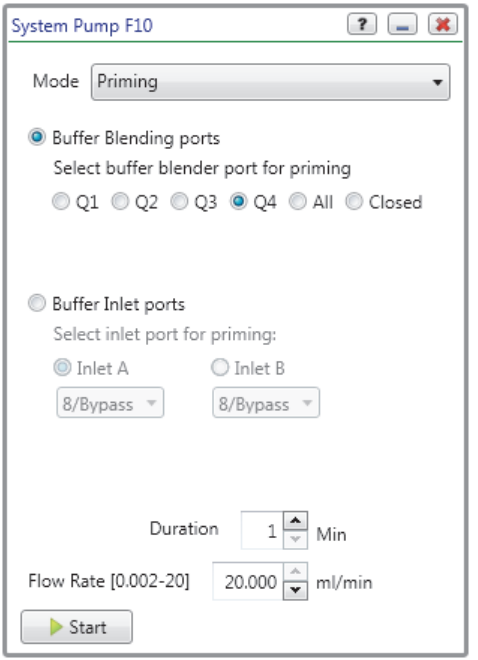
5. Insert a 30 ml syringe into the sample pump's priming port.
6. Slowly withdraw the plunger to withdraw liquid from the port until air no longer enters the syringe (approximately 10 ml).
7. Remove the syringe from the priming port and discard the liquid into waste.
8. Repeat steps 4–7 for the remaining sample inlet ports.

Purging the NGC Discover System

To purge the buffer blending valve

1. Open the System Pump dialog box and select Priming on the Mode dropdown list.

   Note: When in Priming mode, the sample inject valve switches the system pump flow to waste (W2). After the process is completed, the sample inject valve switches the system pump to manually load the column through the loop.



- To purge an individual line of air bubbles, proceed to step 2 on page 143.
- To purge all lines of air bubbles sequentially, proceed to step 3 on page 143.

2. To purge an individual line of air bubbles and fill it with buffer:
   a. Select the port to open.
   b. (Optional) Change the default flow rate.

      The default flow rate is 20 ml/min.

   c. Click Start.
   d. Repeat steps 2a–c for any other port to purge.
3. To purge all lines of air bubbles and fill them with buffer:
   a. Select All.
   b. (Optional) Change the default flow rate.

      The default flow rate is set to 20 ml/min.

   c. Click Start.

   The system pumps and the buffer blending valve start operating at the specified flow rate, exchanging the solution in the inlet lines and expelling any trapped bubbles, cycling sequentially through the ports Q1 to Q4. After the specified duration, the pumps stop momentarily while the blending valve switches to port Q3 in order to flush the lines with water before closing the valve. No change is allowed during this process for the specified duration.

   Note: You can stop the cycle before it completes by clicking Stop. In this case, ensure that all buffer lines are filled with the appropriate buffers before continuing.

To purge the buffer inlet valves

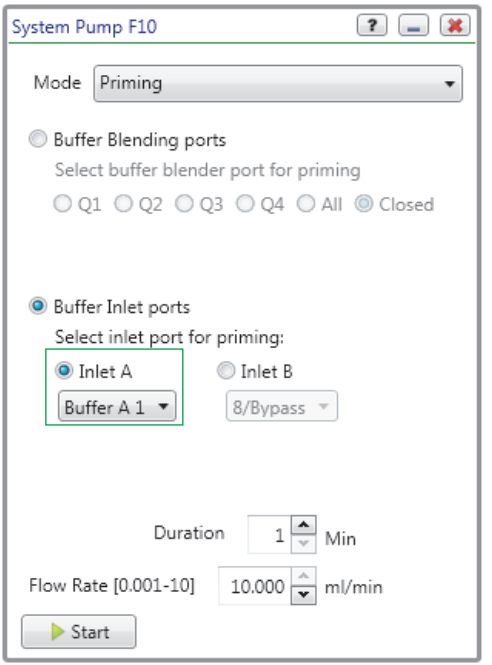
1. Open the System Pump dialog box and select Priming on the Mode dropdown list.

   Note: When in Priming mode, the sample inject valve switches the system pump flow to waste (W2). After the process is completed, the sample inject valve switches the system pump to manually load the column through the loop.

2. Select the first buffer port to purge, for example Buffer A 1.
3. (Optional) Change the default flow rate.

   The default flow rate is set to 10 ml/min.

4. Click Start.

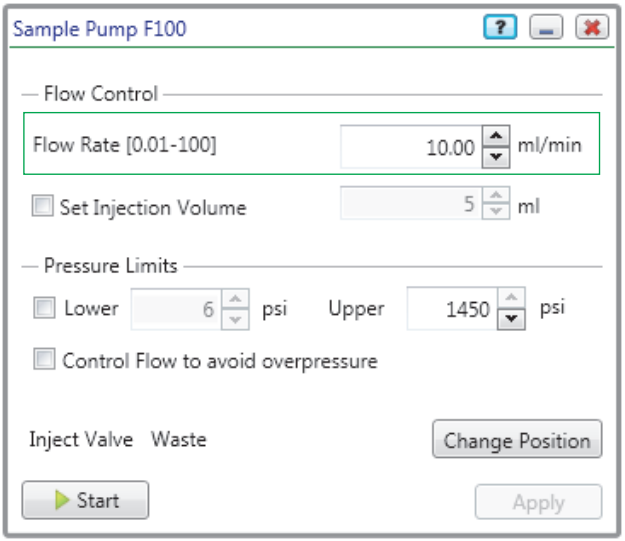


5. Repeat steps 2–4 for the remaining buffer inlet ports.

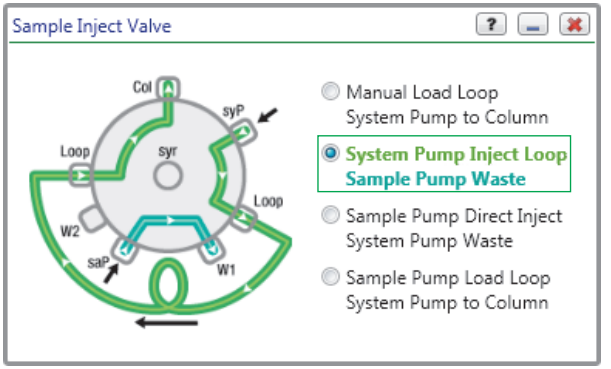
To purge the sample pump

1. In the fluidic scheme, touch or click the Sample Pump module to open its dialog box.

2. In the Sample Pump dialog box, set Flow Rate to 10 ml/min.



3. Click Change Position to set the sample inject valve to Sample Pump Waste and close its dialog box.



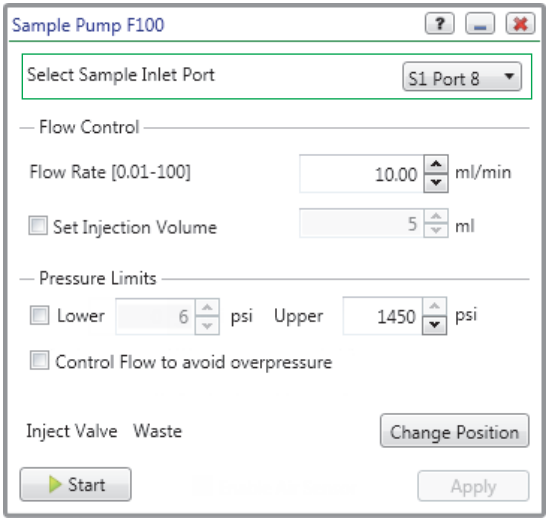
4. Click Start.

To purge the sample inlet valve (if available)

1. In the fluidic scheme, touch or click the Sample Pump module with the sample inlet valve to open its dialog box.

2. In the Sample Pump dialog box, do one of the following:
   - If only one sample inlet valve is present, select S1 Port 8 as the port to purge.
   - If two sample inlet valves are present, click Valve 2 and select S2 Port 8 as the port to purge.

3. Set Flow Rate to 10 ml/min.
4. Click Change Position to set the sample inject valve to Sample Pump Waste and close the dialog box.
5. (Optional) When an air sensor is present, in the Sample Pump dialog box, select Enable Air Sensor to use end-of-sample detection to stop the pump.



6. Click Start.
7. Monitor the pump pressure and outlet flow to ensure that no air is in the lines and that the fluid is flowing properly.

Calibrating the Instrument

The NGC instrument includes integrated pressure and temperature sensors. The pressure sensors monitor the system pressure to protect the column and media from overpressure. The temperature sensor in the conductivity monitor enables the system to provide real-time temperature compensation for conductivity and pH measurements. The measured temperature appears as a trace on the chromatogram.

All sensors and detectors in the NGC instrument ship precalibrated to ensure accurate monitoring. ChromLab enables you to recalibrate the pump flow rate and the conductivity and the pH monitors, zero the pressure sensors, and reset them to their factory settings.

Note: You cannot run a method while calibrating the instrument.

Tip: This section provides general procedures for calibrating the modules. For more information about using ChromLab to calibrate the modules, see the NGC Chromatography Systems and ChromLab Software User Guide.

Calibrating pH

Use two pH calibration buffers with a difference of at least one pH unit. Allow the buffers to reach the operating temperature before use.

To calibrate pH

1. On the NGC touch screen, select Calibrate on the ChromLab dropdown menu.
2. Select pH on the dropdown list.
3. Follow the steps in the pH Calibration dialog box.
4. Verify that Status (at the bottom of the dialog box) is Calibrated.

Calibrating the Pump Flow Rate

Prime and purge the system pumps with water before starting the calibration procedure. Calibrate the flow rate with water.

Note: Ensure that the column is offline before performing this task.

To calibrate the pump flow rate

1. On the NGC touch screen, select Calibrate on the ChromLab dropdown menu.
2. Select Pump Flow Rate on the dropdown list.
3. Follow the steps in the Pump Flow Rate Calibration dialog box.
4. Verify that Status (at the bottom of the dialog box) is Calibrated.

Calibrating Pressure Sensor Zero Point

Use this procedure to zero the pressure on the following modules:

- Sample pump
- System pump
- Column switching valve

To zero the pressure

1. Ensure the modules are not plumbed and are at ambient pressure.
2. On the NGC touch screen, select Calibrate on the ChromLab dropdown menu.
3. Select the pump or valve on the dropdown list.
4. Follow the steps in the Calibration dialog box.
5. Verify that Status (at the bottom of the dialog box) is Calibrated.

Calibrating the Conductivity Monitor

Flow conductivity standard from any commercial supplier through the conductivity flow cell until a stable reading is obtained.

To calibrate the conductivity monitor

1. On the NGC touch screen, select Calibrate on the ChromLab dropdown menu.
2. Select Conductivity Monitor on the dropdown list.
3. Follow the steps in the Conductivity Monitor dialog box.
4. Verify that Status (at the bottom of the dialog box) is Calibrated.

A Upgrading ChromLab Software and NGC Systems

This appendix explains how to upgrade ChromLab software and your NGC system from a previous version to the current version.

Important: If you are running a version of ChromLab earlier than 3.0, you must first upgrade to ChromLab 3.1 or 3.3 and then upgrade to the current version. You can upgrade versions 3.x and later directly to the current version of ChromLab.

Important: If you are running a version of ChromLab earlier than 4.0 and you plan to upgrade your operating system to Windows 10 Pro or Windows 10 Enterprise, you must upgrade ChromLab to the current version before upgrading. If you are running a version earlier than ChromLab 4.0 and have already upgraded to Windows 10 Pro or Windows 10 Enterprise, contact Bio-Rad Technical Support for specific instructions on upgrading ChromLab to the current version.

Caution: Before beginning the upgrade process, ensure that you have saved all manual runs, and that no methods are running.

Upgrading ChromLab Software

Important: The ChromLab installer installs Microsoft SQL Server 2014 Express on the ChromLab computer. Upgrading to or installing SQL Server 2014 Express requires you to reboot your computer several times during the installation process. You will be prompted to do so.

Note: If you are upgrading ChromLab on a 32-bit operating system, the ChromLab installer does not install or upgrade to SQL Server 2014 Express. Your ChromLab database will remain on SQL Server 2008 Express.

Upgrading ChromLab Software to Version 6.1

Note: To ensure the computer has enough disk space to save methods, ChromLab 6.1 detects all existing methods and compresses them. No data are lost and all methods remain on the computer. In Security Edition, signed methods are not altered.

To upgrade ChromLab software

1. Back up your current database.

   See Backing Up the NGC Database in the NGC Chromatography Systems and ChromLab Software User Guide.

2. (Optional) Restore an existing NGC database from a backup file (.bak, .ubk, or .sbk).

   Note: ChromLab database compression occurs only during ChromLab 6.1 installation. You must restore the database before upgrading the software.

   See Restoring the NGC Database in the NGC Chromatography Systems and ChromLab Software User Guide.

3. Uninstall the current version of ChromLab software.

4. Insert the ChromLab software USB into an available USB drive. The ChromLab installer automatically launches.

   If the ChromLab installer does not automatically start:

   a. In Windows Explorer, navigate to and open the ChromLab Software USB drive.

   b. Double-click ChromLab_Setup.exe to start the ChromLab installer.

   Note: Upgrading ChromLab and the database can take several minutes.

5. When the upgrade process is complete, click Finish to exit the wizard.

Updating NGC Systems

Updating the NGC system is a two-step process:

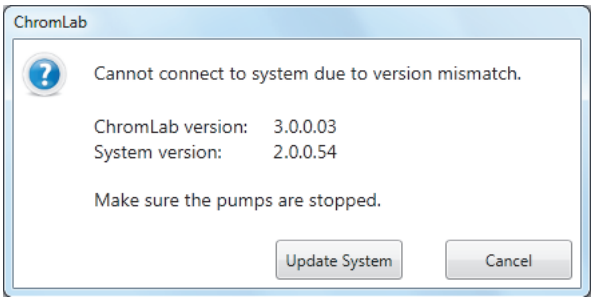
- Updating ChromLab software on the instrument
- Updating the firmware on the instrument

If you are upgrading from ChromLab 5.0 or earlier, or if you have an air sensor in line, you will be prompted to update the NGC firmware. Between the software and firmware update the NGC instrument automatically reboots. The instrument reboots following a successful firmware upgrade as well.

Important: The update process can up to 20 minutes. A progress dialog box appears on the NGC touch screen with information about the time remaining for the update. Do not shut down the instrument during the update process.

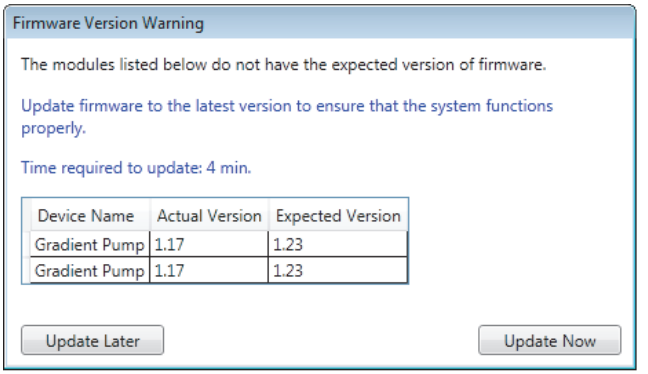
To update the NGC system

1. On the ChromLab computer, start ChromLab. ChromLab automatically connects to the instrument it was last connected to before the software update.
2. A dialog box appears prompting you to update the software on the system. Click Update System.

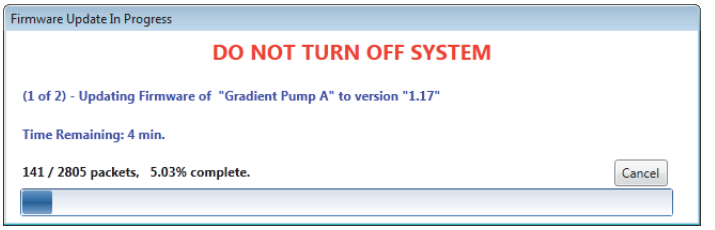


Tip: A firmware upgrade is required if you are upgrading from ChromLab 5.0 or earlier, or if you have an air sensor in line. If you are upgrading ChromLab 5.0 or 5.0.1 and do not have an air sensor, you will not be prompted to update the firmware.

3. After the update process completes, the instrument automatically reboots. The system checks the firmware versions on the modules. If the firmware is not current the Firmware Version Warning dialog box appears. Click Update Now.



A progress dialog box appears on the NGC touch screen with information about the update including the module that is being updated and the time remaining for that update.



Important: When the firmware update completes, you must **completely power down and reboot the NGC instrument** to complete the update process. Not all firmware will be updated if the system is not rebooted. The instrument is then ready for use.

If the firmware update fails, see Firmware Update Failure on page 170.

B Troubleshooting ChromLab Software Installation

This appendix explains what to do if ChromLab software fails to connect to the NGC system.

Possible Causes for Connection Failures

When ChromLab fails to connect to an NGC system, the following error message appears:

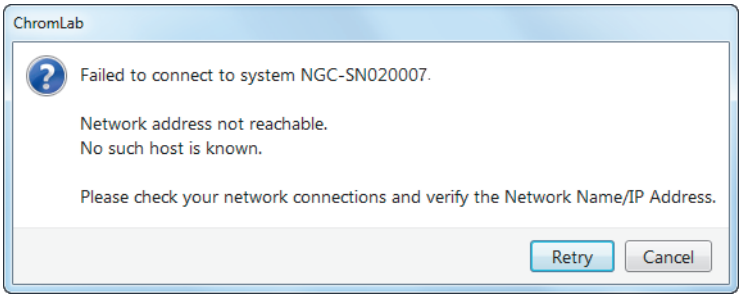


Table 14 on page 158 lists several possible causes for the connection to fail.

Table 14. Possible Causes and Solutions for Connection Failures

Possible Cause	Solution
The network name or IP address entered is incorrect.	1. Verify that the NGC instrument is available on the network. See Troubleshooting Network Connection Issues on page 164 for information about ensuring the NGC system is available on the network. 2. On the error message in ChromLab, click **Retry**. 3. Enter the correct Network Name or IP Address of the instrument and click **Connect** (see step 2 on page 88).

Table 14. Possible Causes and Solutions for Connection Failures, continued

Possible Cause	Solution
A firewall on the ChromLab computer is turned on and does not allow the ChromLab programs and services to run.	1. Check your firewall configuration and ensure that the required ChromLab programs and services are allowed to run. See ChromLab Software Firewall Settings on page 169 for the list of required ChromLab programs and services. See also Appendix D, Firewall Configuration, for information about configuring firewall applications and services. 2. On ChromLab Touch click **Retry**. 3. After the connection on the instrument is successful, on the ChromLab computer click **Retry**. 4. Enter the correct Network Name or IP Address of the instrument and click **Connect** (see step 2 on page 88).

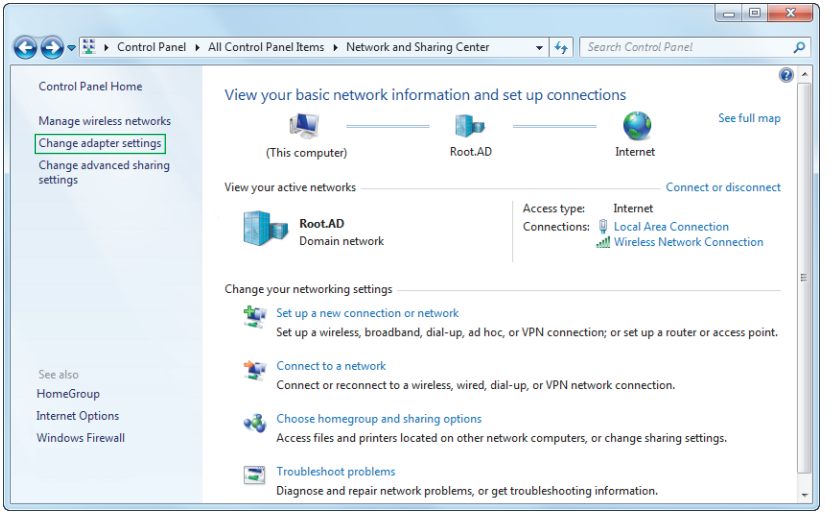
Configuring the Network Adapter for Direct Connection

When connecting the ChromLab computer to the NGC system through a direct cable connection, the network adapter on the ChromLab computer must be configured to use TCP/IP 4.0 with DHCP.

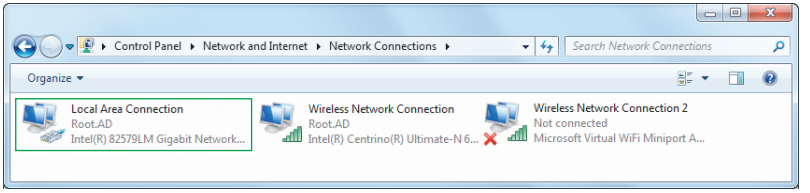
This section explains how to configure Local Area Connection on the ChromLab computer.

To configure Local Area Connection

1. To verify the correct setup, open the Control Panel and open Network and Sharing Center.
2. In the Network and Sharing Center click Change adapter settings in the left pane.

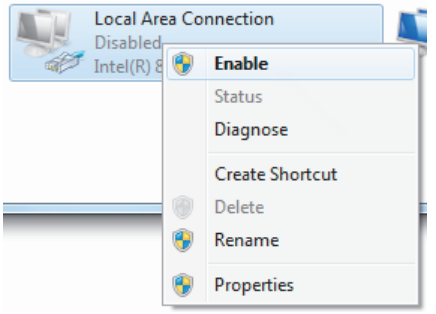


3. Review the list of network connections. If you see at least one icon labeled Local Area Connection proceed to step 4.

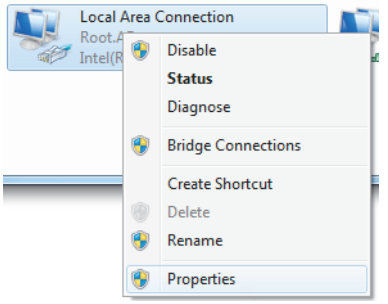


Note: If you do not see this icon, Microsoft Windows does not recognize the network adapter. This could be a driver problem with Windows. Contact the vendor of the computer or your local IT department to solve this problem.

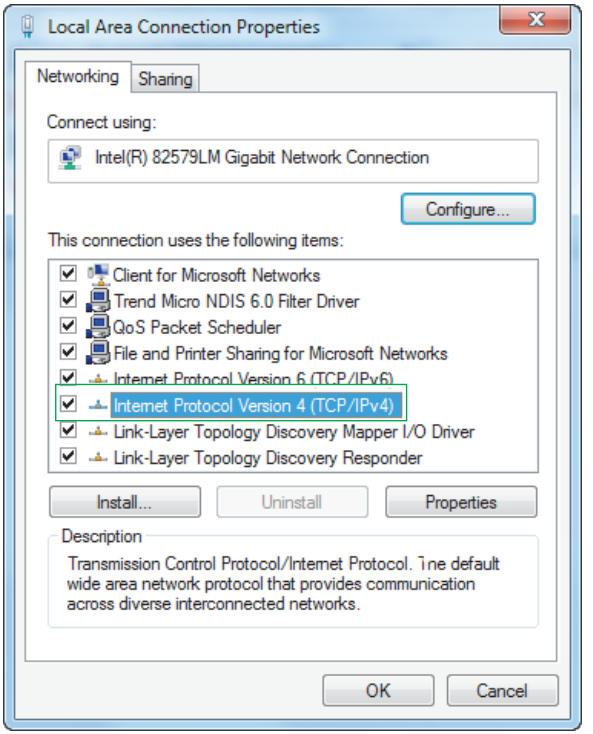
4. If the Local Area Connection icon is disabled, right-click the icon and select Enable to enable the network adapter.



5. Right-click the Local Area Connection icon and select Properties.

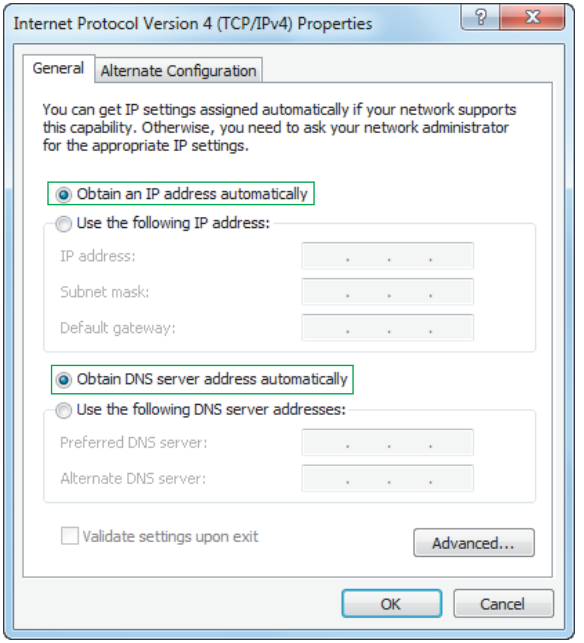


6. In the Local Area Connection Properties dialog box, locate the Internal Protocol version 4 (TCP/IPv4) list item.



Note: If you do not see this item listed, the computer is not set up for TCP/IP. Refer to the vendor for information about enabling TCP/IP.

7. Select Internet Protocol Version 4 (TCP/IPv4) and click Properties. The Internet Protocol version 4 (TCP/IPv4) Properties dialog box appears.
8. Make sure that Obtain an IP address automatically and Obtain DNS server address automatically are selected and click OK.



9. Close the Control Panel and open Network and Sharing Center.

Important: ChromLab does not support third-party firewall applications. Uninstall or disable any third-party firewall application to ensure that ChromLab functions correctly. See Troubleshooting Network Connection Issues on page 164 for more information.

Troubleshooting Network Connection Issues

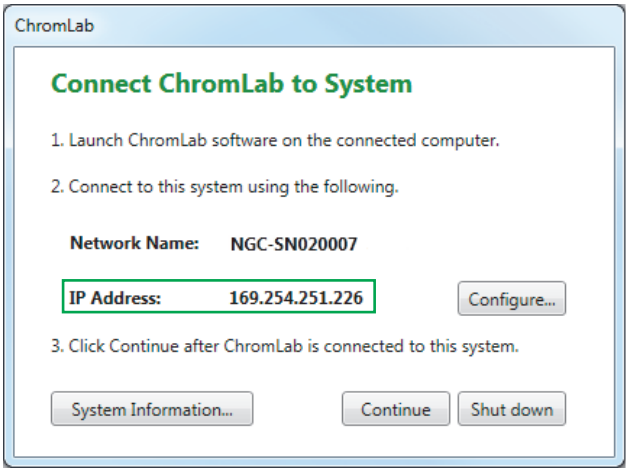
This section explains what to do if ChromLab is unable to connect to the NGC system because the IP address of the instrument has changed.

Locating the IP Address of the NGC Instrument

The IP address of the NGC instrument is available on the initial connection screen as well as in the System Information dialog box.

IP Address on the ChromLab Connection Screen

When you first start the ChromLab instrument, the following dialog box appears:



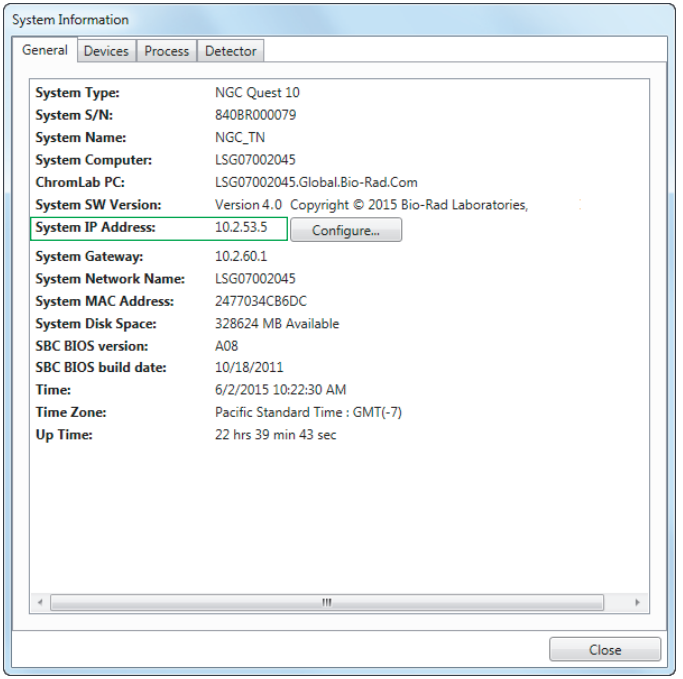
Tip: Write down the IP address. You will need this number in the section Checking the Network Connection on page 167.

IP Address Located in the System Information Dialog Box

If the system is running, you can find the IP address of the NGC instrument in the General tab in System Information.

To locate the IP address in the System Information dialog box

1. On the touch screen, expand the system's dropdown list and select System Information.
2. Locate System IP Address in the General tab.



3. Write down the IP address. You will need this number in the section Checking the Network Connection that follows.

Tip: From this tab you can set a static IP address for the NGC system. Click Configure beside System IP Address and complete Steps 3–5 in Setting a Static IP Address on the NGC Instrument on page 166.

Setting a Static IP Address on the NGC Instrument

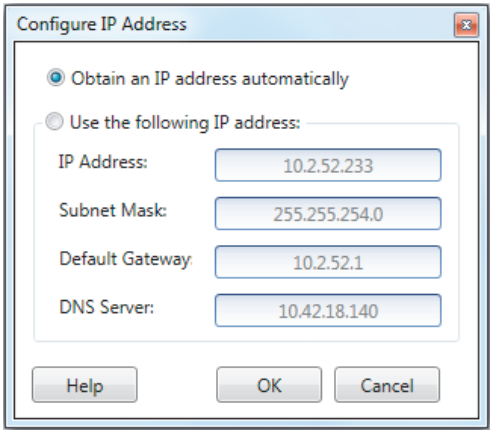
By default, the NGC system's IP address is dynamic. That is, the IP address can change each time the system restarts. In these cases, ChromLab must reestablish a connection to the system. A static IP address never changes; thus ChromLab always reconnects to the system when it restarts.

Important: The NGC system must restart to apply the changes.

To set a static IP address on the NGC instrument

1. On the touch screen, expand the system's dropdown list and select System Information.
2. In the General tab, click Configure beside System IP Address.

   The Configure IP Address dialog box appears.



3. Select Use the following IP address and provide the IP address, subnet mask, default gateway, and DNS server details specific to your site.

   Tip: See your system or network administrator for the appropriate settings.

   - IP address — the specific numeric address for the NGC system
   - Subnet mask — the numeric filter used to define the subnet to which the IP address belongs
   - Default gateway —(optional, required if you plan to install the ChromLab database on a separate subnet or access the NGC system from ChromLab computers that are on another subnet) this is the IP address of the node that allows communication between the subnets
   - DNS server — the IP address of the node that translates a server name to its IP address

4. Click OK.

   A message appears explaining that the NGC system must restart.

5. Click Yes to save the changes and restart the system.

Checking the Network Connection

After you find the IP address of the instrument, or set a static IP address, from the ChromLab computer verify that the instrument can be accessed through the network.

To check the network connection

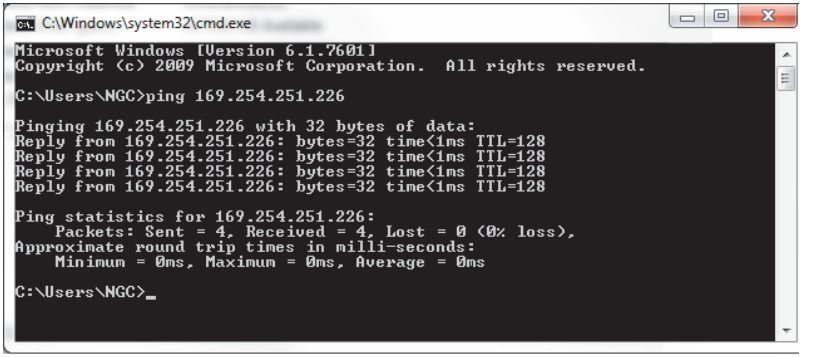
1. On the ChromLab computer, open a Command Prompt window.
2. At the prompt, type

   > ping x.x.x.x

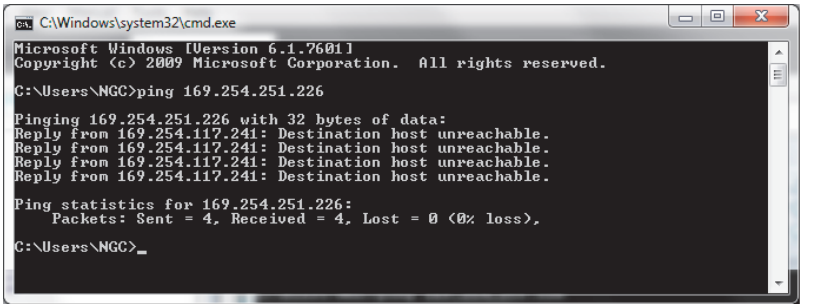
where **x.x.x.x** is the IP address of the instrument.

Tip: The IP address for an NGC instrument that is directly connected to the ChromLab computer begins with the number sequence 169.254.

- If the network connection is set up correctly, you see results similar to the following image. The ChromLab computer should be able to connect to the NGC instrument.



- If the network is not set up correctly, you see results similar to this image:



The ChromLab computer cannot connect to the instrument. Check the setup of the network adapter in the section Configuring the Network Adapter for Direct Connection on page 160. Make sure TCP/IPv4 is installed and set up for DHCP.

ChromLab Software Firewall Settings

If your computer has Windows Firewall turned on, check your firewall settings and ensure that the following programs and services required for ChromLab are allowed to communicate with your computer.

Important: If you have anti-virus software installed on your ChromLab computer, configure the software to allow the following programs and services to communicate with ChromLab.

- Bio-Rad NGC ICMPv4
- Bio-Rad NGC Network Discovery
- Bio-Rad NGC SQLServer Browser
- Bio-Rad NGC SQLServer NG
- Bio-Rad NGC Time Source
- Bio-Rad NGC ChromLab Application

If not all ports are open, run the ChromLab installer again to set up the Windows firewall correctly.

See Firewall Inbound Rules for Bio-Rad NGC Services and Applications on page 179 for a list of firewall configuration requirements.

Firmware Update Failure

If the firmware upgrade fails, restart the NGC instrument. The software attempts the firmware update again.

If the firmware update fails again:

1. Shut down the NGC instrument.
2. Turn off the power at the back of the instrument for 30 seconds.
3. Power on the NGC instrument. The firmware update procedure starts again.

C Connecting the C-96 Autosampler to NGC Systems

Using the C-96 Autosampler with NGC Systems

The C-96 autosampler enhances NGC chromatography systems, providing automated, accurate, and reproducible sample injections. Its easy-to-install accessories allow for a wide range of injection volumes from 5 µl–5 ml.

The signal import module (SIM) connects the C-96 autosampler to NGC systems. The SIM digitizes the analog signal from the C-96 autosampler and transmits the signal to the NGC system.

This appendix explains how to connect and set up the C-96 autosampler for use with the NGC instrument.

Tip: To install and set up the C-96 autosampler, see its documentation.

Connecting the C-96 Autosampler to the NGC Instrument

To connect the autosampler to the NGC instrument

1. Ensure that both the NGC instrument and the C-96 autosampler are powered off.
2. Connect the SIM device to the NGC instrument. See Connecting the SIM to the NGC Instrument on page 68 for more information.
3. On the back of the SIM, firmly grasp the DIGITAL IN female connector and pull it straight out of its port.
4. Grasp the DIGITAL OUT male connector and pull it out of its port.

5. Locate the two cables that connect the autosampler to the SIM:
   - 15-pin D connector cable (part #10027227)
   - 9-pin D connector cable (part #10027224)

   These cables ship with the autosampler.

6. Attach the DIGITAL IN connector to the 15-pin D connector cable.

   Tip: The 15-pin D connector cable has three wires (red, black, and brown).

   a. From left to right, loosen the first, second, and last screws on the connector.

   b. If necessary, strip the plastic wire coating off the wires so that they are exposed.

   c. Insert the wires into the open ports in this order and tighten the screws:
      - Insert the red wire into the first port.
      - Insert the black wire into the second port.
      - Insert the brown wire into the last (ground) port.

      Note: Take care not to overtighten or fray the wires.

7. Attach the DIGITAL OUT connector to the 9-pin D connector cable.

   Tip: The 9-pin D connector cable has two wires (red and black).

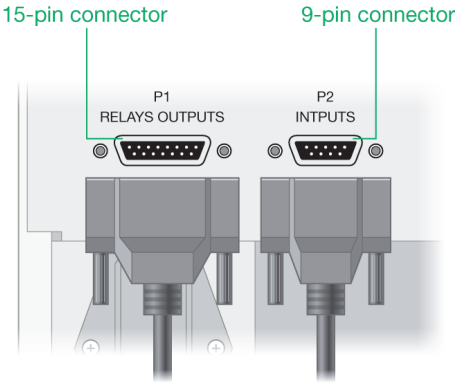
   a. From left to right, loosen the first and last screws on the connector.

   b. Insert the wires into the open ports in this order and tighten the screws, taking care not to overtighten or fray the wires:
      - Insert the red wire into the last port.
      - Insert the black wire into the first (ground) port.

8. On the back of the autosampler:

    a. Insert the 15-pin cable into the left (P1 RELAYS OUTPUTS) connector port and tighten the thumbscrews.

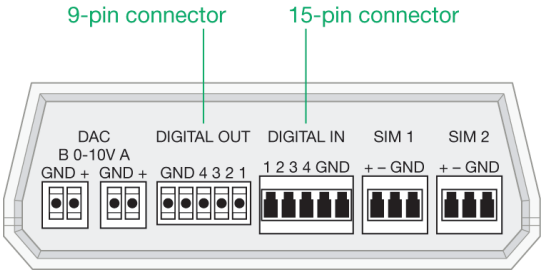
    b. Insert the 9-pin cable into the right (P2 INPUTS) connector port and tighten the thumbscrews.



9. On the back of the SIM:

    a. Insert the P1 RELAYS OUTPUTS cable into the DIGITAL IN port.

    b. Insert the P2 INPUTS cable into the DIGITAL OUT port.



Plumbing and Priming the C-96 Autosampler

This section explains how to plumb the C-96 autosampler to the sample inject valve on the NGC instrument and to prime the autosampler after you plumb it. Before you plumb and prime, you must prepare the tubing. Use 1/16" PEEK tubing to plumb the autosampler to the sample inject valve.

For information about plumbing the autosampler, see the C-96 Autosampler for BioLogic DuoFlow Chromatography System Quick Start Guide or the C-96 Autosampler for BioLogic DuoFlow Chromatography System User Manual.

To prepare the tubing

1. Cut two segments of 1/16" PEEK tubing of adequate length.
2. To one end of each segment, attach a 10-32 fitting. This fitting attaches to the autosampler.
3. To the other end of each segment, attach a 1/4-28 fitting. This fitting attaches to the sample inject valve.

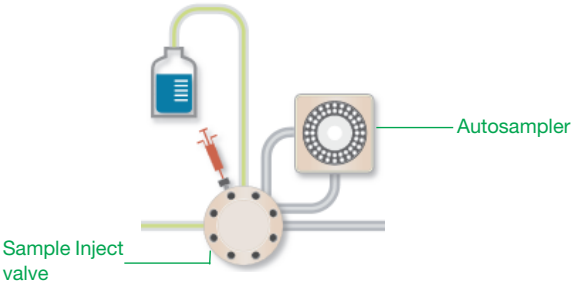
To connect the tubing from the autosampler to the sample inject valve

1. Ensure that both the NGC instrument and the C-96 autosampler are powered off.
2. Attach one 10-32 fitting to Port 1 and the other 10-32 fitting to Port 6 on the autosampler.
3. Attach the 1/4-28 fitting from Port 1 to the Loop E port on the sample inject valve.
4. Attach the 1/4-28 fitting from Port 6 to the Loop F port on the sample inject valve.
5. Insert one 1/4-28 plug to the syringe port and another 1/4-28 plug to the Waste port (W1) on the sample inject valve.
6. Power on the NGC instrument and the autosampler.

To prime and purge the C-96 autosampler

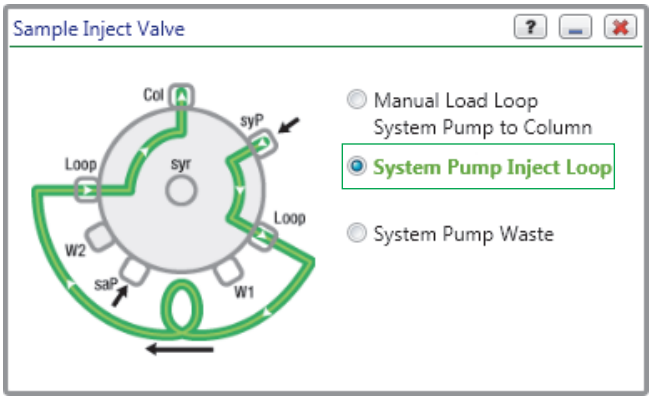
Note: Before priming the autosampler, ensure that any column is offline.

1. Immerse the inlet tubing in a container of buffer or HPLC grade (filtered, degassed) or other high quality water.
2. Use a syringe to prime the pumps. See the section Priming and Purging the System on page 127 for specific information.
3. On the ChromLab computer or the touch screen, start ChromLab in Manual mode.
4. Set the fluidic scheme to display the autosampler and sample inject valve.

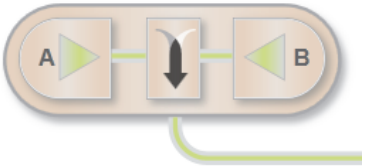


5. In the fluidic scheme, touch or click the Sample Inject Valve module to open its dialog box.

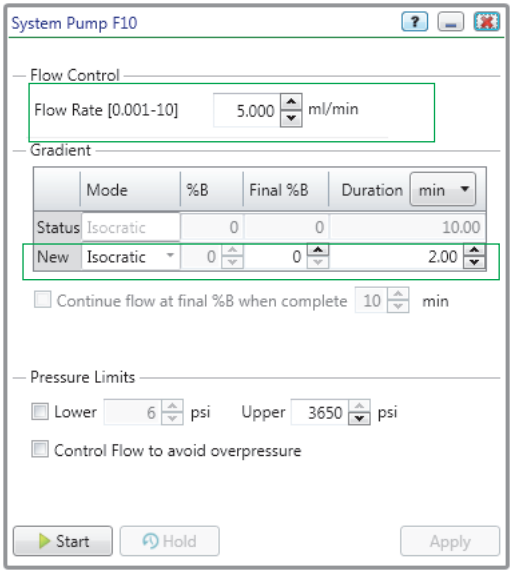
6. Set the inject valve to System Pump Inject Loop.



7. In the fluidic scheme, touch or click the System Pump module to open its dialog box.



8. In the System Pump dialog box:
   a. Set Flow Rate to 5 ml/min.
   b. (Optional) Set Duration to at least 2 min.
   c. Click Start.


System Pump F10
Flow Control
Flow Rate [0.001-10]
5.000
ml/min
Gradient
Mode
%B
Final %B
Duration
min
Status
Isocratic
0
0
10.00
New
Isocratic
0
0
2.00
Continue flow at final %B when complete
10
min
Pressure Limits
Lower
6
psi
Upper
3650
psi
Control Flow to avoid overpressure
Start
Hold
Apply

Setting Up the C-96 Autosampler for Use in ChromLab Methods

This section briefly explains how to set up the autosampler for use in a ChromLab method. For information about creating methods in ChromLab, see the NGC Chromatography Systems and ChromLab Software User Guide.

To set up a method that uses the autosampler

1. In ChromLab create a method that includes the autosampler in the fluidic scheme. The Sample Application phase automatically displays Inject Using Autosampler.
2. In the Sample Application phase, increase the injection volume to include the total volume of the installed autosampler loop and the tubing needed to connect Port 6 on the autosampler to the Loop F port on the sample inject valve.

   Tip: Typically, a sample loading volume of 2–3 ml should be sufficient to completely load the entire sample in the autosampler loop onto the column.
3. Use the front panel on the C-96 autosampler to create a method.

   See the C-96 Autosampler for BioLogic DuoFlow Chromatography System Quick Start Guide or the C-96 Autosampler for BioLogic DuoFlow Chromatography System User Manual for more information.
4. Start the autosampler method and place the autosampler in REMOTE mode.
5. In ChromLab, complete the method setup and start the run.

For multiple samples, perform a multi-run of the ChromLab method. The number of runs (in the multi-run) should correspond to the total number of injections (from the same vial or multiple vials) to be programmed on the autosampler.

D Firewall Configuration

Firewall Inbound Rules for Bio-Rad NGC Services and Applications

Bio-Rad configures ChromLab software using Microsoft Windows firewall with advanced security. If you have a third-party firewall application you must configure that software so that it meets Bio-Rad software's firewall rules. The rules for NGC are listed in Table 15 on page 180. You can see the complete list of inbound firewall rules in the Windows Firewall with Advanced Security tool.

Note: If you have antivirus software installed on your ChromLab computer, ensure that it is configured to allow the Bio-Rad NGC networking applications and services listed in this table.

To view Bio-Rad NGC Firewall Inbound Rules

1. On the ChromLab computer, open the Control Panel and select Administrative Tools.
2. In the list of tools, double-click Windows Firewall with Advanced Security.
3. In the left pane, select Inbound Rules. The list of inbound rules appears in the middle pane.

   Tip: If the list is long, sort the list alphabetically to view the rules for Bio-Rad NGC.

Important: Ensure that the settings for your third-party tool follow the rules for Bio-Rad NGC. If your tool has a "Trust Network" or similar setting, ensure that it is enabled, allowing an unrestricted, trusted connection between the ChromLab computer and the NGC instrument.

For all services and applications listed in Table 15, the following rules apply:

Enabled	Action	Allowed Users	Allowed Computers
Yes	Allow	Any	Any

Table 15. Firewall inbound rules for Bio-Rad NGC services and applications

Name	Group	Program	Protocol	Local Port	Remote Port
Required Bio-Rad Networking Applications and Services					
Bio-Rad NGC ICMPv4		Any	ICMPv4	Any	Any
Bio-Rad NGC Network Discovery LLMNR			UDP	5355	Any
Bio-Rad NGC SQLServer Browser		Any	Any	Any	Any
Bio-Rad NGC SQLServer NG		Any	Any	Any	Any
Bio-Rad NGC Time Source		Any	Any	Any	Any
Bio-Rad NGC ChromLab Application		Any	Any	Any	Any

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Brazil *4003 0399* ***Canada*** *1 905 364 3435* ***China*** *86 21 6169 8500* ***Czech Republic*** *00 800 00 24 67 23* ***Denmark*** *00 800 00 24 67 23*
Finland *00 800 00 24 67 23* ***France*** *00 800 00 24 67 23* ***Germany*** *00 800 00 24 67 23* ***Hong Kong*** *852 2789 3300*
Hungary *00 800 00 24 67 23* ***India*** *91 124 4029300* ***Israel*** *0 3 9636050* ***Italy*** *00 800 00 24 67 23* ***Japan*** *81 3 6361 7000*
Korea *82 2 3473 4460* ***Luxembourg*** *00 800 00 24 67 23* ***Mexico*** *52 555 488 7670* ***The Netherlands*** *00 800 00 24 67 23*
New Zealand *64 9 415 2280* ***Norway*** *00 800 00 24 67 23* ***Poland*** *00 800 00 24 67 23* ***Portugal*** *00 800 00 24 67 23*
Russian Federation *00 800 00 24 67 23* ***Singapore*** *65 6415 3188* ***South Africa*** *00 800 00 24 67 23* ***Spain*** *00 800 00 24 67 23*
Sweden *00 800 00 24 67 23* ***Switzerland*** *00 800 00 24 67 23* ***Taiwan*** *886 2 2578 7189* ***Thailand*** *66 2 651 8311*
United Arab Emirates *36 1 459 6150* ***United Kingdom*** *00 800 00 24 67 23*

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