DIONEX

ICS-2000 Ion Chromatography System
Installation Instructions

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Contents

Installation

This document provides instructions for the initial installation of the ICS-2000 Ion Chromatography System.

> **NOTE** **The order of the steps is important. It is especially important to install Chromeleon® before connecting the USB cable and turning on the ICS-2000 power.**

1   Facility Requirements

- Make sure the ICS-2000 installation site meets the following environmental specifications:

  Operating Temperature: 4 to 40 °C (40 to 104 °F)

  Humidity: 5% to 95% relative humidity, noncondensing

- Provide a sturdy workbench for the ICS-2000 of a height that ensures convenient access to the interior of the ICS-2000.

- Allow at least 15 cm (6 in) behind the ICS-2000 for power connections and ventilation. For optimal performance, install the ICS-2000 in a draft-free location, out of the path of air conditioning and heating vents.

- (Optional) Provide a clean gas source regulated to between 0.55 and 0.83 MPa (80 and 120 psi) for pressurization of the eluent reservoir.

- Use ASTM filtered, Type I (18-megohm) deionized water when preparing eluent and regenerant.

2   Unpacking the ICS-2000 System

1. After removing the ICS-2000 from the shipping box and removing the top layer of foam, remove the next layer of foam (see Figure 1).
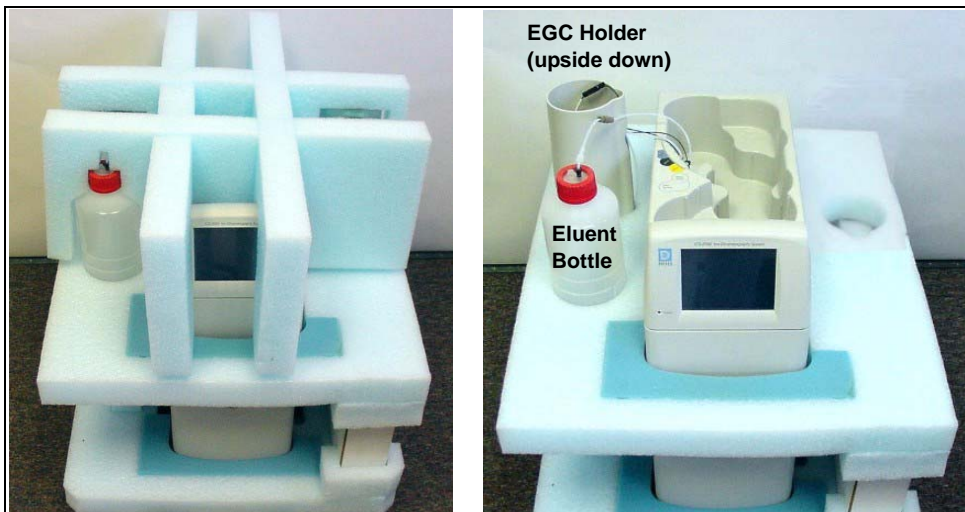
Figure 1. Unpacking the ICS-2000

2. Set the eluent bottle on top of the ICS-2000 (see Figure 2).

3. **TURN OVER THE EGC HOLDER**, and set it on top of the ICS-2000.

Figure 2. ICS-2000 After Installing Eluent Bottle and EGC Holders

4.   Remove the next layer of foam and remove the Ship Kit box (see <u>Figure 3</u>).
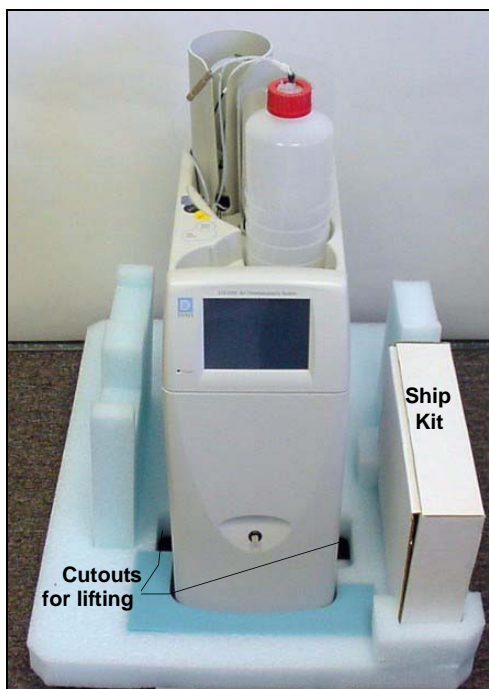
Figure 3. ICS-2000 with Ship Kit

5.   The bottom foam layer has two cutouts on either side of the ICS-2000 module; use these as handholds when lifting the module (see <u>Figure 3</u>).

6.   Lift the ICS-2000 out of the bottom layer of foam and set it on a workbench. Inspect the ICS-2000 for any shipping damage.

Two or more persons should lift the ICS-2000, which weighs 30 kg (66 lb). Lift the ICS-2000 only from each side of the cabinet bottom. Lifting from the front door will damage the door hinges.

CAUTION

Au moins deux personnes peuvent soulever le ICS-2000: il pèse 30 kg (66 lb). Ne soulevez le ICS-2000 que par chaque côté du fond de l'armoire. Son soulèvement par la porte du panneau avant endommagera les charnières de la porte.

MISE EN GARDE

Der ICS-2000 wiegt über 20 kg. Daher sollte das Gerät nur von zwei oder mehr Personen angehoben werden. Greifen Sie dazu an beiden Seiten unter das Gerät. Heben Sie den Autosampler nicht an der Vordertür an, da dadurch die Türangeln beschädigt werden könnten.

VORSICHT

2.1 Unpacking the Computer (North America only)

> **NOTE** These instructions assume that Chromeleon software was installed on the computer before shipping.

1. Remove the central processing unit (CPU), keyboard, mouse, and all documentation from the computer box and place these items on a workbench.

2. Remove the monitor from its box and place it on the workbench.

3. Follow the instructions in the computer installation guide to hook up the monitor, mouse, keyboard, and CPU.

4. Go on to Section 4, "Installing the Chromeleon Software License."

2.2 Unpacking the Computer (outside North America)

1. Refer to *Installing the Chromeleon IC System* (Document No. 031883) to verify that the computer being used meets Chromeleon specifications. The manual is on the Dionex Reference Library CD-ROM (P/N 053891).

2. Remove the central processing unit (CPU), keyboard, mouse, and all documentation from the computer box and place these items on a workbench.

3. Remove the monitor from its box and place it on the workbench.

4. Follow the instructions in the computer installation guide to hook up the monitor, mouse, keyboard, and CPU.

5. If Chromeleon is not installed on the computer, go on to Section 3, "Installing Chromeleon."

6. If Chromeleon is already installed on the computer, go on to Section 4, "Installing the Chromeleon Software License."

3   Installing Chromeleon

NOTES

- **Windows® 2000 or Windows XP is required for controlling the ICS-2000 with Chromeleon. Chromeleon version 6.5 SP2 or later is required.**

- **To install Chromeleon, you must log onto Windows 2000 or XP with administrator privileges. Administrator privileges are not required to run Chromeleon.**

- **For additional details about installing Chromeleon, refer to *Installing the Chromeleon Chromatography Management System with a Dionex Ion Chromatograph (IC)* (Document No. 031883)**

1. Turn on the computer power.

2. Follow the Windows setup steps as they appear on the screen.

3. Verify that the monitor display is set to a minimum of 1024 x 768 with 16 bit color.

4. Insert the Chromeleon CD-ROM into the CD-ROM drive.

5. The Chromeleon Setup menu appears.

6. If the Setup menu does not appear automatically, go to the Autorun folder on the Chromeleon CD-ROM and double-click **autorun.exe**.

7. Select **Launch Chromeleon Setup**.

8. Setup now guides you through the installation procedure; follow the on-screen instructions as they appear.

9. When prompted, select whether to add the Chromeleon Server Monitor to the Startup group. If you select yes, the Server Monitor starts automatically when the computer is started, and the program icon appears in the taskbar.

10. After installing the software, restart the computer.

11. Go on to Section 4, "Installing the Chromeleon Software License."

————— IMPORTANT —————

Installing DX-LAN Devices

If you will also be installing a module that requires a DX-LAN interface
connection, verify that the following steps are completed before continuing:

1. If it is not already installed, install the DX-LAN card in the module. Refer
   to the operator's manual for the module for installation instructions.

2. Install the DX-LAN card in the computer.

3. Connect the module to the DX-LAN.

4. Install the DX-LAN card driver.

Instructions for Steps 2 through 4 are in *Installing the Chromeleon
Chromatography Management System with a Dionex Ion Chromatograph (IC)*
(Document No. 031883).

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4   Installing the Chromeleon Software License

For the Chromeleon computer to control the ICS-2000, a valid software license
must be installed. To install the license, you first install a dongle on the computer
and then enter a license "Key Code" in Chromeleon. (A dongle is an adapter that
is connected to the parallel PC interface or USB port. The dongle stores the serial
number of a Chromeleon computer.)

> **NOTE   If the software license is managed with a License
> Server, a dongle is not required.**

1. Plug the dongle into the appropriate port on the computer (either the parallel
   or USB port, depending on the type of dongle). Tighten the connector screws
   on a parallel port dongle.

2. Microsoft Windows will automatically detect the USB dongle and launch the
   Found New Hardware Wizard. Complete the wizard by selecting the
   following options:

   • If asked whether Windows can connect to Windows Update to search for
     software, select **No, not this time**.

• Select the **Install the software automatically (Recommended)** option (see Figure 4) (it is not necessary to insert a hardware installation CD or floppy disk).
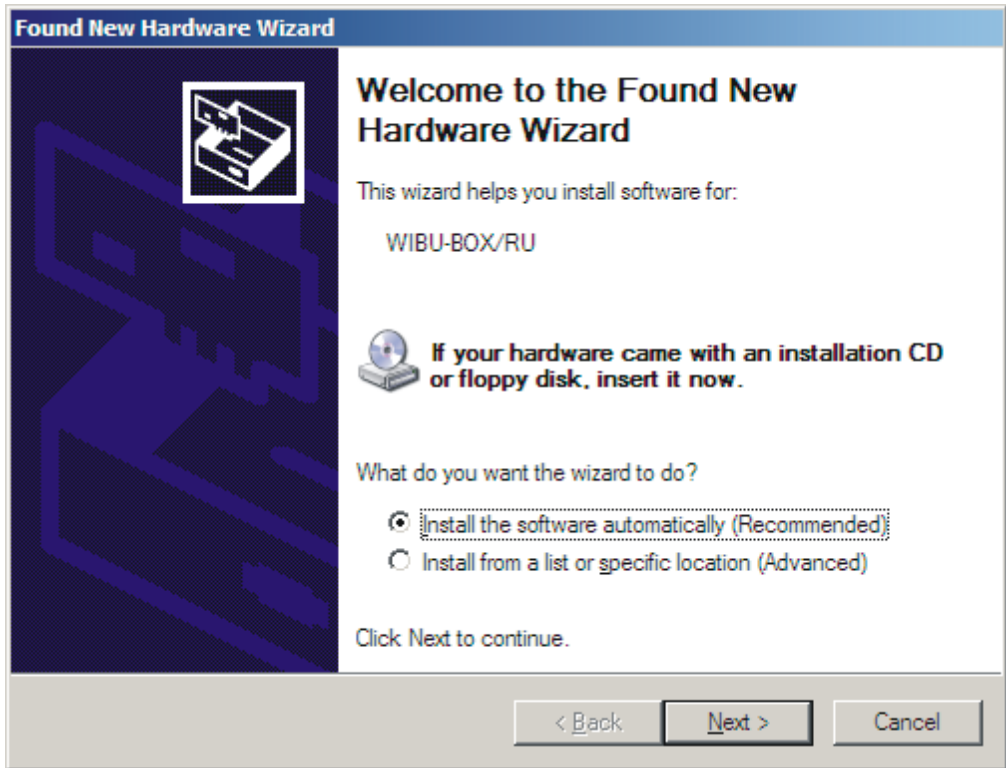
Figure 4. Windows Found New Hardware Wizard

3. If it is not already running, start the Chromeleon Server Monitor by double-clicking the Server Monitor icon on the Windows taskbar.

   If the Server Monitor icon is not on the taskbar, click **Start** on the taskbar and select **All Programs > Chromeleon > Server Monitor**.

4. If the server is not already running, start it by clicking **Start** (see Figure 5).
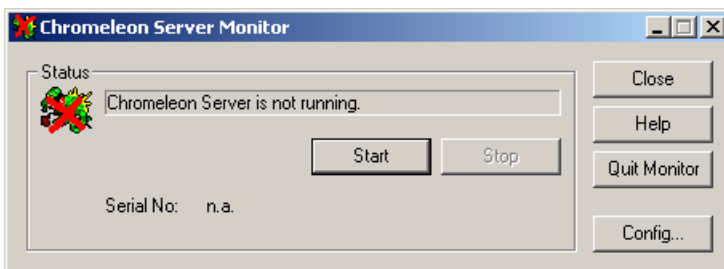
Figure 5. Server Not Running

5. Check the server status:

• If "Chromeleon Server is running idle" is displayed, the license Key Code was entered before shipping the computer, and you can omit the remaining steps in this section. Click **Close** and go on to Section 5.

• If "Chromeleon Server is running idle (Evaluation Mode)" is displayed (see Figure 6), the license Key Code has not yet been entered. If this is the case, go on to Step 6.
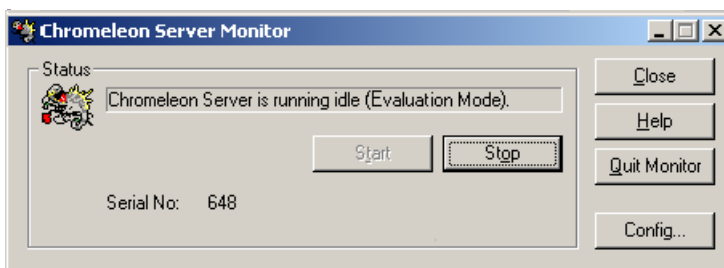
Figure 6. Server Evaluation Mode

6. Open Chromeleon (select **Start>Programs** (or **All Programs**)>**Chromeleon>Chromeleon**).

7. Select **File>Preferences** to open the Preferences dialog box (see Figure 7). Select the **License** tab and click **Dongle**. Enter the **Key Code** exactly as it appears on the Chromeleon Software License key code sheet. Click **OK**.
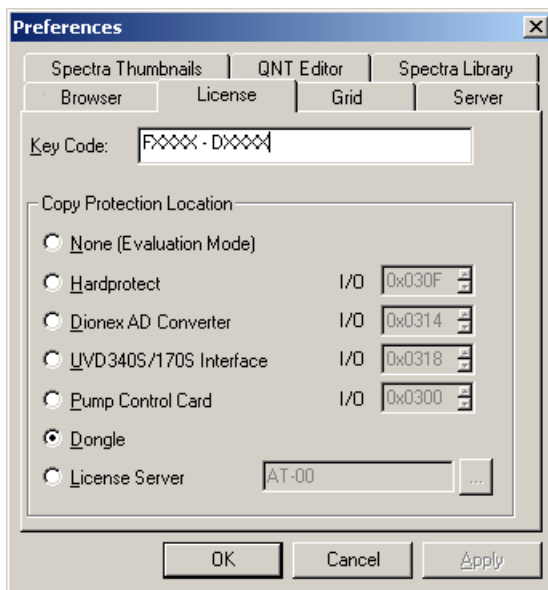
Figure 7. Preferences: License Page

8. Check the Server Monitor status. It should now display "Chromeleon Server is running idle." (see Figure 8).
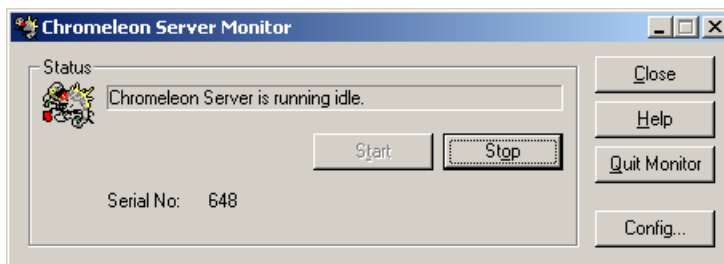
Figure 8. Server Running

9. Click **Close** to close the Server Monitor window.

10. Go on to Section 5.

5   Connecting the ICS-2000 to the Chromeleon PC

The ICS-2000 rear panel provides a USB receptacle for connecting the ICS-2000 to a USB port on the Chromeleon PC. The rear panel also provides two USB ports for connecting other Dionex USB-compliant modules to the system.

IMPORTANT | **Do not turn on the power to the ICS-2000 or other USB module(s) until after you connect the USB cable.**

Before connecting the USB cable, verify that Chromeleon is installed. If not, Windows will be unable to identify the new USB device when the power is turned on. See Section 3 to install Chromeleon.

5.1   Connecting the ICS-2000 to the PC

1. Locate the USB cable (P/N 960779) in the ICS-2000 Ship Kit (P/N 064375).

2. Plug the cable's "A" connector into a USB port on the Chromeleon PC and plug the cable's "B" connector into the USB receptacle (labeled **FROM PC**) on the ICS-2000 rear panel (see Figure 9).
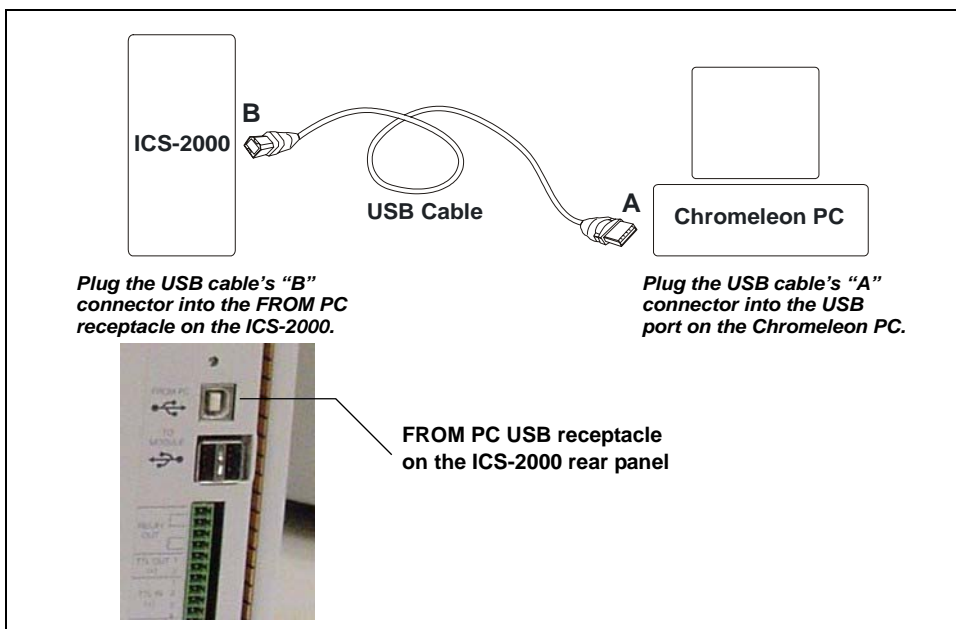
Figure 9. Example Connections: One ICS-2000 Connected to the Computer

5.2   Connecting Additional USB Devices

The ICS-2000 provides two USB ports for connecting additional Dionex USB-compliant modules to the system.

To connect an additional USB module, plug the "A" connector on a USB cable into an "A" port (labeled **TO MODULE**) on the ICS-2000 rear panel and plug the cable's "B" connector into the USB receptacle on the USB module (see Figure 10).
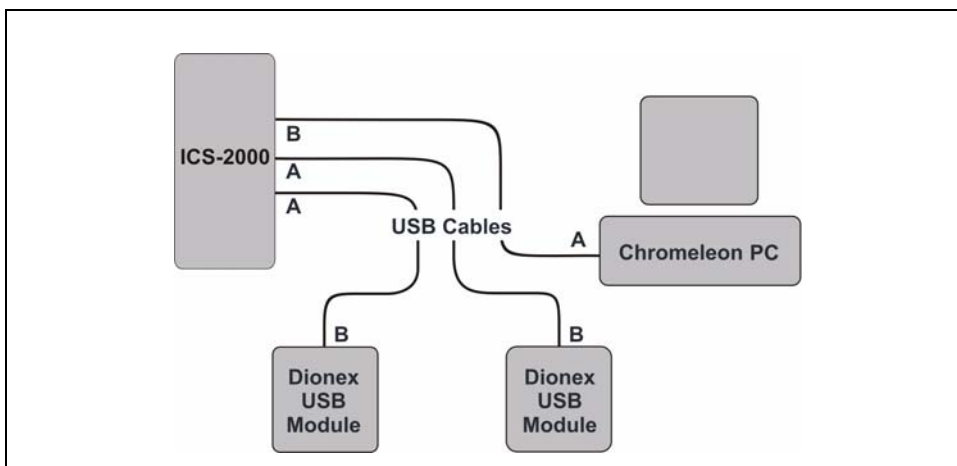
*Figure 10. Example Connections: Two Dionex USB Modules
Connected to the ICS-2000*

NOTE   If the number of USB devices in the system exceeds the number of available USB ports, connect the devices to the system with a USB-compliant, full-speed external hub. One or more hubs is also required if the ICS-2000 or other USB device is more than 5 meters (16 ft) from the PC. Refer to the manual provided by the hub vendor for complete installation instructions.

IMPORTANT

The USB standard limits the USB cable length to 5 meters (16 ft). Each USB device can be separated from the PC by no more than five hubs. Thus, each USB device can be located no more than 30 meters (32 yds) from the PC.

6   Connecting the Power Cord

Connect the power cord (IEC 320 C13) (ordered separately) from the main power receptacle on the rear panel to a grounded power source. The ICS-2000 power supply is auto-sensing, so no adjustment is required to select the line voltage.

SHOCK HAZARD—To avoid electrical shock, use a grounded receptacle. Do not operate the ICS-2000 or connect it to AC power mains without an earthed ground connection.

The power supply cord is used as the main disconnect device. Make sure the socket-outlet is located near the ICS-2000 and is easily accessible.

Operation at AC input levels outside of the specified operating voltage range may damage the ICS-2000.

DANGER D'ÉLECTROCUTION—Pour éviter toute électrocution, il faut utiliser une prise de courant avec prise de terre. Ne l'utilisez pas et ne le branchez pas au secteur C.A. sans utiliser de branchement mis à la terre.

Le cordon d'alimentation principal est utilisé comme dispositif principal de débranchement. Veillez à ce que la prise de base soit située/installée près du module et facilement accessible.

STROMSCHLAGGEFAHR—Zur Vermeidung von elektrischen Schlägen ist eine geerdete Steckdose zu verwenden. Das Gerät darf nicht ohne Erdung betrieben bzw. an Wechselstrom angeschlossen werden.

Das Netzkabel ist das wichtigste Mittel zur Stromunterbrechung. Stellen Sie sicher, daß sich die Steckdose nahe am Gerät befindet und leicht zugänglich ist.

Go on to .

7   Turning On the ICS-2000 Power

IMPORTANT
Before turning on the ICS-2000 power, verify that Chromeleon software is installed. See Section 3 for installation instructions. If Chromeleon is not installed first, Windows will be unable to identify the new USB device.

1. If it is not already on, turn on the computer power and log onto Windows 2000 or Windows XP as an administrator.

2. If the Chromeleon Server is not running (the icon on the taskbar is crossed out in red

    ), start the Server by right-clicking the icon and selecting **Start Server**. When the server starts, the

    icon changes to gray   .

3. Press the power switch on the ICS-2000 rear panel (see Figure 11) to turn on the power.

Figure 11. ICS-2000 Rear Panel

4. Windows automatically detects the new USB device. A message flashes on the screen to inform you that new hardware was found.
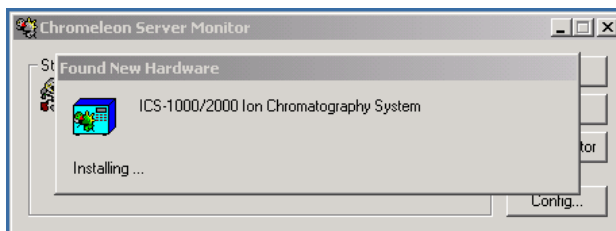
5. The Found New Hardware Wizard appears. This wizard installs the ICS-2000
    device into the Windows Device Manager. Complete the wizard by selecting
    the following options:

    *   If asked whether Windows can connect to Windows Update to search for
        software, select **No, not this time**.

    *   Select the **Install the software automatically (Recommended)** option
        (see Figure 12).
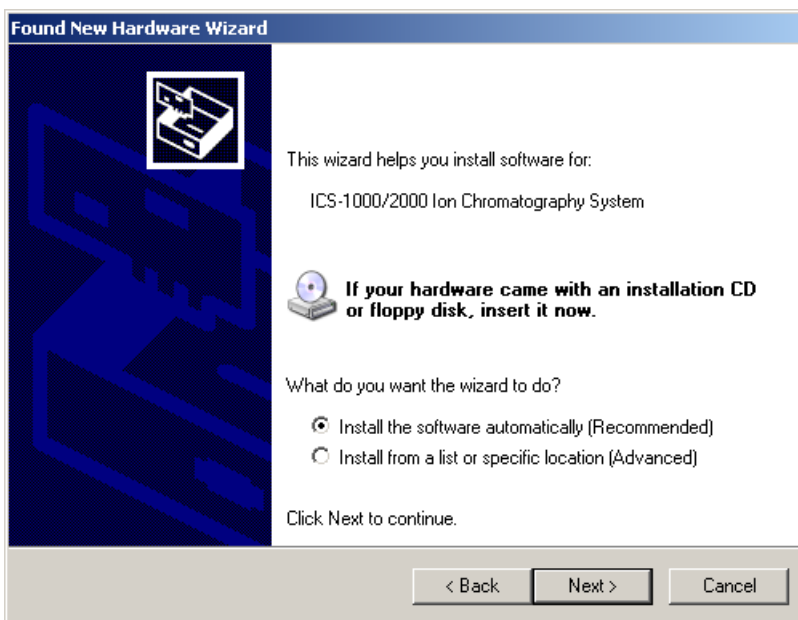
Figure 12. Windows Found New Hardware Wizard

    *   After you click **Next**, Windows installs the software.

    *   When the wizard finishes installing the software, click **Finish**.

6. Go on to Section 8.

8   Setting Up Chromeleon

NOTE **This section provides brief instructions for setting up Chromeleon. For details about any of these steps, refer to the Chromeleon user's guide or online Help.**

8.1   Assigning the ICS-2000 to a Timebase

After the ICS-2000 power is turned on and the Windows Found New Hardware Wizard is finished, the Chromeleon USB Auto Configuration Wizard automatically appears. The wizard presents two options (see Figure 13):
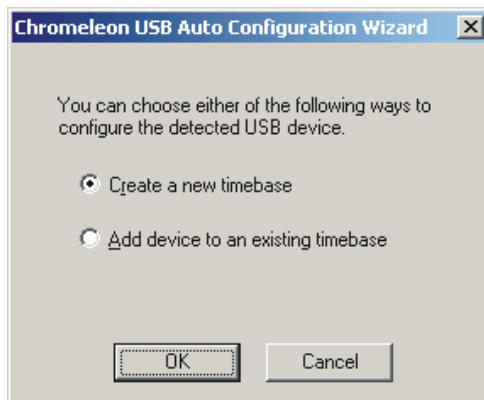
Figure 13. Chromeleon USB Auto Configuration Wizard: Page 1

To create a new timebase:

1. Select the **Create a new timebase** option and click **OK**.

    Page 2 of the wizard appears (see <u>Figure 14</u>).
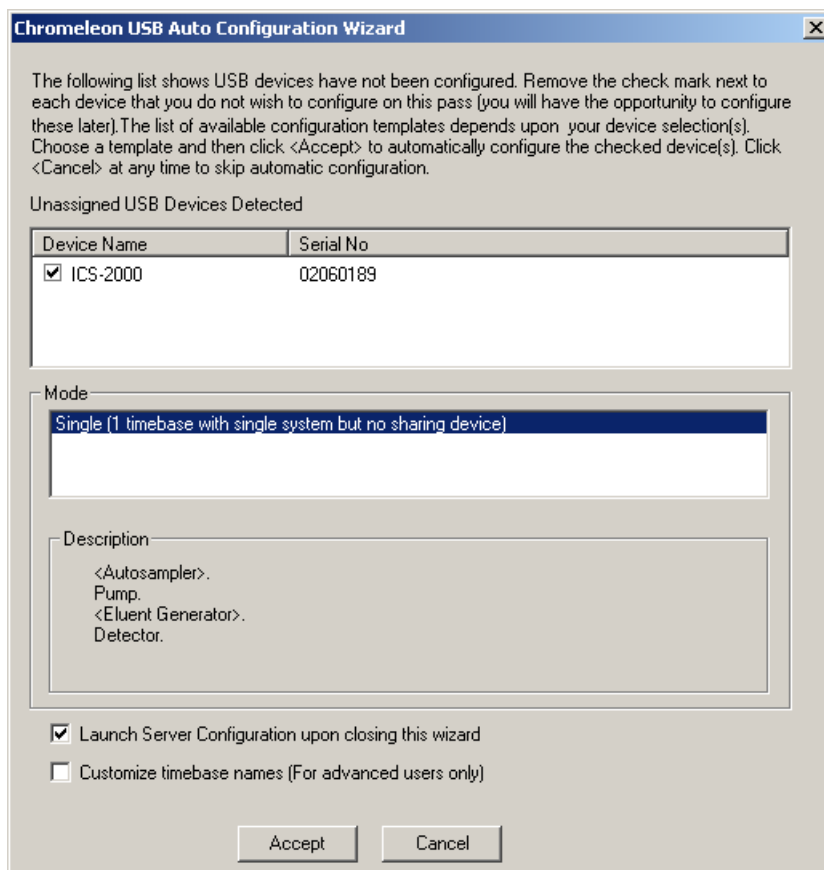
Figure 14. Chromeleon USB Auto Configuration Wizard: Page 2

2. Review the names displayed in the **Unassigned USB Devices Detected** window. If the list includes the name of a device that you do not want to configure now, clear the check mark before the device name.

    If you are installing more than one ICS-2000, you can verify the serial numbers for each by checking the label on the component panel. The serial number is also shown on the **INFORMATION** touch screen page.

3. In the **Mode** window, select a pre-defined configuration template for the new timebase. Typically for the ICS-2000, one configuration is available: **Single (1 timebase with single system but no sharing device)**. The **Description** box lists the devices included in the mode. Devices in brackets are optional.

4. Select the **Launch Server Configuration upon closing this wizard** check box.

    The check box is disabled if the Server Configuration program is already running.

5. Click **Accept** to create a new timebase.

    The Server Configuration automatically starts running when you close the wizard. If the Server Configuration was already running, it is updated with the new configuration information.

To add an unassigned USB device to an existing timebase:

1. In the Chromeleon USB Auto Configuration Wizard, select the **Add device to an existing timebase** option and click **OK**.

    This launches the Server Configuration program.

2. Select an existing timebase to which the ICS-2000 can be assigned.

3. When you finish making changes here, click **OK** to close the dialog box.

    The Server Configuration program window appears.

To verify the configuration:

1. In the Server Configuration program, click the + icon next to the server name to expand the folder. The timebase you created is displayed (see Figure 15).
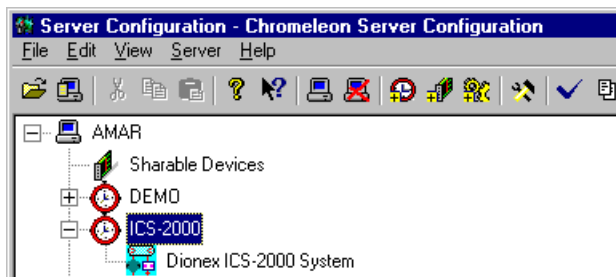
Figure 15. Server Configuration with ICS-2000 Timebase

2. To verify that the ICS-2000 is correctly connected to the timebase, double-click its name under the timebase. Click **Yes** if the following message appears: "Communication to the device will be stopped…Do you want to continue?"

3. The ICS-2000 System dialog box opens (see Figure 16). The **General** page shows the Device Name (**Pump_ECD**), the Mode (**Live**), and the Module Serial No.
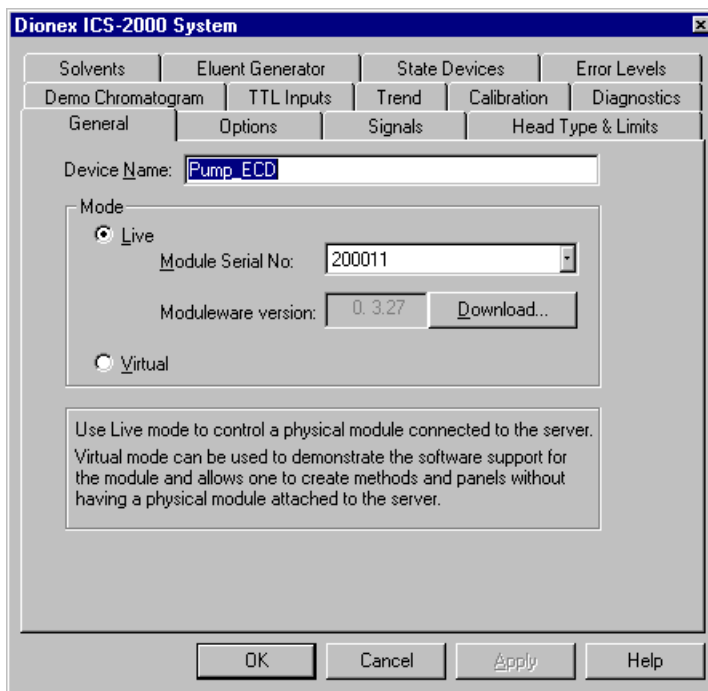
Figure 16. ICS-2000 System Properties

4. Close the dialog box and then save the configuration (select **File>Save Installation**).

5. If you are going to add one or more DX-LAN devices to the timebase, go on to Section 8.2. Otherwise, exit the Server Configuration program and then go on to Section 9.

8.2   Assigning DX-LAN Devices to the Timebase (Optional)

Follow the instructions in this section if you are adding one or more
devices to the timebase that are connected to the PC through a DX-LAN
interface (not through USB connections).

1. Follow the instructions in *Installing the Chromeleon
    Chromatography Management System with a Dionex Ion
    Chromatography (IC)* (Document No. 031883) to add the DX-LAN
    card to the server configuration as a sharable device.

2. Select the timebase that was created for the ICS-2000 (see Figure 17);

    then, click the **Add device** icon ⬚ on the toolbar (or select
    Edit>Add Device).
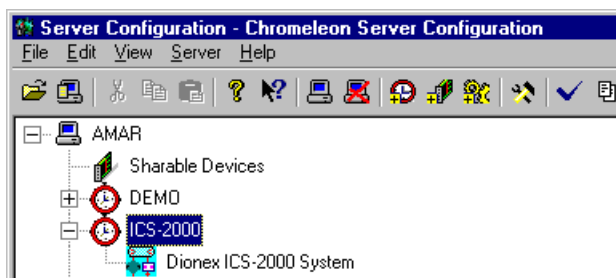
Figure 17. Example: ICS-2000 Timebase

The Add device to timebase dialog box appears.

3. Under **Manufacturers**, select **Dionex: IC Modules** and then select the device from the **Devices** list.
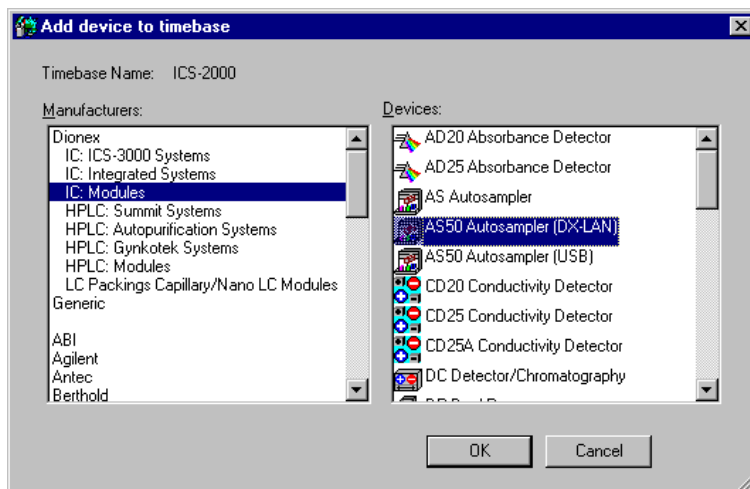
Figure 18. Add Device to Timebase Dialog Box

4. Click **OK**. A configuration properties dialog box for the device appears. Figure 19 shows an example of the properties for an AS50 Autosampler.
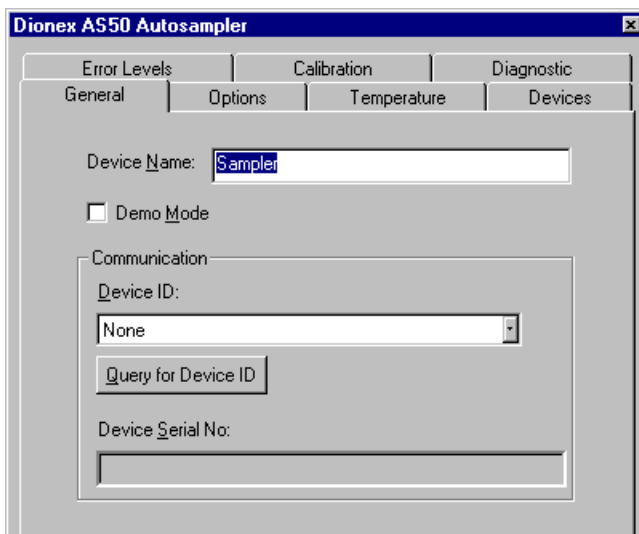
Figure 19. AS50 Configuration Properties

5. On the **General** tab page, clear the **Demo Mode** check box if it is currently selected, and then select the DX-LAN Device ID number. **Note**: Devices display their DX-LAN ID numbers when their power is turned on.

6. Click **OK** to close the dialog box.

7. Save the configuration (select **File>Save Installation**).

8. Exit the Server Configuration program.

9. Go on to .

9   Installing and Plumbing the Columns and Suppressor

NOTE   **This section provides brief installation and plumbing instructions for the columns and suppressor. Before beginning the installation, refer to the column and suppressor manuals for detailed start-up and installation instructions. The manuals are provided on the Dionex Reference Library CD-ROM (P/N 053891).**

Before beginning:

• Remove the guard column, separator column, and suppressor from their boxes.

• Remove the fitting plugs from the ends of each column and from all ports on the suppressor.

• Discard any tubing temporarily connecting the suppressor ports.

9.1   Setting Up the Column Heater

1. Cut off the two shipping ties from the column heater and remove them (see Figure 20).

2. Loosen the two thumbscrews on the heater cover (they remain attached to the cover).

3. Pull the heater cover straight out to remove it.
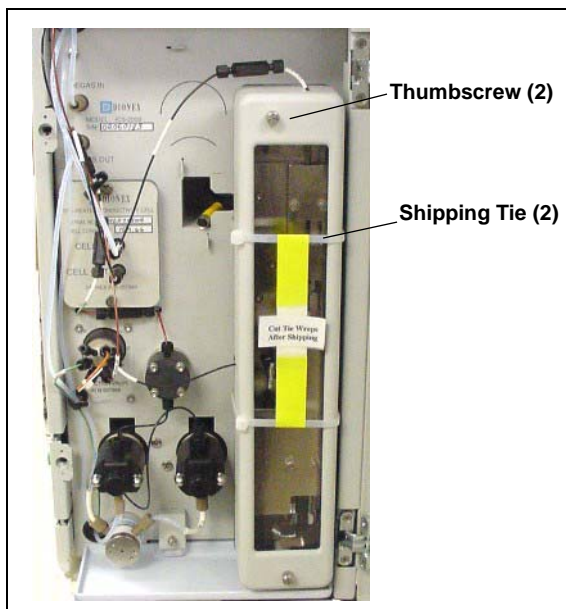
Figure 20. ICS-2000 Column Heater Setup

4. Unscrew the six thumbscrews on the top metal plate (see Figure 21) and remove the plate.

5. Go on to Section 9.2.

Thumbscrew (6)
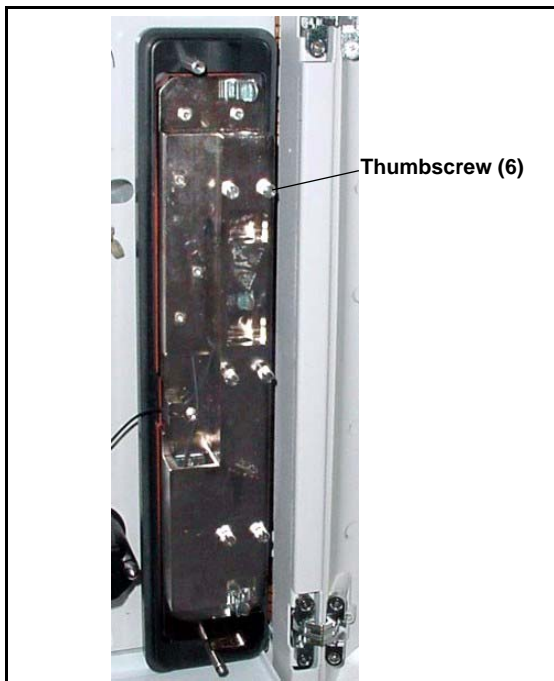
Figure 21. ICS-2000 Column Heater Cover Removed

9.2   Installing the Columns

1. Remove the coupler connecting **GUARD IN** and **GUARD OUT**.

2. Connect **GUARD IN** to the guard column inlet. Check the arrow on the column label; it should point down (flow away from the injection valve).

3. Connect **GUARD OUT** to the guard column outlet.

4. Push the guard column onto the back column clip.

5. Remove the coupler connecting **COL IN** and **COL OUT**.

6. Connect **COL IN** to the separator column inlet. Connect **COL OUT** to the separator column outlet. Check the arrow on the column label. It should point up (flow toward the cell).

7. Push the separator column onto the front column clips.

8. Replace the top metal plate on the column heater.

9.3   Installing the Suppressor

1. Locate the suppressor mounting tabs on the component panel (see Figure 22). Reach into the opening between the tabs and pull the yellow connector and attached cable slightly out of the opening.

2. Connect this cable to the cable from the suppressor (align the pins on the two connectors and push them together).

1 **Suppressor Mounting Tabs**

2 **Suppressor Cable Connector**

3 **Guideline for AES**

4 **Guideline for SRS**

Figure 22

*Suppressor Mounting Tabs
and Guidelines*

3. Orient the suppressor with the **REGEN OUT** fitting on top and the cable to the right.

4. Feed the cable into the opening in the component panel.

5. Align the top of the suppressor with the guideline printed on the component panel (see Figure 22) and align the slots on the rear of the suppressor with the tabs on the panel.

6. Press the suppressor onto the tabs and then slide it down to lock it in place. Pull slightly on the center of the suppressor to verify that it is securely fastened. Figure 23 shows an SRS suppressor installed on the component panel.

7. Remove the coupler connecting **ELUENT IN** and **ELUENT OUT** and connect these lines to the corresponding ports on the suppressor.

Figure 23. Suppressor Installed (SRS Shown)

8. Remove the fitting plug from **REGEN IN** and connect it to the **REGEN IN** port on the suppressor. **Do not connect the REGEN OUT port until after completing the eluent generator setup** (Section 14).

9. Replace the cover on the column heater, making sure the **GUARD IN** line is aligned with the slot on the side of the heater cover.

10. Go on to Section 10.

10   Connecting the Waste Lines

The ICS-2000 has the following waste lines:

*   **PUMP WASTE** carries prime waste from the pump.

*   **TO WASTE OUT** carries sample overflow from the injection valve.

*   **WASTE, GAS SEPARATOR** carries system waste from the suppressor.

1. Untape the coiled waste lines from the rear panel. Place the ends of the **PUMP WASTE** and **TO WASTE OUT** lines into a waste container.

2. Direct the **WASTE, GAS SEPARATOR** line from the top of the ICS-2000 to the rear panel. Snap the line onto one of the tubing clips on the rear panel. Connect the line to the gas separator waste tube (see Section 10.1).

> **NOTE**   **To prevent waste from siphoning back into the system, check the lines periodically to be sure they are not bent, pinched, or elevated at any point.**

10.1   Installing the Gas Separator Waste Tube

1. Locate the gas separator waste tube assembly in the ICS-2000 Ship Kit (P/N 064375).

2. Connect the **WASTE, GAS SEPARATOR** line from the suppressor to one of the 3-mm (1/8-in) ID white Teflon lines on the gas separator waste tube assembly (see Figure 24).
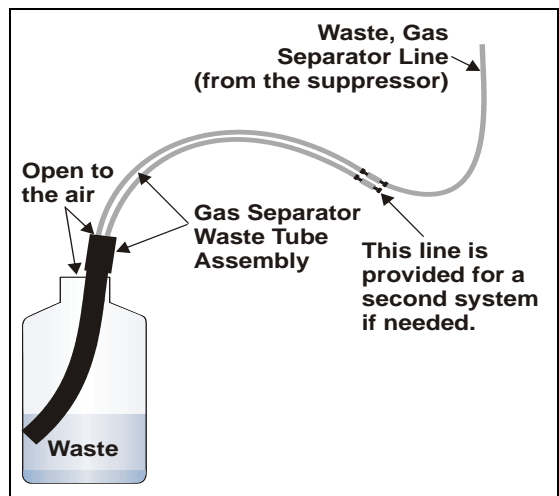

Figure 24. Gas Separator Waste Tube Installation

3. Place the gas separator waste tube assembly into the waste container. Make sure the tubing junction (where the white Teflon tubing meets the black polyethylene tubing) is above the top of the container and

that the gas separator waste tube and the waste container are open to the atmosphere.

4. Go on to Section 11.

CAUTION

DO NOT CAP THE WASTE CONTAINER: The ICS-2000, Atlas Electrolytic Suppressor, and Self-Regenerating Suppressor (SRS) use an electrolytic process that results in the production of small amounts of oxygen or hydrogen gas. To ensure that the gas is not trapped in a closed container and allowed to concentrate, install a 1.3-cm (0.52-in) ID black gas separator waste tube (P/N 045460) in an uncapped waste container. Connect the Waste, Gas Separator line to the waste tube (see Figure 24).

MISE EN GARDE

NE FERMEZ PAS LE CONTENEUR DE GAZ RÉSIDUEL: Le ICS-2000, le Atlas Electrolytic Suppressor, et le Self-Regenerating Suppressor (SRS) travaillent avec un proces d´électrolyse, qui produit des petites quantités de gaz d´oxygène ou d´hydrogène. Afin de garantir que le gaz ne soit pas enfermé dans un conteneur fermé et puisse s´y concentrer, connectez un tube noir à gaz résiduel (diamètre intérieur = 1,3 cm; n° de commande 045460) à un conteneur ouvert (non fermé). Connectez le conteneur résiduel au tube résiduel/gaz séparateur (désigné: « Waste, Gas Separator»).

VORSICHT

VERSCHLIESSEN SIE DEN ABFALLBEHÄLTER NICHT: Der ICS-2000, Atlas Electrolytic Suppressor und Self-Regenerating Suppressor (SRS) verwenden einen Elektrolyseprozess, wodurch kleine Mengen an Sauerstoff und Wasserstoff entstehen. Führen Sie einen schwarzen Gasabscheiderschlauch (ID = 1,3 cm; Bestell-Nr. 045460) in einen offenen (unverschlossenen) Abfallbehälter, damit sich das Gas nicht in einem geschlossenen Behälter sammelt und aufkonzentriert. Verbinden Sie die mit Waste, Gas Separator bezeichnete Leitung mit dem Abfallschlauch.

11   Setting Up the Eluent Reservoir

1. Rinse the eluent reservoir.

2. Fill the reservoir with ASTM filtered, Type I (18-megohm) deionized water.

3. Place the reservoir on top of the ICS-2000.

4. Install the cap and handtighten.

> **NOTE**   **The ICS-2000 does not require pressurized reservoirs. However, if eluent is manually degassed or is sensitive to contamination, Dionex recommends pressurizing the reservoir with helium or nitrogen. See <u>Section 21</u> for instructions.**

5. Go on to <u>Section 12</u>.

12   Setting the Eluent Level

After filling the reservoir, open the touch screen **HOME** page and enter the volume of liquid in the reservoir in the **Eluent Level** field (see Figure 25), or enter the volume in the **Eluent Bottle** field on the Chromeleon Control panel (see Figure 26). The ICS-2000 determines the eluent usage, by monitoring the flow rate and the length of time the pump is on, and updates the field as the eluent is used up. A warning is displayed if the level falls below 200 mL. The warning is repeated at 100 mL and at 0 mL.

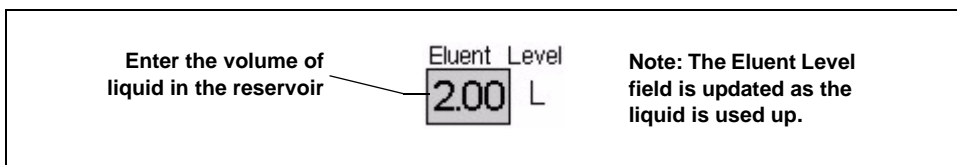| IMPORTANT	**In order for the eluent level displayed on the screen to be accurate, the level must be entered by the user when the reservoir is filled. The ICS-2000 does not automatically detect when the reservoir is filled, nor when it is empty.**

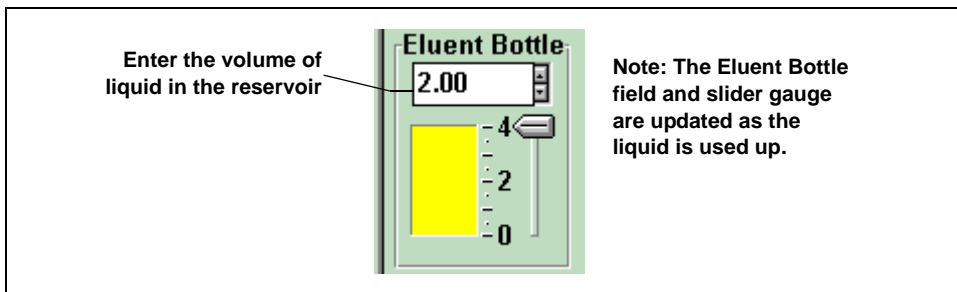
Figure 25. Home Page: Setting the Eluent Level

Figure 26. Chromeleon Control Panel: Setting the Eluent Level

Go on to Section 13.

13   Priming the Pump

1. Verify that the eluent reservoir is filled, the reservoir cap is installed and handtightened, and the liquid line from the ICS-2000 to the reservoir cap is connected (see <u>Section 11</u>).

2. Verify that the waste lines are directed to a waste container.

3. The priming procedure consists of two parts:

    •   Priming the eluent lines with a syringe (see <u>Section 13.1</u>). Perform this procedure at initial installation, after changing eluents, or when eluent lines are empty.

    •   Priming the pump heads with the **Prime** button (see <u>Section 13.2</u>). Perform this procedure after the eluent lines are primed.

13.1   Priming the Eluent Lines with a Syringe

> **NOTE** **Prime the eluent lines after initial installation, after changing eluents, or when eluent lines are empty.**

1. Verify that the pump is turned off.

2. Connect a 10 mL syringe (P/N 054578) to the port in the priming valve on the primary pump head (see Figure 27).
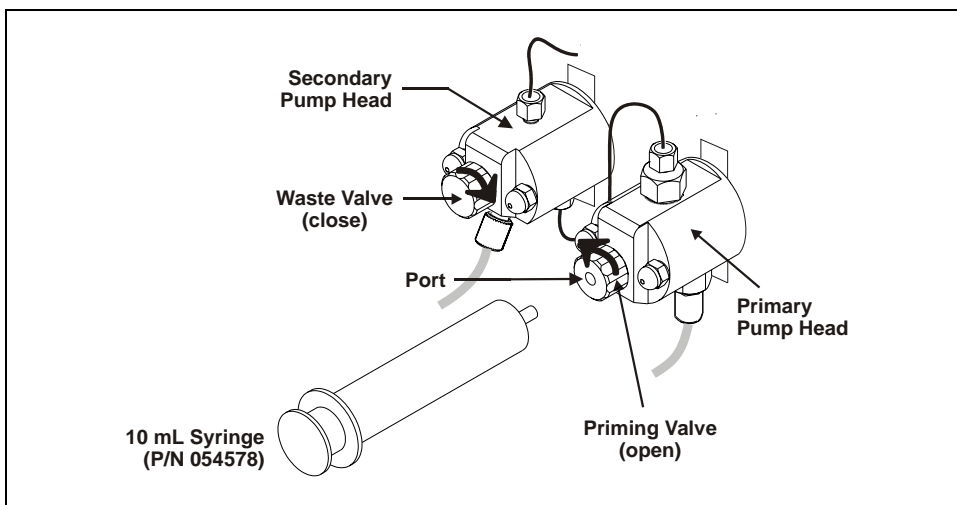

Figure 27. Priming the Eluent Lines

3. Open the priming valve by turning it one-quarter to one-half turn counterclockwise.

4. On the ICS-2000 touch screen, touch the page name (for example, HOME ▼) in the bottom right corner to open a menu of pages.

5. Touch **PUMP** to open the touch screen **PUMP** page (see <u>Figure 28</u>). Under **Eluent Valve**, touch the **Open** button.
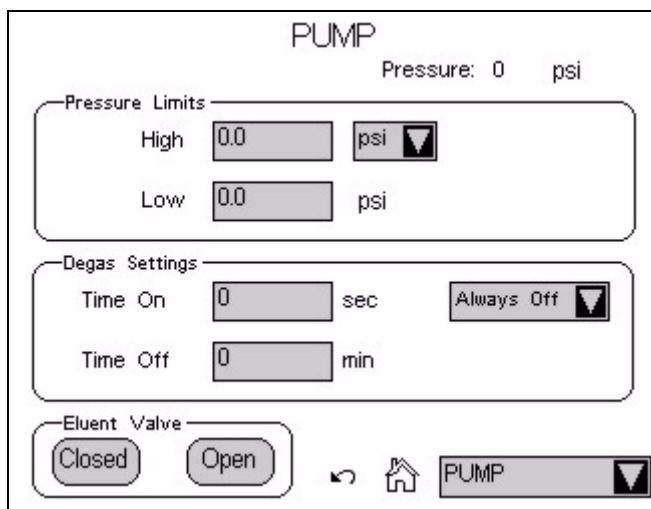
Figure 28. Pump Page: Eluent Valve Open

6. Draw the syringe back to begin pulling eluent through the flow path. It may take several syringe draws to remove all air or previous eluent from the tubing. Draw out a minimum of 20 mL of eluent to ensure that the vacuum degas assembly is primed.

7. After priming the lines thoroughly, close the priming valve. **Do not overtighten the priming valve.**

8. Touch **Eluent Valve Closed** on the touch screen **PUMP** page.

13.2 Priming the Pump Heads with the Prime Button

> **NOTE Perform this procedure after priming the eluent lines (see Section 13.1).**

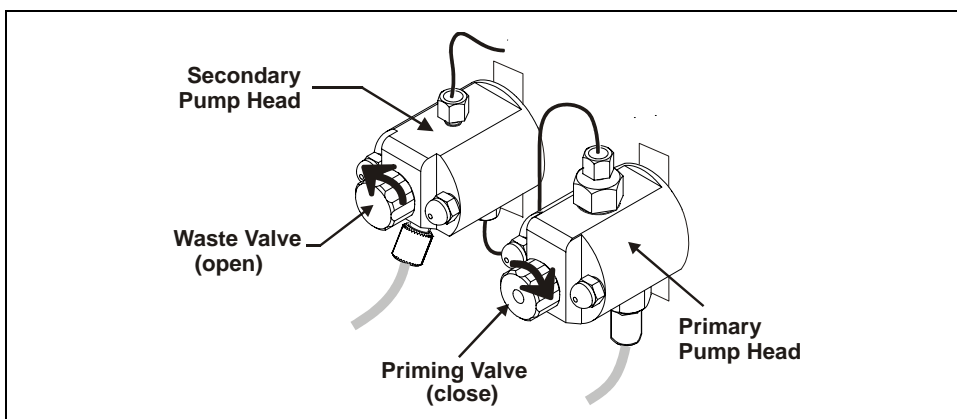1. Check that the priming valve on the primary pump head is closed (see Figure 29).

Figure 29. Priming the Pump

2. Open the waste valve on the secondary pump head by turning the knob one-quarter to one-half turn counterclockwise (see Figure 29). Opening the valve directs the eluent flow path to waste and eliminates backpressure.

3. Touch **Prime** on the ICS-2000 touch screen **HOME** page. Confirm that the waste valve is open by pressing **OK** when the reminder message appears. The pump will begin pumping at approximately 3 mL/min.

4. Continue priming the ICS-2000 until no air bubbles are exiting the pump waste line.

5. Press **Pump Off**.

6. Close the waste valve. **Do not overtighten.** The pump is now ready for operation.

7. Go on to Section 14.

> **NOTE If the two standard priming procedures described above are unsuccessful, prime the pump with isopropyl alcohol. See "Chapter 5,**

> Troubleshooting," in the ICS-2000 operator's manual for instructions.

14   Setting Up the Eluent Generator

Before Beginning

Remove the EluGen cartridge (EGC) and the other items to be installed from their shipping containers. Depending on the type of eluent to be generated, the other items may include a Continuously Regenerated Trap Column (CR-TC), an EPM Electrolytic pH Modifier, and/or an EGC CO_3 Mixer.

> **NOTE   The EGC degas assembly is installed inside the EGC holder at the factory.**

⚠ **CAUTION**

The EluGen cartridge contains one of the following: a corrosive base (KOH, LiOH, or NaOH), a corrosive acid (MSA), or a concentrated K_2CO_3 solution. Wear protective eyewear and gloves when handling the cartridge.

⚠ **MISE EN GARDE**

La cartouche d'EluGen contient un de ce qui suit: une base corrosive (KOH, LiOH, ou NaOH), un acide corrosif (MSA), ou une solution concentrée de K_2CO_3. Porter des lunettes et des gants protectives en manipulant la cartouche.

⚠ **VORSICHT**

Die EluGen-Kassette enthält eine korrodierende Base (KOH, LiOH oder NaOH), eine korrodierende Säure (MSA) oder eine konzentrierte K_2CO_3-Lösung. Tragen Sie daher beim Umgang mit Kassette eine Schutzbrille und Handschuhe.

Refer to the EluGen cartridge, CR-TC, and EPM manuals for the optimal operating conditions for your application. The manuals are provided on the Dionex Reference Library CD-ROM (P/N 053891).

14.1   Eluent Generator Setup for KOH, LiOH, MSA, and NaOH Eluents

Follow the instructions in this section if you are installing a KOH, LiOH, MSA, or NaOH EluGen cartridge and a CR-TC.

- If you are installing a K_2CO_3 cartridge, an EPM, and an EGC CO_3 Mixer (for generating carbonate/bicarbonate eluent), go to <u>Section 14.2</u>.

- If you are installing a K_2CO_3 cartridge and an EGC CO_3 Mixer (for generating carbonate eluent), go to <u>Section 14.3</u>.

Overview

The eluent generator setup procedure for KOH, LiOH, MSA, or NaOH eluents consists of the following main steps:

- Installing the CR-TC.

- Installing the EluGen cartridge.

- Connecting the EluGen cartridge vent line.

- Recording the EluGen cartridge serial number in Chromeleon.

- Conditioning the EluGen cartridge.

- Hydrating the CR-TC.

- Completing the eluent generator setup.

Items Required to Complete the Setup Procedure

In addition to the EluGen cartridge and the CR-TC, you will need the following items to complete the eluent generator setup.

Item	P/N	Use To
Yellow 0.5 mL/min, 7 MPa (1000 psi) backpressure coil (supplied in the ICS-2000 Ship Kit (P/N 064375))	053765	Provide backpressure during setup procedures.
EluGen Cartridge Vent Line Tubing Kit (supplied with the cartridge)	063092	Vent the cartridge during operation.
10-32 to 1/4-28 coupler (supplied in the ICS-2000 Ship Kit)	042806	Temporary connection during setup procedures.
Temporary waste container (beaker, bottle, etc.) (not supplied)	n/a	Collect waste during setup procedures.
10-32 fittings 10-32 ferrules	043275 043276	Complete the connections
1/8-in fittings 1/8-in ferrules	052267 048949	Complete the connections

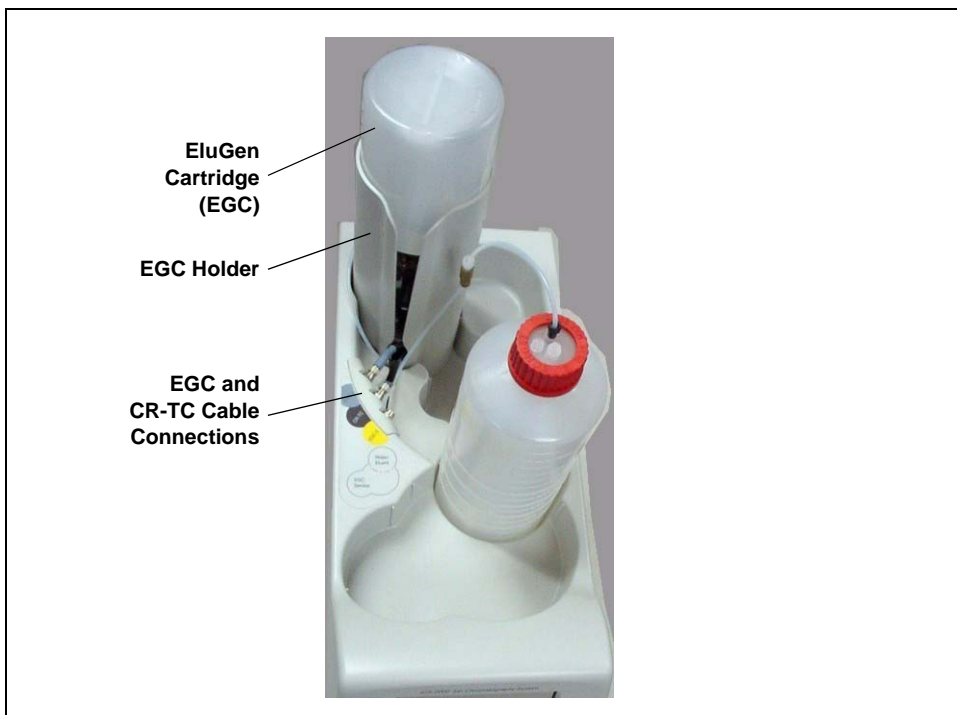Figure 30 illustrates the ICS-2000 after the EluGen cartridge is installed.

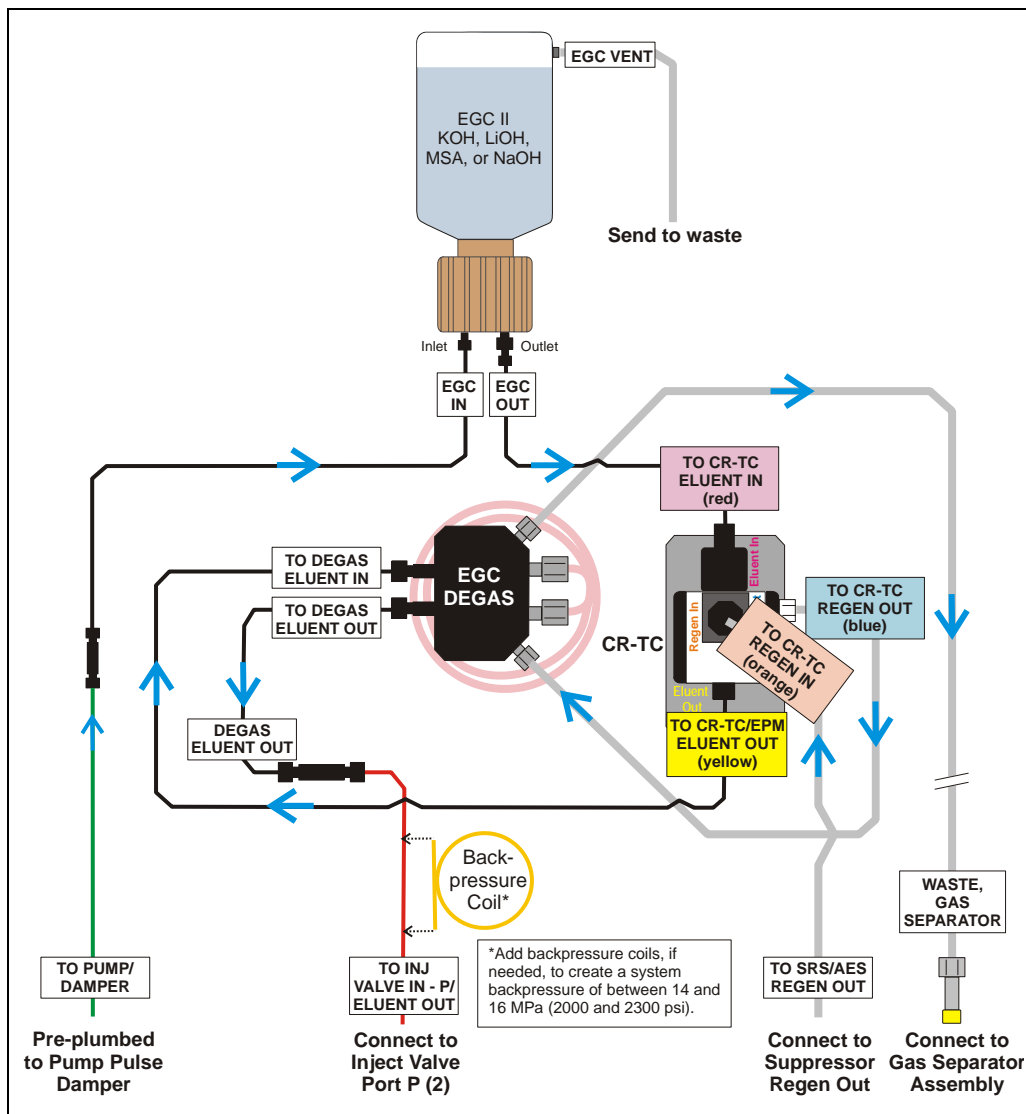*Figure 30. ICS-2000 with an EluGen Cartridge Installed (Top View)*

Figure 31 illustrates the liquid flow path through the eluent generator components after all setup steps are complete and the eluent generator is ready for operation.

Figure 31. Eluent Generator Flow Schematic with CR-TC:
Use for Generating KOH, LiOH, MSA, or NaOH Eluent

Installing the CR-TC

1. Tilt the cartridge holder to view the bottom of the holder and brace the holder against the back corner of the ICS-2000 (see Figure 32).

Metal ball stud for mounting the CR-TC

Figure 32. Cartridge Holder (tilted to view the bottom)

2. Before installing the CR-TC, note the metal ball stud inside the bottom of the cartridge holder (see Figure 32) and the bracket on the CR-TC mounting plate (see Figure 33). These are used to mount the CR-TC inside the holder after it is plumbed.

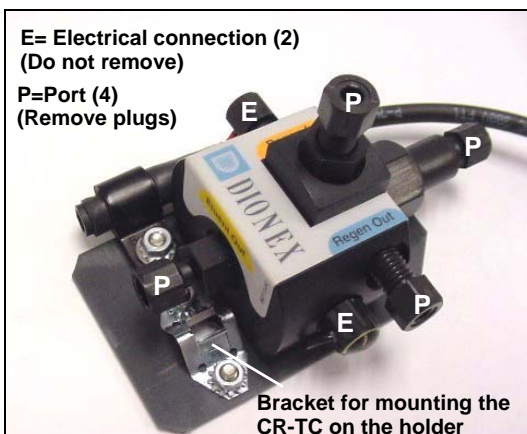**E= Electrical connection (2)
(Do not remove)**

**P=Port (4)
(Remove plugs)**

Bracket for mounting the CR-TC on the holder

Figure 33. CR-TC

3. Remove the plugs from the four ports, labeled "P" in Figure 33. **Do not remove the two electrical connections, labeled "E" in the figure**.

4. With the CR-TC oriented as shown in <u>Figure 34</u>, connect each line to the corresponding port on the CR-TC.

    NOTE **To help retain the fittings and ferrules on the lines, remove the coupler from each line just before connecting the line to a port.**
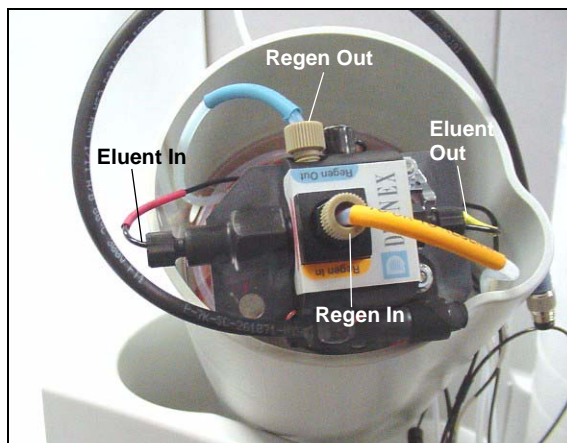

Figure 34. Plumbed CR-TC

5. Check that none of the lines are caught under the CR-TC and then push the CR-TC onto the metal stud inside the EGC holder (see <u>Figure 35</u>). Push down until the CR-TC snaps into place.
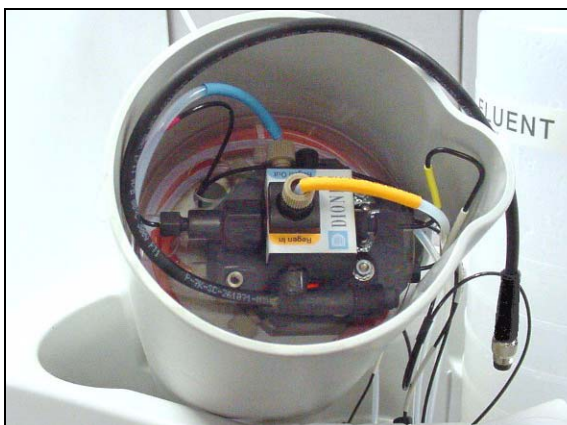

Figure 35. CR-TC Installed in Holder

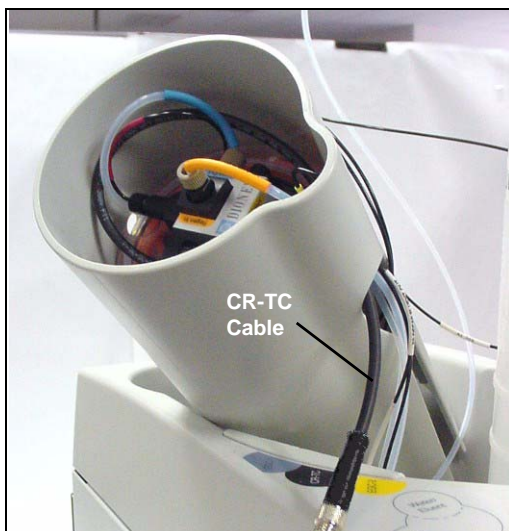6. Feed the CR-TC cable through the slot on the side of the EGC holder (see Figure 36).

Figure 36. Installing the CR-TC

7. Turn the EGC holder right-side up and set it back into position.

Installing the EluGen Cartridge

1. Orient the EluGen cartridge with the fittings facing up and remove the plugs from the EluGen cartridge **INLET** and **OUTLET** ports (see Figure 37).
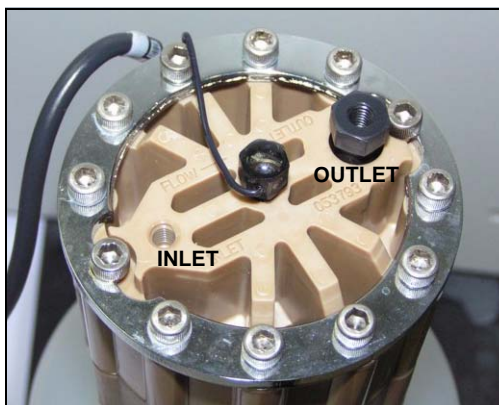

Figure 37. EluGen Cartridge Inlet and Outlet Ports

2. Set the EluGen cartridge in the service area on top of the ICS-2000 and orient it with the cable toward the EGC holder (see Figure 38).
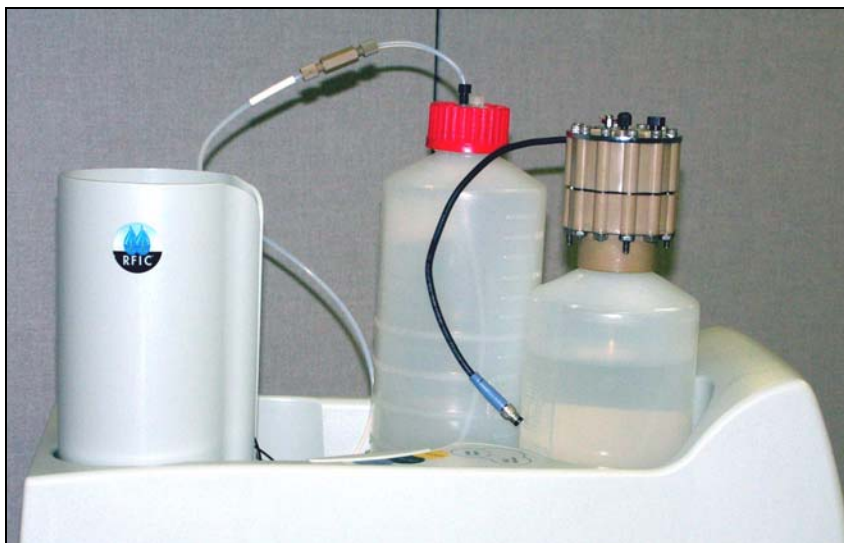

Figure 38. EluGen Cartridge in Service Area

3. Pull the coiled black **EGC IN** and **EGC OUT** lines out slightly from the cartridge holder.

4. Disconnect the **EGC IN** line from the union that connects it to the **EGC OUT** line.

5. Connect **EGC IN** to the EGC **INLET** port (see Figure 39).
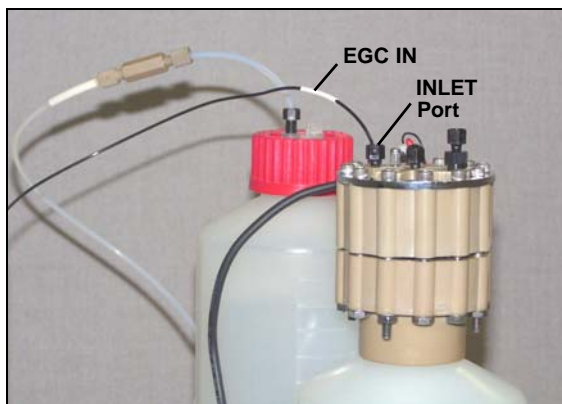

Figure 39. EGC Inlet Port Connections

6. Locate the yellow 0.5 mL/min, 7 MPa (1000 psi) backpressure coil (P/N 053765) in the ICS-2000 Ship Kit (P/N 064375).

7. Connect one end of this coil to the EGC **OUTLET** port (see Figure 40). Leave the other end of the coil unconnected.
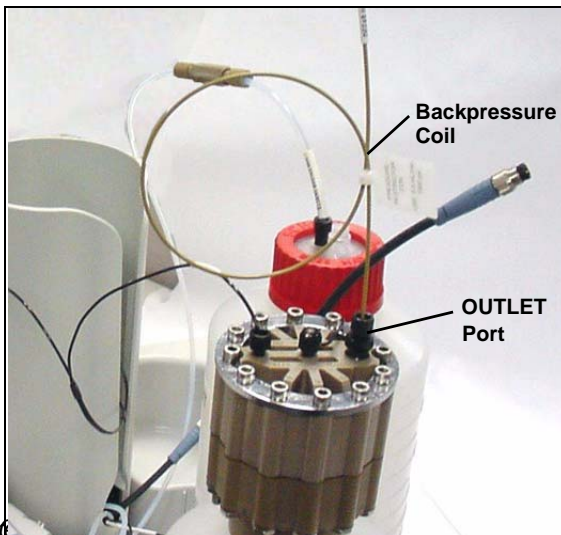

Figure 40. EGC Outlet Connection for Conditioning the EGC

NOTE **The backpressure coil connection is temporary; it is required only during the EluGen cartridge conditioning procedure described in "Conditioning the EluGen Cartridge" on page 2-49.**

8. Turn the EluGen cartridge over (with the fittings facing down). **Shake the EluGen cartridge vigorously, and tap it with the palm of your hand 10 to 15 times. Check that all bubbles trapped in the eluent generation chamber are dislodged.**

⚠ **CAUTION**

The EluGen cartridge contains one of the following: a corrosive base (KOH, LiOH, or NaOH), a corrosive acid (MSA), or a concentrated K_2CO_3 solution. Wear protective eyewear and gloves when handling the cartridge.

⚠ **MISE EN GARDE**

La cartouche d'EluGen contient un de ce qui suit: une base corrosive (KOH, LiOH, ou NaOH), un acide corrosif (MSA), ou une solution concentrée de K_2CO_3. Porter des lunettes et des gants protectives en manipulant la cartouche.

⚠ **VORSICHT**

Die EluGen-Kassette enthält eine korrodierende Base (KOH, LiOH oder NaOH), eine korrodierende Säure (MSA) oder eine konzentrierte K_2CO_3-Lösung. Tragen Sie daher beim Umgang mit Kassette eine Schutzbrille und Handschuhe.

9. Slide the EluGen cartridge down into the holder until it stops. Make sure the cable and backpressure coil remain out of the holder (see Figure 41).

   NOTE **To avoid crimping the lines inside the holder, do not twist the cartridge when you slide it into the holder. The lines are designed to coil inside the holder.**

Figure 41. Installing the EluGen Cartridge in the Holder

10. Remove the plug from the **EGC-1** connector on top of the ICS-2000.

11. Orient the cartridge's blue 4-pin electrical cable connector as shown in Figure 42. Push it onto the **EGC-1** connector on the ICS-2000. Twist the ring on the cable connector fingertight to secure it.

Figure 42. Connecting the EluGen Cartridge Cable

Connecting the Vent Line

1. Locate the vent line tubing kit (P/N 063092) supplied with the EluGen cartridge. Slide the label onto one end of the tubing and then push the barbed luer lock onto the tubing.

2. Unscrew and remove the plug from the vent opening on the side of the EluGen cartridge (see Figure 43).

Vent Plug (remove)

Figure 43. EluGen Cartridge Vent Plug

3. Screw the luer adapter onto the vent opening. Remove the cap on the luer adapter by twisting. **Save the cap.**

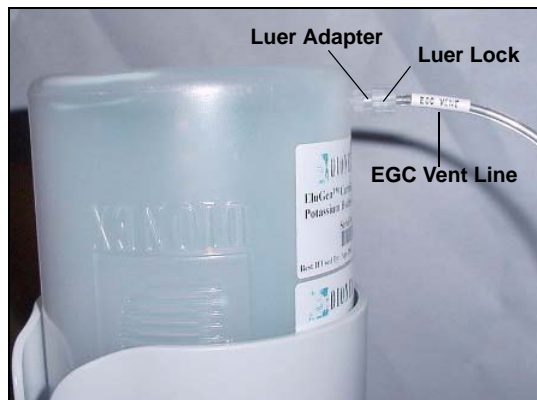4. Twist the luer lock and EluGen cartridge vent line into the luer adapter (see Figure 44).

Figure 44. Installing the EluGen Cartridge Vent Line

> **NOTE**   **To prevent leaks from the EluGen cartridge, always replace the luer adapter cap before moving the EluGen cartridge.**

5. Direct the EluGen cartridge vent line to the rear of the ICS-2000 and snap it onto one of the tubing clips on the rear panel.

6. Direct the vent line to the waste container and insert it down into the gas separator waste tube about 10 to 15 cm (4 to 6 in).

Recording the EluGen Cartridge Serial Number in Chromeleon

The serial number is printed on the EluGen cartridge label.

1. Open the Chromeleon Server Configuration program (select **Start > Programs** (or **All Programs**) **> Chromeleon > Server Configuration**).

2. Double-click the ICS-2000 system icon. The properties dialog box for the ICS-2000 appears.

3. Click the **Eluent Generator** tab (see Figure 45).

4. Select the **EGC-1** check box and enter the EluGen cartridge serial number.

5. Click **OK.**

Figure 45. Eluent Generator Configuration Properties Example

Conditioning the EluGen Cartridge

After completing the installation steps described in the previous sections, condition the EluGen cartridge for 30 minutes.

1. Set a temporary waste container, such as a beaker, on top of the ICS-2000 and direct the yellow backpressure coil from the EluGen cartridge **OUTLET** port to the container.

2. On the ICS-2000 touch screen **HOME** page, set the pump flow rate to **1.00 mL/min**.

3. Touch the **EGC** button on the **HOME** page to open the **ELUENT GENERATOR** page. Set the EGC concentration to **50 mM**.

4. Verify that the suppressor and CR-TC are off.

IMPORTANT
To avoid damaging the suppressor and CR-TC, always turn off the suppressor and CR-TC before conditioning the EluGen cartridge. The pump flow is on during conditioning, however, no flow reaches the suppressor or CR-TC.

5. Verify that the eluent reservoir is filled with ASTM filtered, Type 1 (18 megohm-cm) deionized water (see Section 11).

6. Turn on the pump.

7. Turn on the EluGen cartridge.

8. Run at the selected settings (1.00 mL/min at 50 mM) for 30 minutes.

9. Turn off the EluGen cartridge.

10. Turn off the pump.

11. Disconnect the EluGen cartridge cable.

12. Remove the backpressure tubing from the waste container and remove the waste container.

13. Lift the EluGen cartridge out of the holder, turn it over, and set it in the service area.

14. Disconnect the backpressure coil from the EluGen cartridge **OUTLET** port.

15. Connect the **EGC OUT** line to the **OUTLET** port (see Figure 46).

Figure 46. EGC Inlet and Outlet Connections

16. Turn over the EluGen cartridge. Check for bubbles; if necessary, shake and tap the EluGen cartridge to remove bubbles.

17. Reinstall the EluGen cartridge in the holder.

18. Do not reconnect the EluGen cartridge cable until after hydrating the CR-TC.

Hydrating the CR-TC

Always hydrate the CR-TC before initial operation. This requires running ASTM filtered, Type 1 (18 megohm-cm) deionized water through the CR-TC for 10 minutes, while bypassing the columns and suppressor.

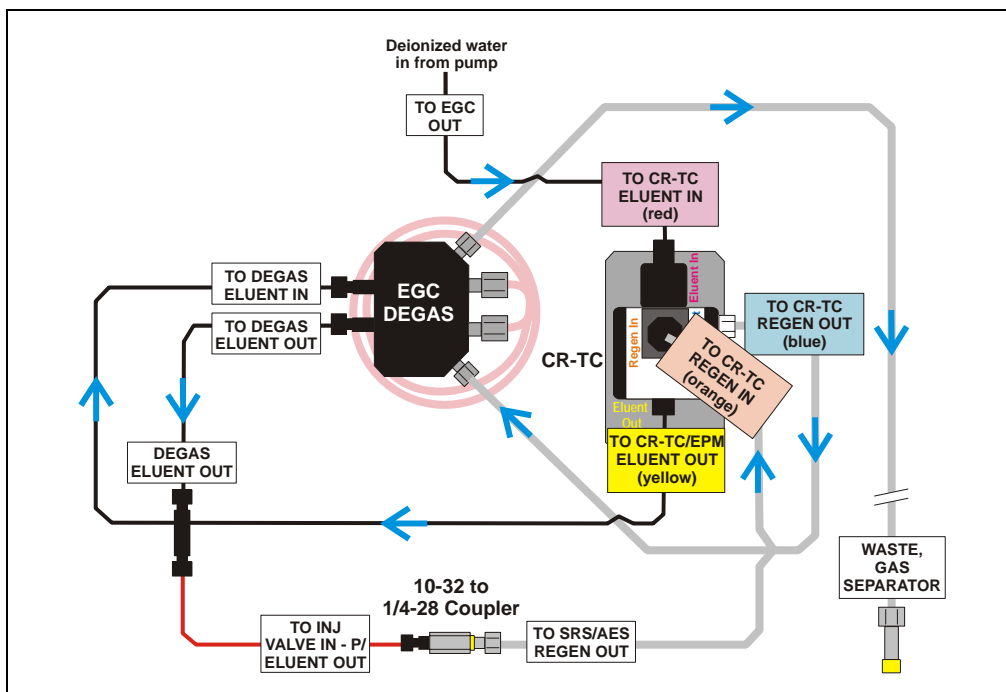Figure 47 illustrates the liquid flow path through the CR-TC during the hydration procedure.

Figure 47. CR-TC Plumbing for Hydration

1. Disconnect the **TO INJ VALVE IN - P/ELUENT OUT** line from port **P** (**2**) on the injection valve.

2. Disconnect the **TO SRS/AES REGEN OUT** line from the suppressor.

3. Use a 10-32 to 1/4-28 coupler (P/N 042806) to connect the **TO INJ VALVE IN - P/ELUENT OUT** line to the **SRS/AES REGEN OUT** line.

4. Verify that the suppressor is off.

IMPORTANT

To avoid damaging the suppressor, always turn off the suppressor before hydrating the CR-TC. The pump flow is on during conditioning, however, no flow reaches the suppressor.

5. without automatically turning onTurn on the pump and set the flow to the rate recommended for your application.

6. Pump deionized water through the CR-TC for at least 10 minutes.

7. Turn off the pump and remove the coupler.

Completing the Eluent Generator Setup

1. Reconnect the **TO SRS/AES REGEN OUT** line to the **REGEN OUT** port on the suppressor.

2. Reconnect the **TO INJ VALVE IN - P/ELUENT OUT** line to port **P** (**2**) on the injection valve.

3. Reconnect the EluGen cartridge cable.

4. Remove the plug from the **CR-TC** connector on top of the ICS-2000

5. Orient the CR-TC's black 3-pin electrical cable connector as shown in <u>Figure 42</u>. Push it onto the **CR-TC** connector on the ICS-2000. Twist the ring on the cable connector and fingertighten to secure it.
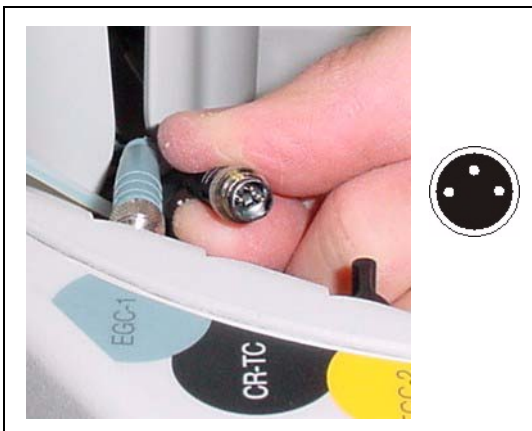

Figure 48. Connecting the CR-TC Cable

> **NOTE** **Backpressure tubing may be required between the injection valve and the EGC degas eluent outlet. The EluGen cartridge requires 14 to 16 MPa (2000 to 2300 psi) of system backpressure for removal of electrolysis gas from the eluent produced by the cartridge. See <u>Section 16.1</u> for details.**

Go on to <u>Section 15</u>.

14.2 Eluent Generator Setup for Carbonate/Bicarbonate Eluent

Follow the instructions in this section if you are installing a K_2CO_3 cartridge, an EPM, and an EGC CO_3 Mixer (for generating carbonate/bicarbonate eluent).

- If you are installing a K_2CO_3 cartridge and an EGC CO_3 Mixer (for generating carbonate eluent), go to .

- If you are installing a KOH, LiOH, MSA, or NaOH EluGen cartridge and a CR-TC, go to .

Overview

The eluent generator setup procedure for carbonate/bicarbonate eluent consists of the following main steps:

- Installing the EluGen cartridge.

- Connecting the EluGen cartridge vent line.

- Installing the EPM.

- Plumbing the EPM for conditioning.

- Recording the EluGen cartridge and the EPM serial numbers in Chromeleon.

- Conditioning the EluGen cartridge and the EPM.

- Installing the EGC CO_3 Mixer.

- Temporarily filling the EGC CO_3 Mixer with deionized water.

- Filling the EGC CO_3 Mixer with eluent of the required concentration.

- Completing the eluent generator setup.

Items Required to Complete the Setup Procedure

The following items are required to setup the EluGen cartridge, EPM, and EGC CO_3 Mixer. Except as noted, all items are supplied in the ICS-2000 Ship Kit (P/N 064375).

Item	P/N	Used To
EPM mounting bracket	063624	Mount the EPM on the EGC holder
35 cm (14 in) of black 0.25-mm (0.010-in) ID PEEK tubing	064340	Lengthen the line between the EGC degas eluent inlet and the EPM **ELUENT OUT** port
30 cm (12 in) of black 0.25-mm (0.010-in) ID PEEK tubing	064334	Lengthen the line between the EluGen cartridge outlet and the EPM **ELUENT IN** port
28 cm (11 in) of clear 1.58-mm (0.062-in) ID Teflon tubing	064337	Lengthen the line between the EGC degas regenerant inlet and the EPM **REGEN OUT** port
EluGen Cartridge Vent Line Tubing Kit (supplied with the cartridge)	063092	Vent the cartridge during operation
Yellow 0.5 mL/min, 7 MPa (1000 psi) backpressure coil	053765	Provide backpressure during setup procedures
EGC CO_3 Mixer mounting clips	063642	Install the mixer
Phillips head screwdriver (not supplied)	n/a	Install the EGC CO_3 Mixer mounting clips
35 cm (14 in) of black 0.25-mm (0.010-in) ID PEEK tubing	064346	Connect the EGC degas eluent outlet and the EGC CO_3 Mixer inlet
60 cm (24 in) of black 0.25-mm (0.010-in) ID PEEK tubing	064343	Connect the EGC CO_3 Mixer outlet to port **P** (**2**) on the injection valve
Temporary waste container (beaker, bottle, etc.) (not supplied)	n/a	Collect waste during setup procedures
10-32 to 10-32 coupler 10-32 to 1/4-28 coupler	042627 042806	Complete the connections
10-32 fittings 10-32 ferrules	043275 043276	Complete the connections
1/8-in fittings 1/8-in ferrules	052267 048949	Complete the connections

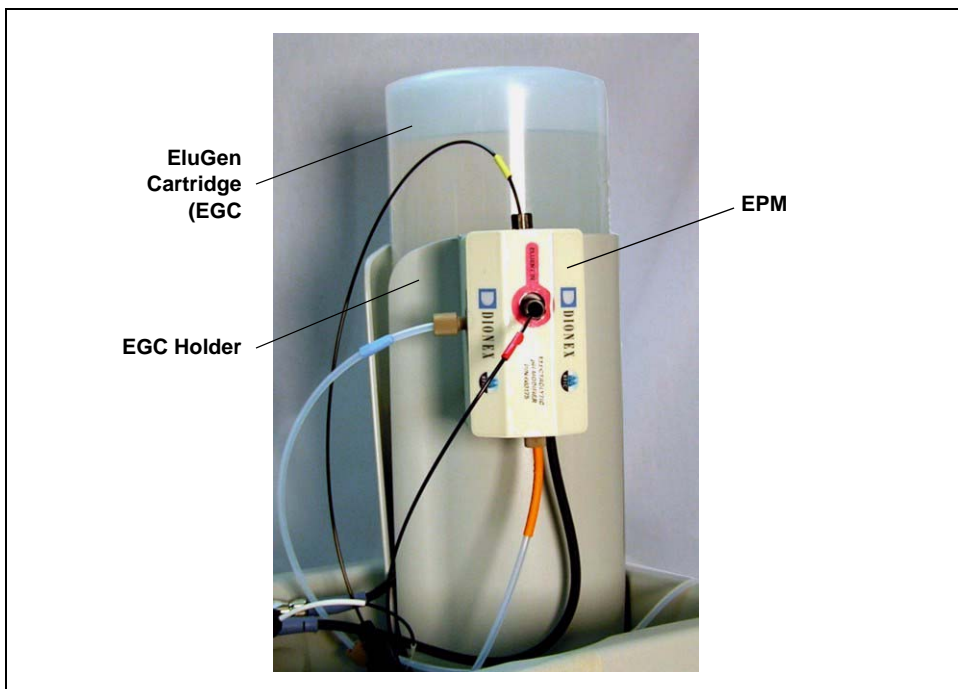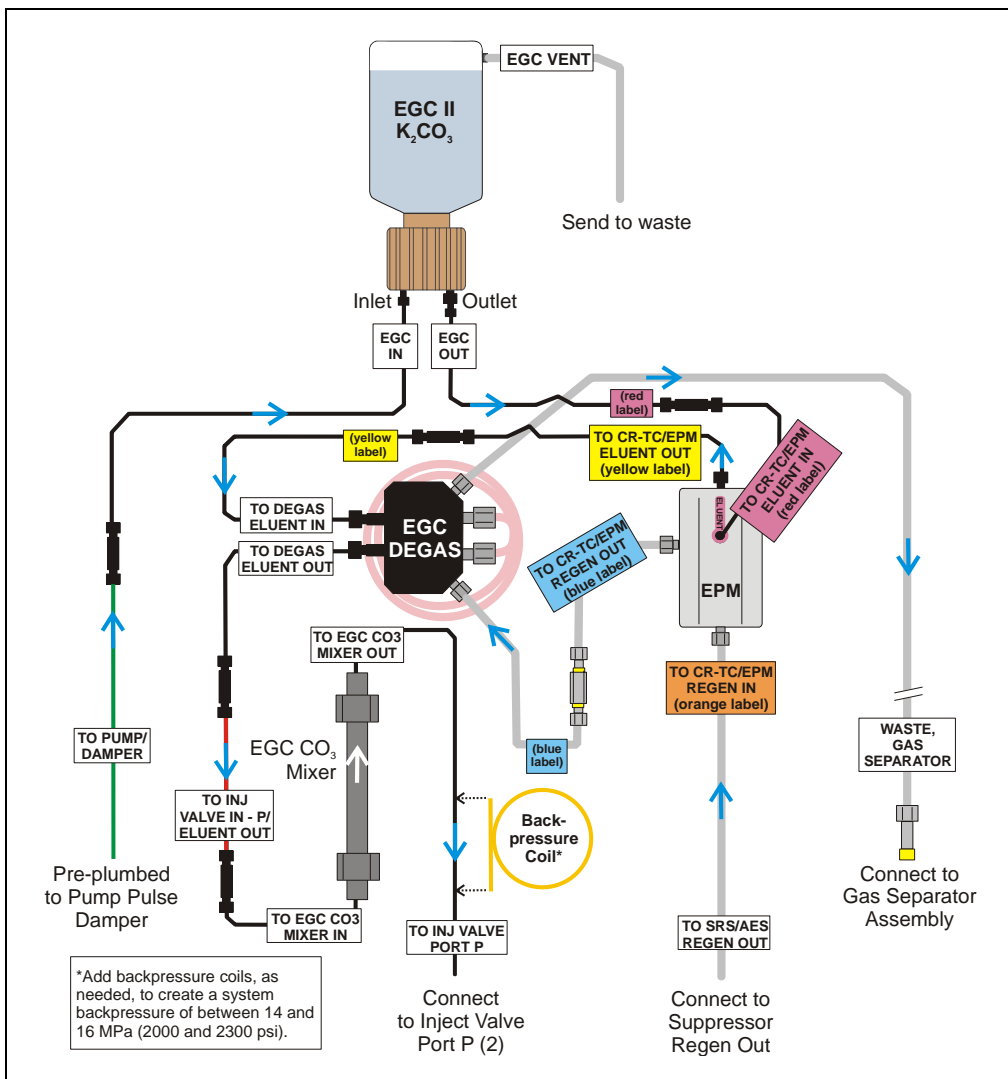Figure 49 illustrates the EluGen cartridge and EPM after installation.

Figure 49. ICS-2000 with an EluGen Cartridge and EPM Installed

[Figure 50](#) illustrates the liquid flow path through the eluent generator components after all setup steps are complete and the eluent generator is ready for operation.

Figure 50. Eluent Generator Flow Schematic with an EPM and EGC CO$_3$ Mixer: Use for Generating Carbonate/Bicarbonate Eluent

Installing the EluGen Cartridge

1. Tilt the cartridge holder to view the bottom and brace the holder against the back corner of the ICS-2000 (see Figure 51).

Figure 51. Cartridge Holder (tilted to view the bottom)

2. Use the precut tubing assemblies included in the ICS-2000 Ship Kit to extend the length of three lines as described below:

a. Disconnect the **TO CR-TC ELUENT IN** line (red label) from the coupler that connects it to the **TO CR-TC ELUENT OUT** line (yellow label). Connect a 32 to 10-32 coupler to the end of the **TO CR-TC ELUENT IN** line and connect the 30 cm (12 in) length of black PEEK tubing (red labels) (P/N 064334) to the coupler (see Figure 63).

b. Connect the 35 cm (14 in) length of black PEEK tubing (yellow labels) (P/N 064340) to the coupler on the **TO CR-TC ELUENT OUT** line (yellow label).

c. Disconnect the **TO CR-TC REGEN IN** line (orange label) from the coupler that connects it to the **TO CR-TC REGEN OUT** line (blue label). Connect the 28 cm (11 in) length of clear Teflon tubing (blue labels) (P/N 064337) to the coupler on the **TO CR-TC REGEN OUT** line (blue label).
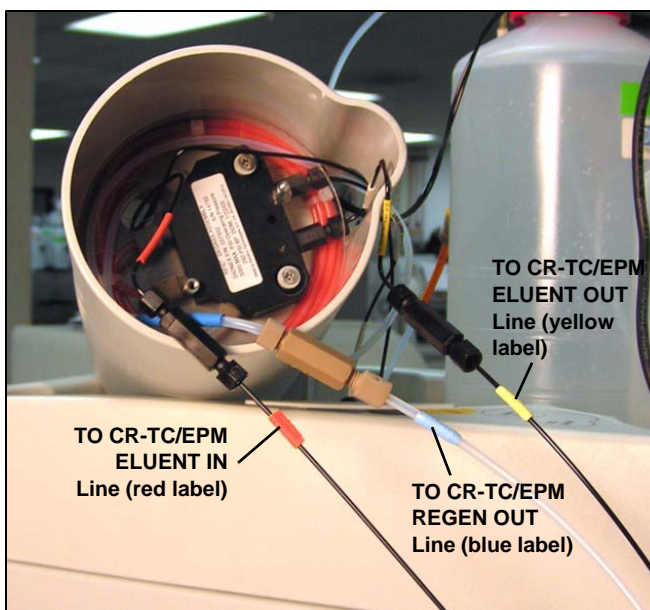

Figure 52. EPM Eluent and Regen Line Extensions

3. Pull the **TO CR-TC REGEN IN** line (orange label) out of the opening on the side of the holder.

4. Thread the three extended lines (red, yellow, and blue labels) through the opening on the side of the holder (see Figure 53).
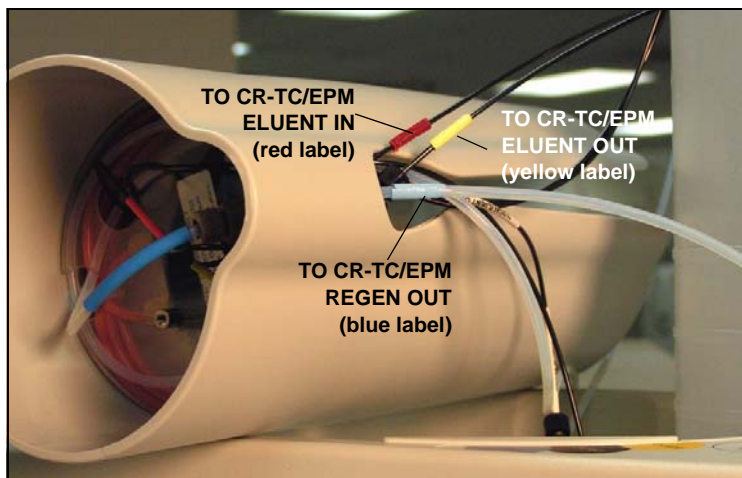

Figure 53. TO CR-TC/EPM Lines Outside of Holder

5. Turn the EGC holder right-side up and set it back into position.

6. Orient the EluGen cartridge with the fittings facing up and remove the plugs from the cartridge **INLET** and **OUTLET** fittings (see Figure 54).
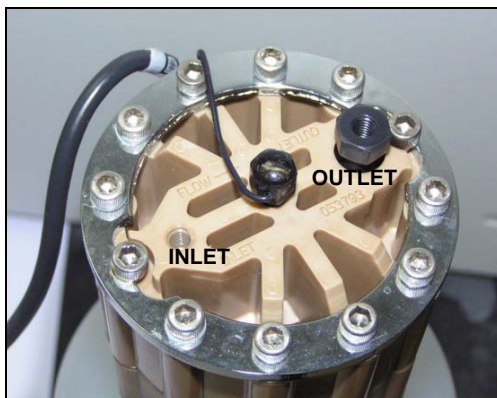
Figure 54. EluGen Cartridge Fitting Plugs

7. Set the EluGen cartridge in the service area on top of the ICS-2000 and orient it with the cable toward the EGC holder (see Figure 55).

Figure 55. EluGen Cartridge in Service Area

8. Pull the coiled black **EGC IN** and **EGC OUT** lines out from inside the EGC holder. Disconnect the **EGC IN** line from the coupler that connects it to the **EGC OUT** line.

9. Connect the **EGC IN** line to the EluGen cartridge **INLET** port (see Figure 80).

10. Remove the coupler and connect the **EGC OUT** line to the EluGen cartridge **OUTLET** port.
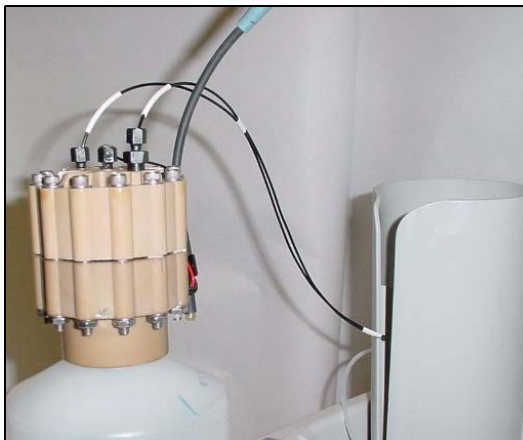
Figure 56. EluGen Cartridge Inlet and Outlet Port Connections

11. Turn the EluGen cartridge over (with the fittings facing down). **Shake the EluGen cartridge vigorously, and tap it with the palm of your hand 10 to 15 times. Check that all bubbles trapped in the eluent generation chamber are dislodged.**

⚠ **CAUTION**

The EluGen cartridge contains one of the following: a corrosive base (KOH, LiOH, or NaOH), a corrosive acid (MSA), or a concentrated K_2CO_3 solution. Wear protective eyewear and gloves when handling the cartridge.

⚠ **MISE EN GARDE**

La cartouche d'EluGen contient un de ce qui suit: une base corrosive (KOH, LiOH, ou NaOH), un acide corrosif (MSA), ou une solution concentrée de K_2CO_3. Porter des lunettes et des gants protectives en manipulant la cartouche.

⚠ **VORSICHT**

Die EluGen-Kassette enthält eine korrodierende Base (KOH, LiOH oder NaOH), eine korrodierende Säure (MSA) oder eine konzentrierte K_2CO_3-Lösung. Tragen Sie daher beim Umgang mit Kassette eine Schutzbrille und Handschuhe.

12. Slide the EluGen cartridge down into the holder until it stops (see Figure 57). Make sure the cable remains out of the holder.

   NOTE **To avoid crimping the lines, do not twist the cartridge when you slide it into the holder. The lines are designed to coil inside the holder.**

Figure 57. EluGen Cartridge Installed in the Holder

13. Remove the plug from the **EGC-1** connector on top of the ICS-2000.

14. Orient the cartridge's blue 4-pin electrical cable connector as shown in Figure 58. Push it onto the **EGC-1** connector on the ICS-2000. Twist the ring on the cable connector fingertight to secure it.

Figure 58. Connecting the EluGen Cartridge Cable

Connecting the EluGen Cartridge Vent Line

1. Locate the EluGen Cartridge Vent Line Tubing Kit supplied with the EluGen cartridge.

2. Slide the label onto one end of the tubing and then push the barbed luer lock onto the tubing.

3. Unscrew and remove the plug from the vent opening on the side of the EluGen cartridge (see Figure 59).

Vent Plug (remove)

Figure 59. EluGen Cartridge Vent Plug

4. Screw the luer adapter onto the vent opening. Remove the cap on the luer adapter by twisting. **Save the cap.**

5. Twist the luer lock and EluGen cartridge vent line into the luer adapter (see Figure 60).
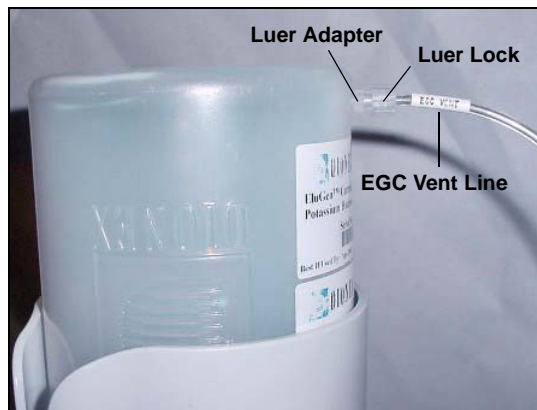
Figure 60. Installing the EluGen Cartridge Vent Line

> **NOTE** **To prevent leaks from the EluGen cartridge, always replace the luer adapter cap before moving the EluGen cartridge.**

6. Direct the vent line to the waste container and insert it down into the gas separator waste tube about 10 to 15 cm (4 to 6 in).

Installing the EPM

1. Remove the plugs from the EPM eluent and regen liquid ports.

2. Push the EPM onto the ball studs on the mounting bracket (see Figure 61).
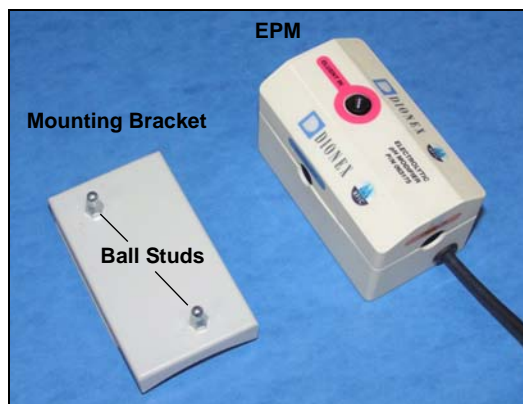
Figure 61. EPM and Mounting Bracket

3. Lift the EluGen cartridge up slightly from the EGC holder and slide the EPM bracket onto the side of the holder (see Figure 62).

Figure 62. EPM and Mounting Bracket Installed on EGC Holder

4. Connect the following lines to the EPM:

- Connect the **TO CR-TC/EPM ELUENT OUT** line (yellow label) to the **ELUENT OUT** port on the EPM (see Figure 63).

- Connect the **TO CR-TC/EPM ELUENT IN** line (red label) to the **ELUENT IN** port on the EPM.

- Connect the **TO CR-TC/EPM REGEN IN** line (orange label) to the **REGEN IN** port on the EPM.

- Connect the **TO CR-TC/EPM REGEN OUT** line (blue label) to the **REGEN OUT** port on the EPM.
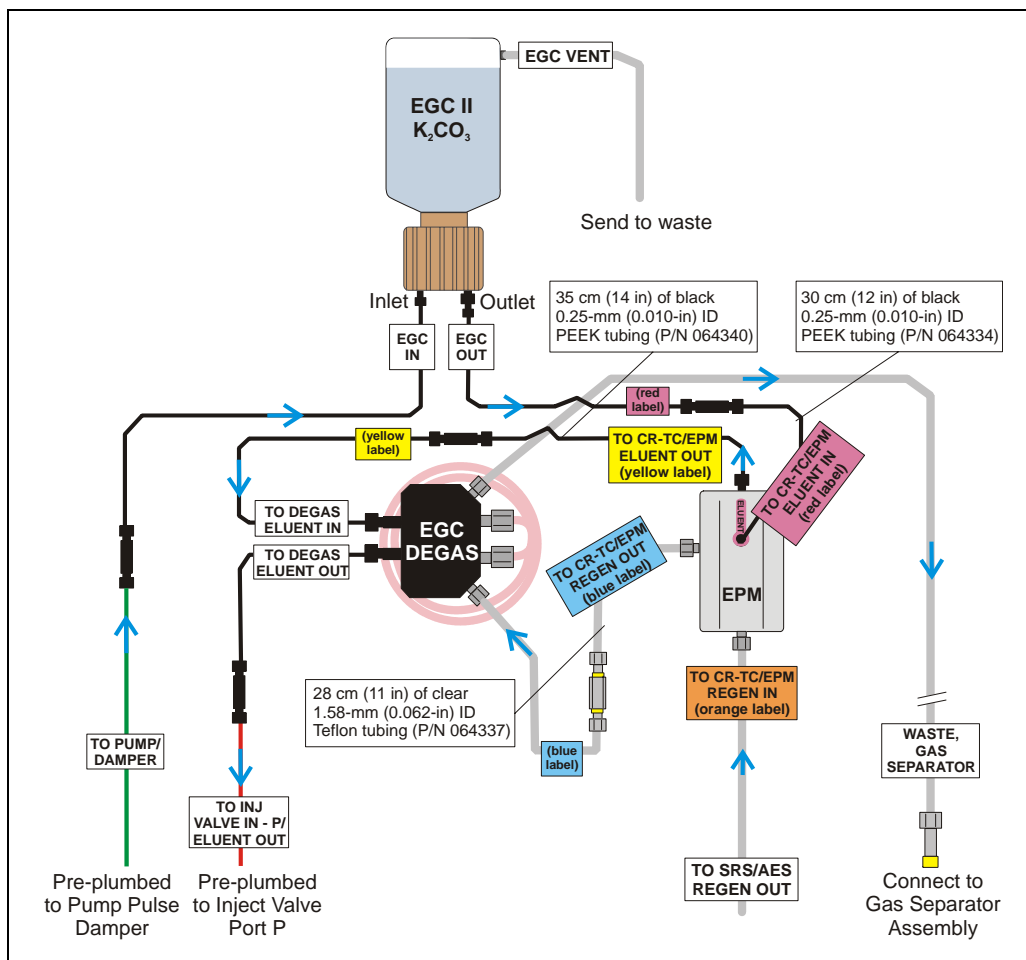
Figure 63. EluGen Cartridge and EPM Plumbing with Tubing Extensions

5.   Remove the plug from the **EGC-2** connector on top of the ICS-2000.

6.   Connect the EPM electrical cable to the **EGC-2** connector.

Recording the EluGen Cartridge and EPM Serial Numbers in Chromeleon

The serial numbers are printed on labels on the EluGen cartridge and EPM.

1. Open the Server Configuration program (select **Start > Programs** (or **All Programs**) **> Chromeleon > Server Configuration**).

2. Double-click the ICS-2000 system icon. The properties dialog box for the ICS-2000 appears.

3. Click the **Eluent Generator** tab (see Figure 45).

4. Select the **EGC-1** check box and enter the EluGen cartridge serial number.

5. Select the **EGC-2** check box and enter the serial number of the EPM.

6. Click **OK.**

Figure 64. Eluent Generator Configuration Properties Example

Plumbing the EluGen Cartridge and EPM for Conditioning

Figure 65 illustrates the liquid flow path through the EluGen cartridge and EPM during the conditioning procedure.
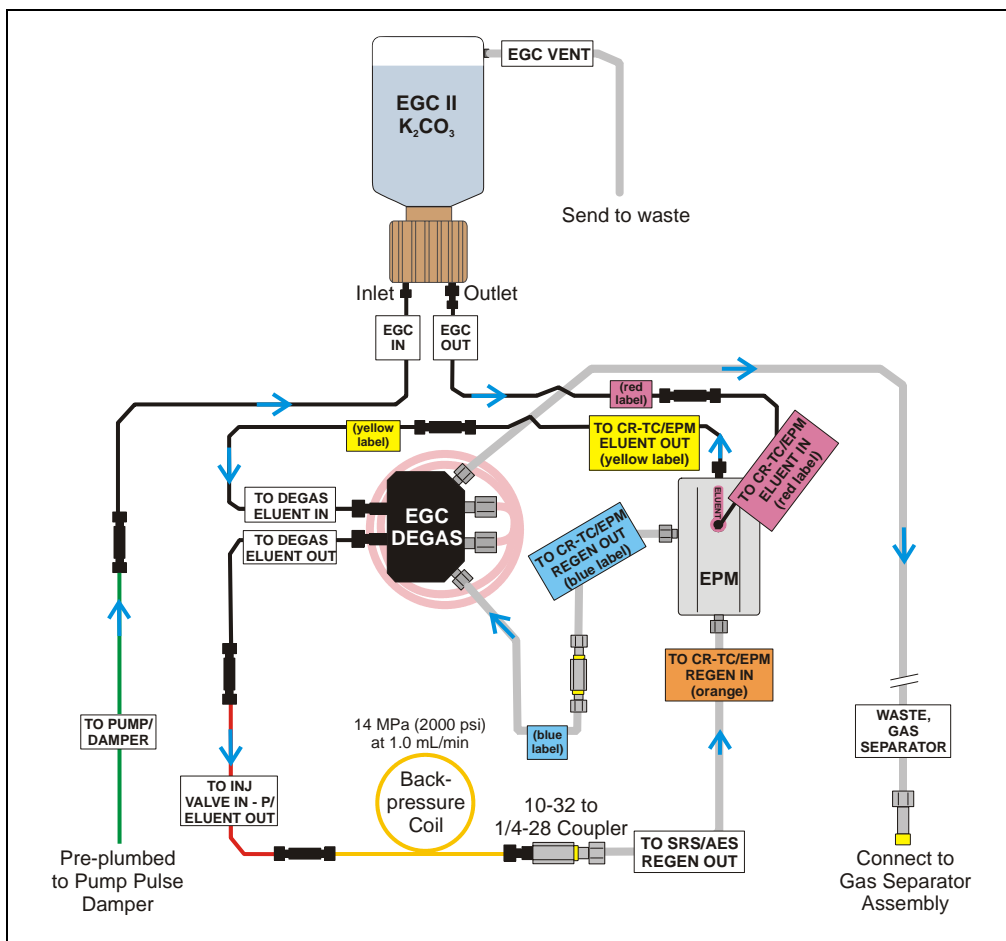

Figure 65. EluGen Cartridge and EPM Plumbing for Conditioning with Carbonate/Bicarbonate Eluent

1. Disconnect the **TO INJ VALVE IN - P/ELUENT OUT** line from port **P** (**2**) on the injection valve.

2. Use a 10-32 to 10-32 coupler (P/N 042627) to connect the yellow 0.5 mL/min, 7 MPa (1000 psi) backpressure coil (P/N 053765) to the **TO INJ VALVE IN - P/ELUENT OUT** line.

3. Connect a 10-32 to 1/4-28 coupler (P/N 042806) to the free end of the backpressure coil.

4. Disconnect the **TO SRS/AES REGEN OUT** line from the suppressor **REGEN OUT** port.

5. Connect the **TO SRS/AES REGEN OUT** line to the 10-32 to 1/4-28 coupler (see Figure 66).

> **NOTE** **The backpressure coil connection in Figure 66 is temporary; it is required only during the EPM and EluGen cartridge conditioning procedure described in the next section.**
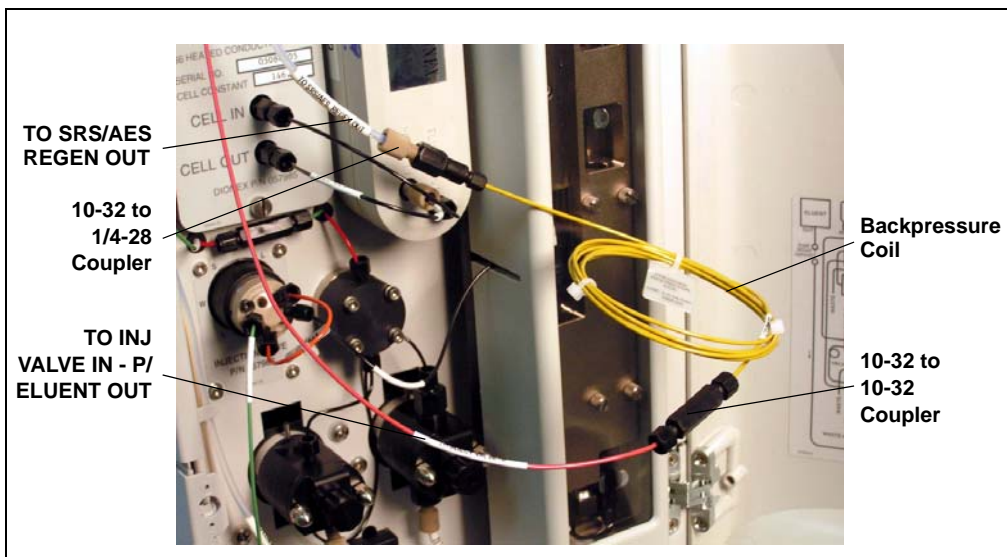

Figure 66. Backpressure Coil Connections for Conditioning the EluGen Cartridge and EPM with Carbonate/Bicarbonate Eluent

Conditioning the EPM and EluGen Cartridge

After completing the plumbing connections described in the previous sections, follow the steps below to hydrate the EPM for 5 minutes and then condition the EPM and EluGen cartridge for 30 minutes.

1. Make sure the eluent reservoir is filled with ASTM filtered, Type I (18-megohm) deionized water.

2. Verify that the suppressor is off.

IMPORTANT   **To avoid damaging the suppressor, always turn off the suppressor before conditioning the EPM and EluGen cartridge. The pump flow is on during conditioning, however, no flow reaches the suppressor.**

3. On the ICS-2000 touch screen **HOME** page, set the pump flow rate to **1.00 mL/min**.

4. Turn on the pump.

5. Run the pump for 5 minutes to hydrate the EPM.

6. Touch the **EGC** button on the **HOME** page to open the **ELUENT GENERATOR** page.

7. Verify that the cartridge type for **EGC-1** is **Carb** and the type for **EGC-2** is **pH Mod**.

   If the cartridge types are wrong, make sure the cartridge serial numbers were entered correctly in the Chromeleon Server Configuration program (see "Recording the EluGen Cartridge and EPM Serial Numbers in Chromeleon" on page 2-66).

8. Select the following settings:

   • Set the **EGC-1** concentration to **9 mM**.

   • Set the **EGC-2** concentration to **1 mM**.

9. Turn on the EGC-1 and EGC-2 currents.

10. Run the EluGen cartridge and EPM at these settings for 30 minutes.

11. Turn off the EGC-1 and EGC-2 current.

12. Turn off the pump.

Installing the EGC CO$_3$ Mixer

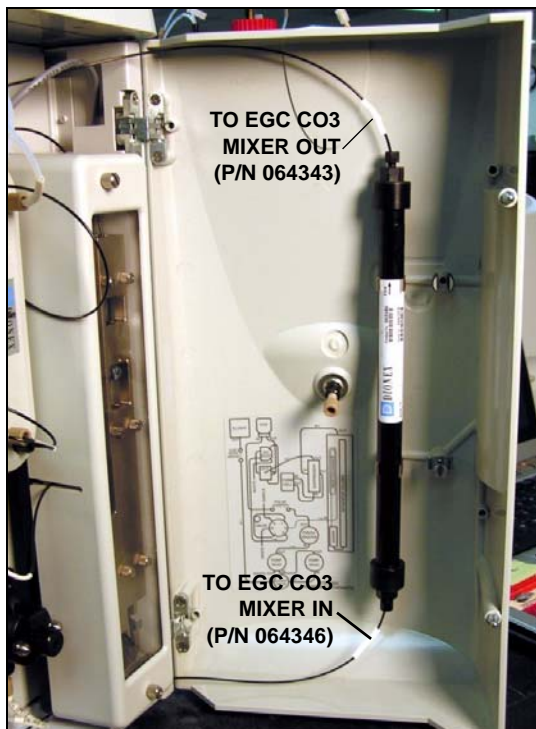Figure 67 illustrates the EGC CO_3 Mixer after installation.

Figure 67. ICS-2000 with an EGC CO$_3$ Mixer Installed

1. Use a Phillips head screwdriver to remove the existing small diameter mounting clips from the inside of the ICS-2000 door.

2. Install the larger diameter clips (P/N 063642) (see Figure 68).

Figure 68. Location of Mounting Clips for the EGC CO3 Mixer

3. Orient the mixer with the outlet pointing upward and push it onto the clips (see Figure 69). The mixer outlet must point upward to ensure thorough mixing of the eluent.

4. Locate the 35 cm (14 in) length of black PEEK tubing (white labels) (P/N 064346). Connect the end labeled **TO EGC CO3 MIXER IN** to the mixer inlet.

5. Locate the 60 cm (24 in) length of black PEEK tubing (white labels) (P/N 064343). Connect the end labeled **TO EGC CO3 MIXER OUT** to the mixer outlet.

Figure 69. EGC CO$_3$ Mixer Installed on the ICS-2000 Door

Filling the EGC CO$_3$ Mixer with Deionized Water

1. Verify that the EGC-1 and EGC-2 currents are off.

2. Disconnect the EluGen cartridge inlet line (labeled **TO PUMP/DAMPER**) from the coupler that connects it to the green pump outlet line (see Figure 70).
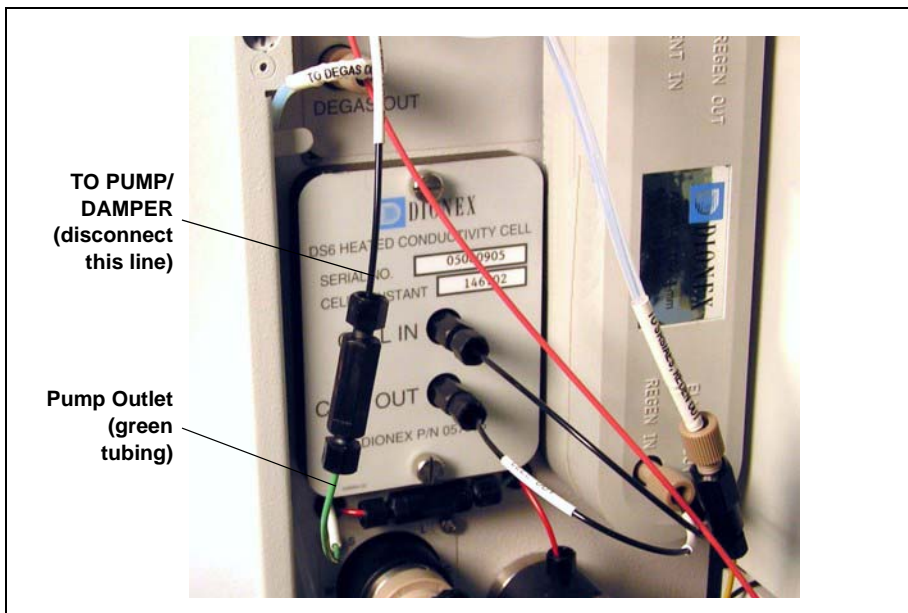

Figure 70. EluGen Cartridge Inlet and Pump Outlet

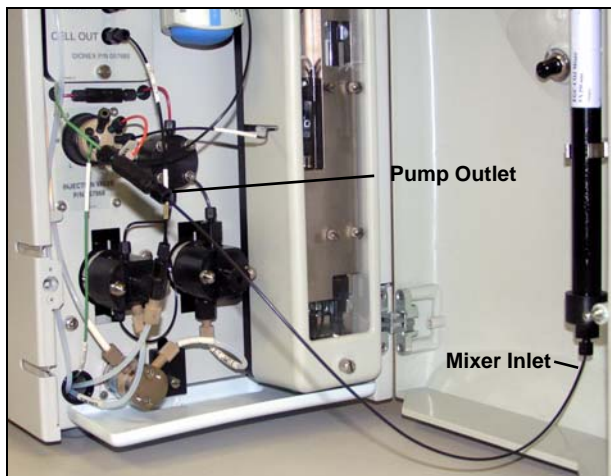3. Connect the pump outlet to the mixer inlet (see Figure 71).

Figure 71. Pump Outlet Connected to Mixer Inlet for Mixer Hydration

4. Direct the mixer outlet line to a temporary waste container, such as a beaker.

5. Verify that the suppressor is off.

IMPORTANT **To avoid damaging the suppressor, always turn off the suppressor before filling the mixer. The pump flow is on during filling, however, no flow reaches the suppressor.**

6. Set the pump flow rate to **5.00 mL/min.**

7. Turn on the pump.

8. Run the pump until the mixer is filled and there is a consistent flow of water exiting the mixer outlet.

   It takes about 5 minutes to fill a 4-mm mixer and about 2 minutes to fill a 2-mm mixer.

9. Turn off the pump.

Filling the EGC CO$_3$ Mixer with the Carbonate/Bicarbonate Eluent

Before initial use, follow the steps in this section to fill the EGC CO$_3$ Mixer with the carbonate/bicarbonate eluent concentration required for the application to be run.

Figure 72 illustrates the liquid flow path through the eluent generator components during initial filling of the EGC CO$_3$ Mixer with carbonate/bicarbonate eluent.
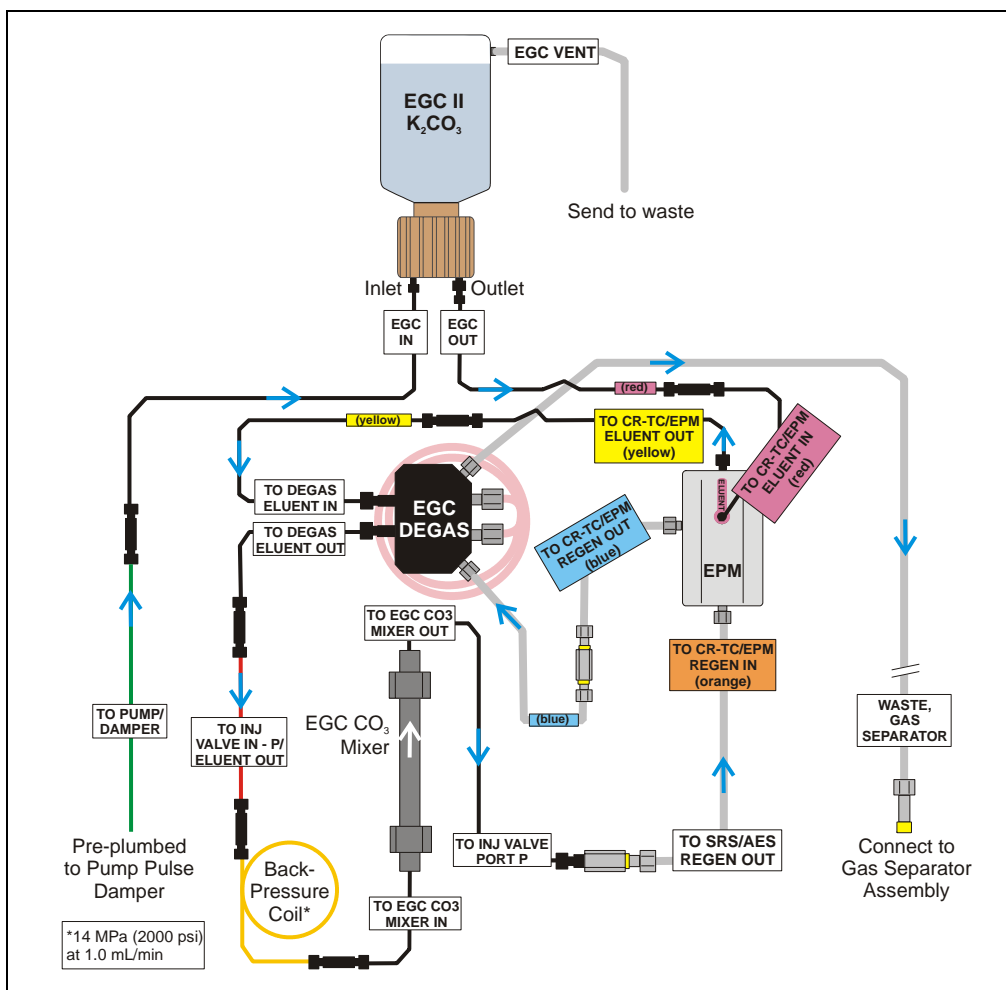

Figure 72. EluGen Cartridge and EPM Plumbing for Initial Filling of the EGC CO$_3$ Mixer with Carbonate/Bicarbonate Eluent

1. Disconnect the pump outlet from the mixer inlet.

2. Reconnect the pump outlet and the EluGen cartridge inlet.

3. Connect a 10-32 to 10-32 coupler to the mixer inlet.

4. Disconnect the outlet of the yellow PEEK backpressure coil from the **TO SRS/AES REGEN OUT** line and then connect the backpressure coil to the mixer inlet (see Figure 73).

5. Connect the mixer outlet to the **TO SRS/AES REGEN OUT** line.

> **NOTE** **The backpressure coil connection is temporary; it is required only during initial filling of the mixer.**
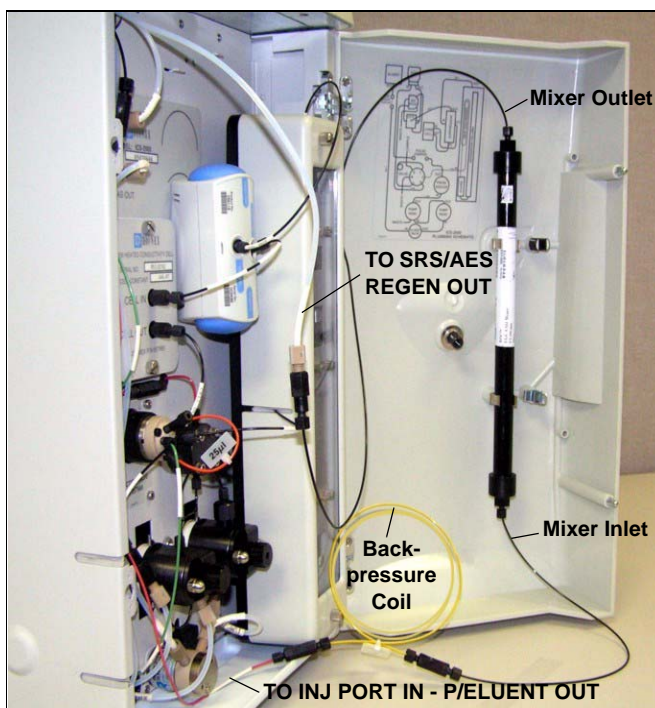
Figure 73. Mixer Connected Directly to Eluent Generator Outlet for Initial Filling

6. Verify that the suppressor is off.

IMPORTANT **To avoid damaging the suppressor, always turn off the suppressor before filling the mixer. The pump flow is on during filling, however, no flow reaches the suppressor.**

7. Set the pump flow rate to the rate required for the application.

8. Turn on the pump.

9. Verify that the system backpressure is between 14 and 16 MPa (2000 and 2300 psi). If necessary, adjust the pressure by adding or removing backpressure tubing.

10. Set the **EGC-1** and **EGC-2** concentrations to the values required for your application. For example, for a 3.5 mM K_2CO_3/1.0 mM $KHCO_3$ mixture, set the **EGC-1** concentration to 3.5 mM and the **EGC-2** concentration to 1.0 mM.

11. Turn on the **EGC-1** and **EGC-2** currents.

12. Run at the selected settings until the mixer is filled with the eluent mixture. At a flow rate of 1 mL/min it will take about 45 minutes to fill the 4-mm mixer and about 15 minutes to fill the 2-mm mixer.

> **NOTE** **The void volume of the 4-mm mixer is about 16 mL. The void volume of the 2-mm mixer is about 5 mL.**

13. Turn off the **EGC-1** and **EGC-2** currents.

14. Turn off the pump.

15. Remove the yellow PEEK backpressure coil from the **TO INJ VALVE IN - P/ELUENT OUT** line and the mixer inlet.

16. Disconnect the mixer outlet from the **TO SRS/AES REGEN OUT** line and remove the 10-32 to 1/4-28 coupler.

17. Reconnect the **TO SRS/AES REGEN OUT** line to the suppressor **REGEN OUT** port.

Completing the Eluent Generator Setup for Carbonate/Bicarbonate Eluent

Figure 74 illustrates the liquid flow path through the ICS-2000 after all setup steps are complete and the eluent generator is ready for operation.
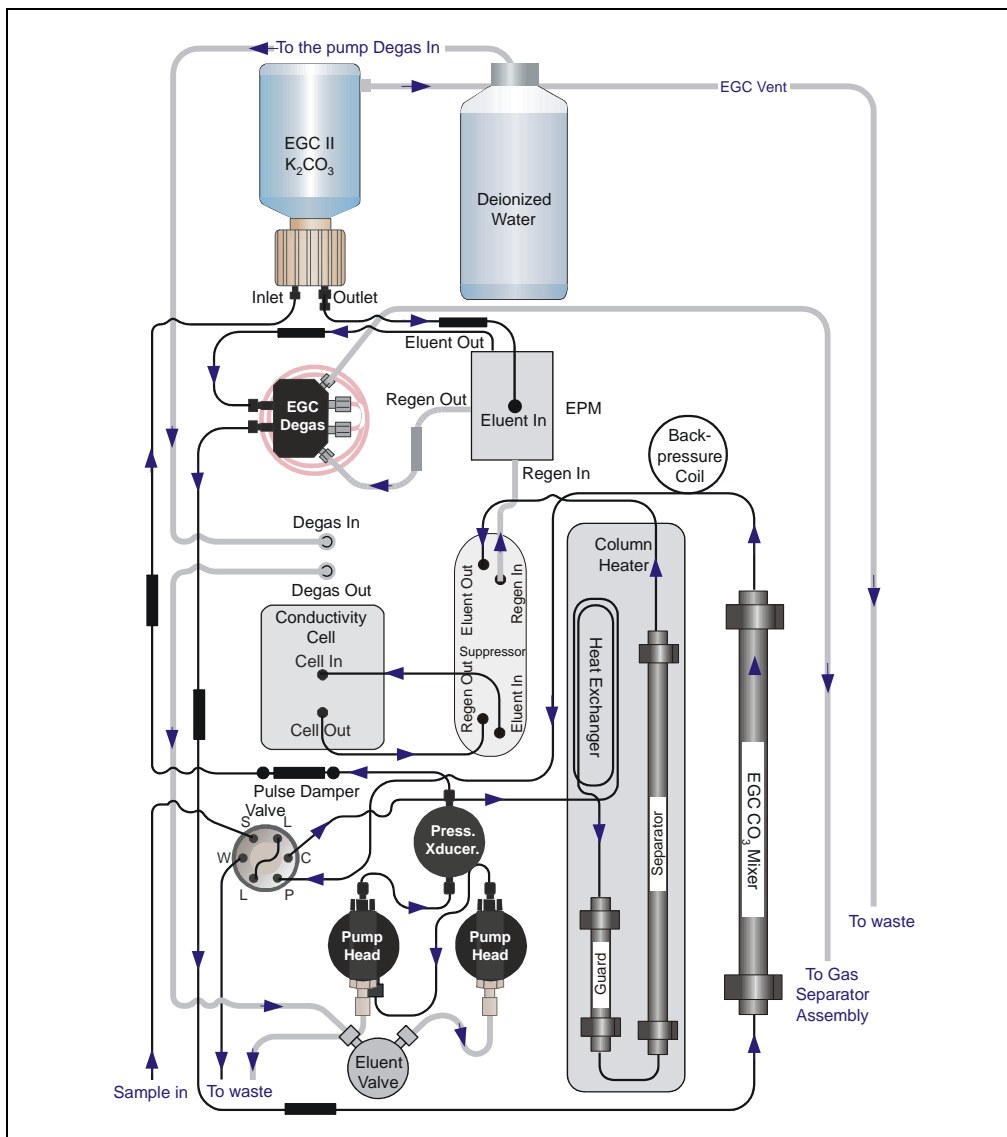

Figure 74. ICS-2000 Flow Schematic: Carbonate/Bicarbonate Eluent Generation

1. Connect the **TO INJ VALVE IN - P/ELUENT OUT** line to the coupler attached to the mixer inlet line. Route this line along the back of the drip tray to prevent it from being pinched when the ICS-2000 door is opened and closed

2. Route the mixer outlet line to the back of the component panel (see Figure 75).

3. Connect the mixer outlet line to port **P** (**2**) on the injection valve.

Figure 75. Mixer Outlet Routed to the Back of the Component Panel

NOTE **Backpressure tubing may be required between the injection valve and the EGC CO$_3$ Mixer outlet. The EluGen cartridge requires 14 to 16 MPa (2000 to 2300 psi) of system backpressure for removal of electrolysis gas from the eluent produced by the cartridge. See Section 16.1 for details.**

Go on to Section 15.

14.3   Eluent Generator Setup for Carbonate Eluent

Follow the instructions in this section if you are installing a K_2CO_3 cartridge and an EGC CO_3 Mixer (for generating carbonate eluent).

- If you are installing a KOH, LiOH, MSA, or NaOH EluGen cartridge and a CR-TC, go to Section 14.1.

- If you are installing a K_2CO_3 cartridge, an EPM, and an EGC CO_3 Mixer (for generating carbonate/bicarbonate eluent), go to Section 14.2.

Overview

The eluent generator setup procedure for carbonate eluent consists of the following main steps:

- Installing the EluGen cartridge and preparing for conditioning.

- Conditioning the EluGen cartridge.

- Installing the EGC CO_3 Mixer.

- Filling the EGC CO_3 Mixer with the eluent concentration required for the application.

- Completing the eluent generator setup.

Items Required to Complete the Setup Procedure

In addition to the EluGen cartridge and the EGC CO_3 Mixer, you will need the following items to complete the eluent generator setup. Except as noted, all items are supplied in the ICS-2000 Ship Kit (P/N 064375).

Item	P/N	Use To
Yellow 0.5 mL/min, 7 MPa (1000 psi) backpressure coil	053765	Provide backpressure during setup procedures
EluGen Cartridge Vent Line Tubing Kit (supplied with the cartridge)	063092	Vent the cartridge during operation
EGC CO_3 Mixer mounting clips	063642	Install the mixer
Phillips head screwdriver (not supplied)	n/a	Install the EGC CO_3 Mixer mounting clips
35 cm (14 in) of black 0.25-mm (0.010-in) ID PEEK tubing	064346	Connect the EGC degas eluent outlet and the EGC CO_3 Mixer inlet
60 cm (24 in) of black 0.25-mm (0.010-in) ID PEEK tubing	064343	Connect the EGC CO_3 Mixer outlet to port **P** (**2**) on the injection valve
Temporary waste container (beaker, bottle, etc.) (not supplied)	n/a	Collect waste during setup procedures
10-32 fittings 10-32 ferrules	043275 043276	Complete the plumbing connections
1/8-in fittings 1/8-in ferrules	052267 048949	Complete the plumbing connections
10-32 to 10-32 couplers	042627	Complete the plumbing connections

Figure 76 illustrates the liquid flow path through the eluent generator components after all setup steps are complete and the eluent generator is ready for operation.
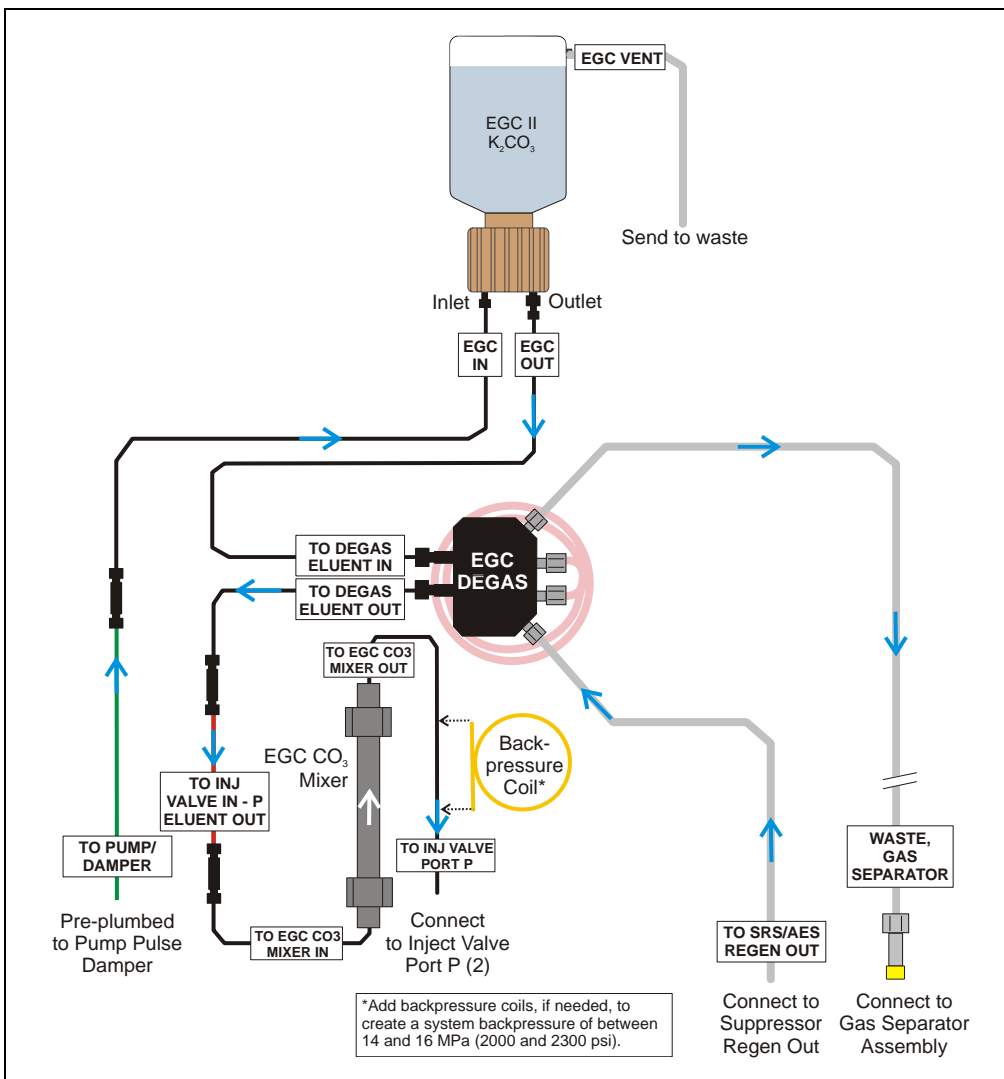
Figure 76. Eluent Generator Flow Schematic with an EGC CO$_3$ Mixer: Use for Generating Carbonate Eluent

Installing the EluGen Cartridge and Preparing for Conditioning

Follow the steps in this section to install the EluGen cartridge and prepare it for conditioning before initial use.

Figure 77 illustrates the liquid flow path during the conditioning procedure.
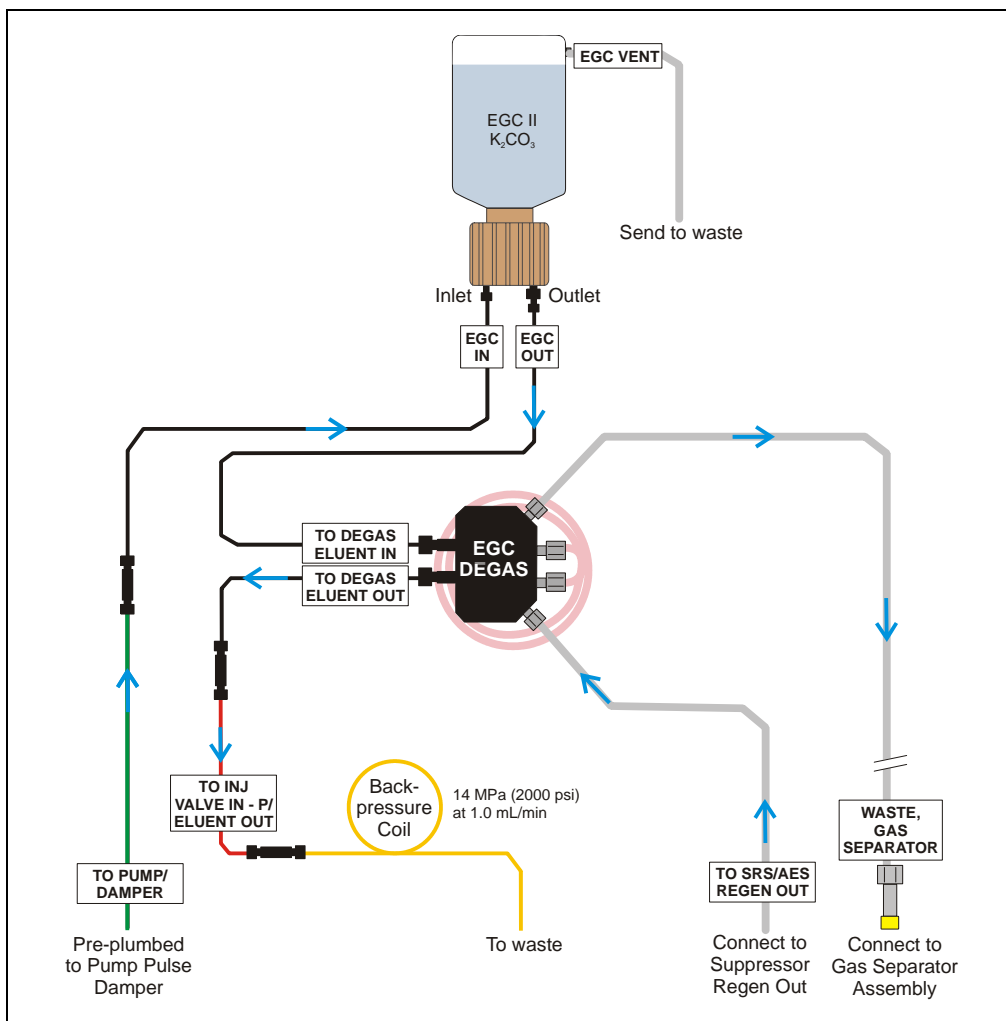
Figure 77. EluGen Cartridge Plumbing for Conditioning with Carbonate Eluent

1. Orient the EluGen cartridge with the fittings facing up and remove the plugs from the cartridge **INLET** and **OUTLET** fittings (see [Figure 54](#)).
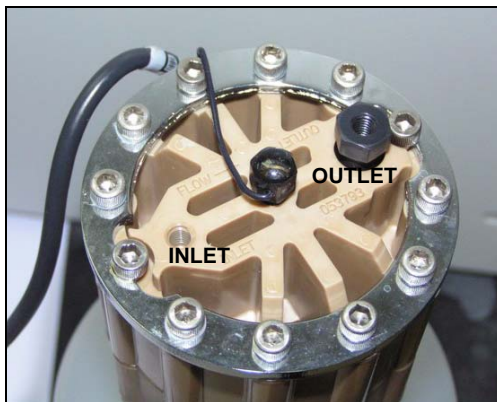
Figure 78. EluGen Cartridge Fitting Plugs

2. Set the EluGen cartridge in the service area on top of the ICS-2000 and orient it with the cable toward the EGC holder (see [Figure 79](#)).

Figure 79. EluGen Cartridge in Service Area

3. Pull the coiled black **EGC IN** and **EGC OUT** lines out from inside the EGC holder. Disconnect the **EGC IN** line from the coupler that connects it to the **EGC OUT** line.

4. Connect the **EGC IN** line to the EluGen cartridge **INLET** port (see Figure 80).

5. Remove the coupler and connect the **EGC OUT** line to the EluGen cartridge **OUTLET** port.
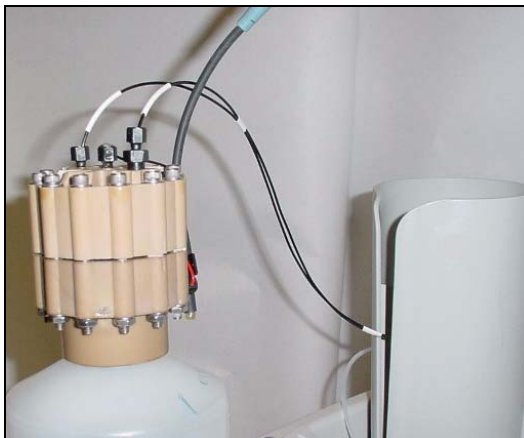
Figure 80. EluGen Cartridge Port Connections

6. Turn the EluGen cartridge over (with the fittings facing down). **Shake the EluGen cartridge vigorously, and tap it with the palm of your hand 10 to 15 times. Check that all bubbles trapped in the eluent generation chamber are dislodged.**

CAUTION

The EluGen cartridge contains one of the following: a corrosive base (KOH, LiOH, or NaOH), a corrosive acid (MSA), or a concentrated K_2CO_3 solution. Wear protective eyewear and gloves when handling the cartridge.

MISE EN GARDE

La cartouche d'EluGen contient un de ce qui suit: une base corrosive (KOH, LiOH, ou NaOH), un acide corrosif (MSA), ou une solution concentrée de K_2CO_3. Porter des lunettes et des gants protectives en manipulant la cartouche.

VORSICHT

Die EluGen-Kassette enthält eine korrodierende Base (KOH, LiOH oder NaOH), eine korrodierende Säure (MSA) oder eine konzentrierte K_2CO_3-Lösung. Tragen Sie daher beim Umgang mit Kassette eine Schutzbrille und Handschuhe.

7. Slide the EluGen cartridge down into the holder until it stops (see Figure 81). Make sure the cable remains out of the holder.

    NOTE   To avoid crimping the lines, do not twist the cartridge when you slide it into the holder. The lines are designed to coil inside the holder.

Figure 81. EluGen Cartridge Installed in the Holder

8. Remove the plug from the **EGC-1** connector on top of the ICS-2000.

9. Orient the cartridge's blue 4-pin electrical cable connector as shown in Figure 82. Push it onto the **EGC-1** connector on the ICS-2000. Twist the ring on the cable connector fingertight to secure it.

Figure 82. Connecting the EluGen Cartridge Cable

10. Disconnect the **TO INJ VALVE IN - P/ELUENT OUT** line from port **P** (**2**) on the injection valve.

11. Use a 10-32 to 10-32 coupler (P/N 042627) to connect the **TO INJ VALVE IN - P/ELUENT OUT** line to one end of the yellow 0.5 mL/min, 7 MPa (1000 psi) backpressure coil (P/N 053765) (see Figure 83).

12. Direct the free end of the backpressure coil to a temporary waste container.
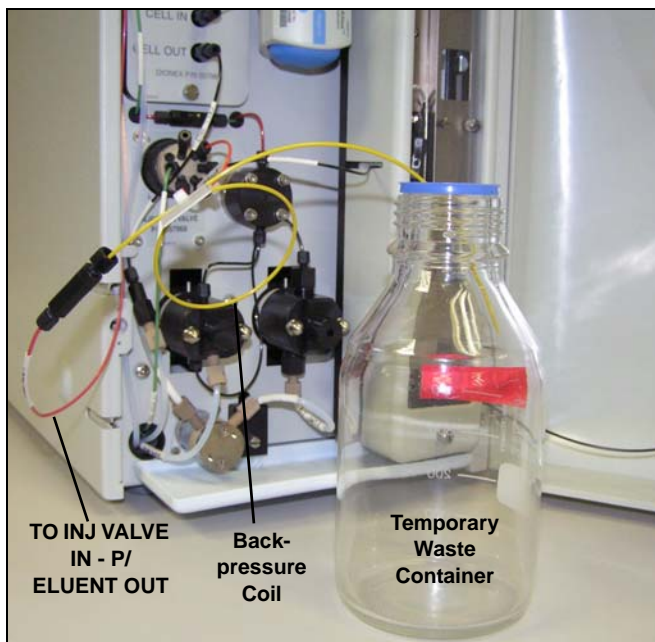
Figure 83. Plumbing Connections for Conditioning the EluGen Cartridge with Carbonate Eluent

Installing the EluGen Cartridge Vent Line

1. Locate the EluGen Cartridge Vent Line Tubing Kit (P/N 063092) supplied with the EluGen cartridge.

2. Slide the label onto one end of the tubing and then push the barbed luer lock onto the tubing.

3. Unscrew and remove the plug from the vent opening on the side of the EluGen cartridge (see Figure 84).

Figure 84. EluGen Cartridge Vent Plug

4. Screw the luer adapter onto the vent opening. Remove the cap on the luer adapter by twisting. **Save the cap.**

5. Twist the luer lock and EluGen cartridge vent line into the luer adapter (see Figure 85).
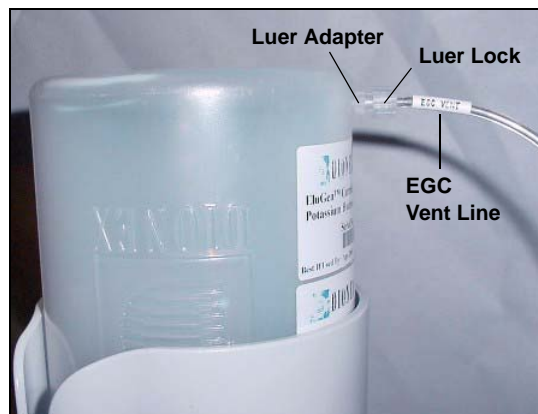
Figure 85. Installing the EluGen Cartridge Vent Line

NOTE **To prevent leaks from the EluGen cartridge, always replace the luer adapter cap before moving the EluGen cartridge.**

6. Direct the EluGen cartridge vent line to the rear of the ICS-2000 and snap it onto one of the tubing clips on the rear panel.

7. Direct the vent line to the waste container and insert it down into the gas separator waste tube about 10 to 15 cm (4 to 6 in).

Recording the EluGen Cartridge Serial Number in Chromeleon

The serial number is printed on the EluGen cartridge label.

1. Open the Chromeleon Server Configuration program (select **Start>Programs** (or **All Programs**)>**Chromeleon>Server Configuration**).

2. Double-click the ICS-2000 system icon. The properties dialog box for the ICS-2000 appears.

3. Click the **Eluent Generator** tab (see Figure 86).

4. Select the **EGC-1** check box.

5. Enter the EluGen cartridge serial number and click **OK**.

Figure 86. Eluent Generator Configuration Properties Example

Conditioning the EluGen Cartridge

After completing the installation steps described in the previous sections, condition the EluGen cartridge for 30 minutes before initial use.

1. Make sure the eluent reservoir is filled with ASTM filtered, Type I (18-megohm) deionized water.

2. Verify that the suppressor is off.

IMPORTANT

To avoid damaging the suppressor, always turn off the suppressor before conditioning the EluGen cartridge. The pump flow is on during conditioning, however, no flow reaches the suppressor.

3. On the ICS-2000 touch screen **HOME** page, set the pump flow rate to **1.00 mL/min**.

4. Turn on the pump.

5. On the touch screen **HOME** page, touch the **EGC** button to open the **ELUENT GENERATOR** page. Verify that the cartridge type is **Carb**.

    If the cartridge type is wrong, verify that the cartridge serial number was entered correctly in the Chromeleon Server Configuration program (see "Recording the EluGen Cartridge Serial Number in Chromeleon" on page 2-88).

6. Set the **EGC-1** concentration to **9 mM**.

7. Turn on the EGC-1 current.

8. Run the EluGen cartridge at these settings for 30 minutes.

9. Turn off the EGC-1 current.

10. Turn off the pump.

Installing the EGC CO$_3$ Mixer

Figure 67 illustrates the EGC CO$_3$ Mixer after installation.
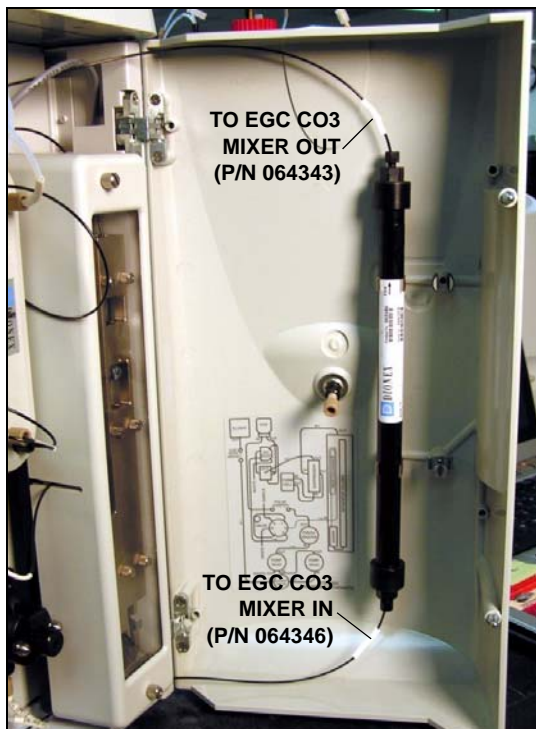
Figure 87. ICS-2000 with an EGC CO$_3$ Mixer Installed

1. Use a Phillips head screwdriver to remove the existing small diameter mounting clips from the inside of the ICS-2000 door.

2. Install the larger diameter mounting clips (P/N 063642) (see Figure 88).
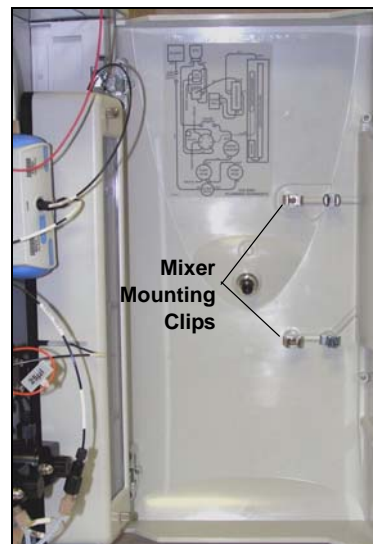
Figure 88. Location of Mounting Clips for the EGC CO3 Mixer

3. Orient the mixer with the outlet pointing upward and push it onto the clips (see Figure 89). The mixer outlet must point upward to ensure thorough mixing of the eluent.

4. Locate the 35 cm (14 in) length of black PEEK tubing (white labels) (P/N 064346). Connect the end labeled **TO EGC CO3 MIXER IN** to the mixer inlet.

5. Locate the 60 cm (24 in) length of black PEEK tubing (white labels) (P/N 064343). Connect the end labeled **TO EGC CO3 MIXER OUT** to the mixer outlet.

Figure 89. EGC CO$_3$ Mixer Installed on the ICS-2000 Door

Filling the EGC CO$_3$ Mixer with the Carbonate Eluent

Before initial use, follow the steps in this section to fill the EGC CO$_3$
Mixer with the carbonate eluent required for the application to be run.
Figure 90 illustrates the liquid flow path through the eluent generator
components during initial filling of the EGC CO$_3$ Mixer with carbonate
eluent.
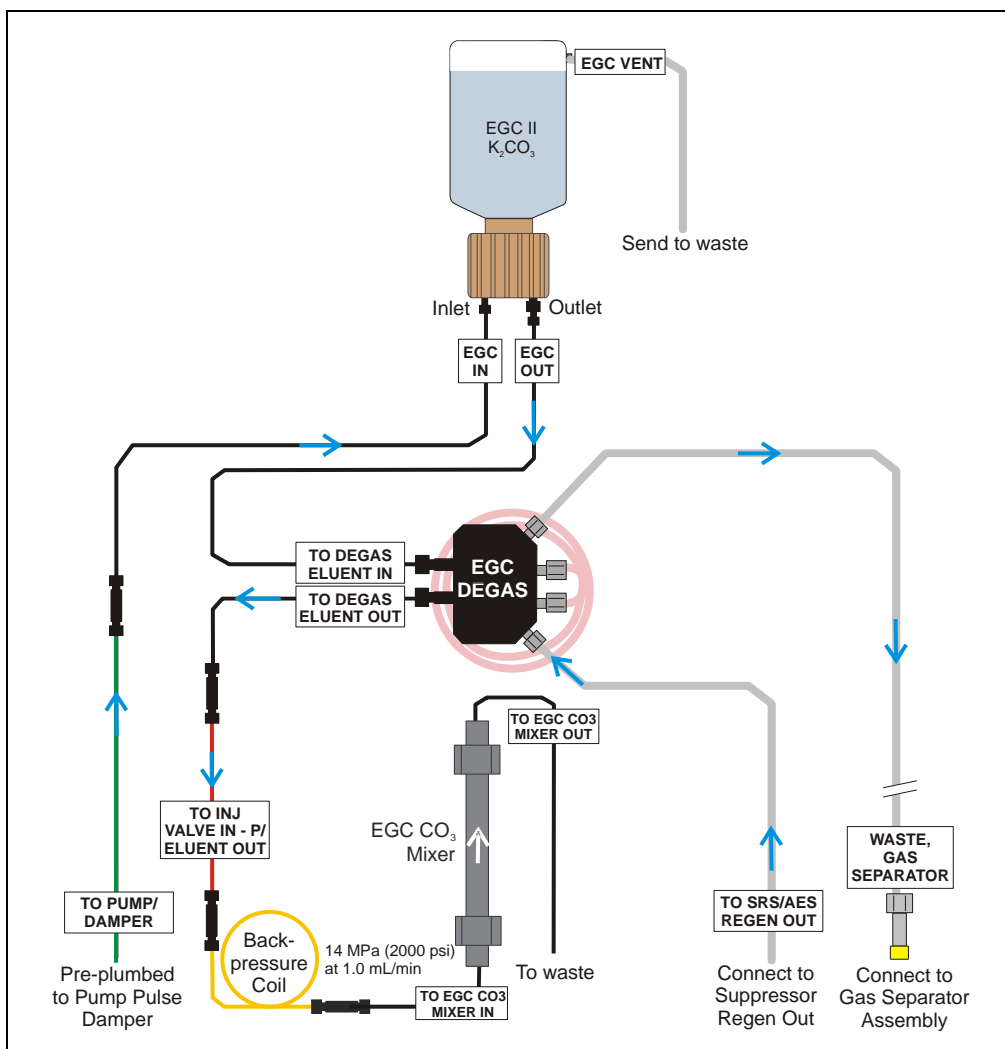
Figure 90. Plumbing for Filling the EGC CO$_3$ Mixer with Carbonate Eluent

1. Connect a 10-32 to 10-32 coupler to the mixer inlet and connect the outlet of the yellow PEEK backpressure coil to the coupler.

2. Direct the mixer outlet to the temporary waste container.

3. Verify that the suppressor is off.

IMPORTANT **To avoid damaging the suppressor and CR-TC, always turn off the suppressor before conditioning the EluGen cartridge. The pump flow is on during conditioning, however, no flow reaches the suppressor.**

4. Verify that the **Automatically turn on with pump** option is not selected on the ICS-2000 touch screen **SUPPRESSOR** page (see Section C.9). Disabling this option lets you turn on the pump, without automatically turning on the suppressor.

5. Set the pump flow rate to the rate required for the application.

6. Turn on the pump.

7. Verify that the system backpressure is between 14 and 16 MPa (2000 and 2300 psi). If necessary, adjust the pressure by adding or removing backpressure tubing.

8. Set the **EGC-1** concentration to the value required for your application.

9. Turn on the **EGC-1** current.

10. Run at these settings until a consistent flow of eluent is exiting the mixer outlet. At a flow rate of 1 mL/min it will take about 16 minutes to fill a 4-mm mixer and about 5 minutes to fill a 2-mm mixer.

> NOTE **The void volume of the 4-mm mixer is about 16 mL. The void volume of the 2-mm mixer is about 5 mL.**

11. Turn off the **EGC-1** current.

12. Turn off the pump.

13. Remove the yellow PEEK backpressure coil from the **TO INJ VALVE IN - P/ELUENT OUT** line and the mixer inlet.

14. Retain the coupler on the mixer inlet.

Completing the Eluent Generator Setup for Carbonate Eluent

Figure 91 illustrates the liquid flow path through the ICS-2000 after all
setup steps are complete and the eluent generator is ready for operation.
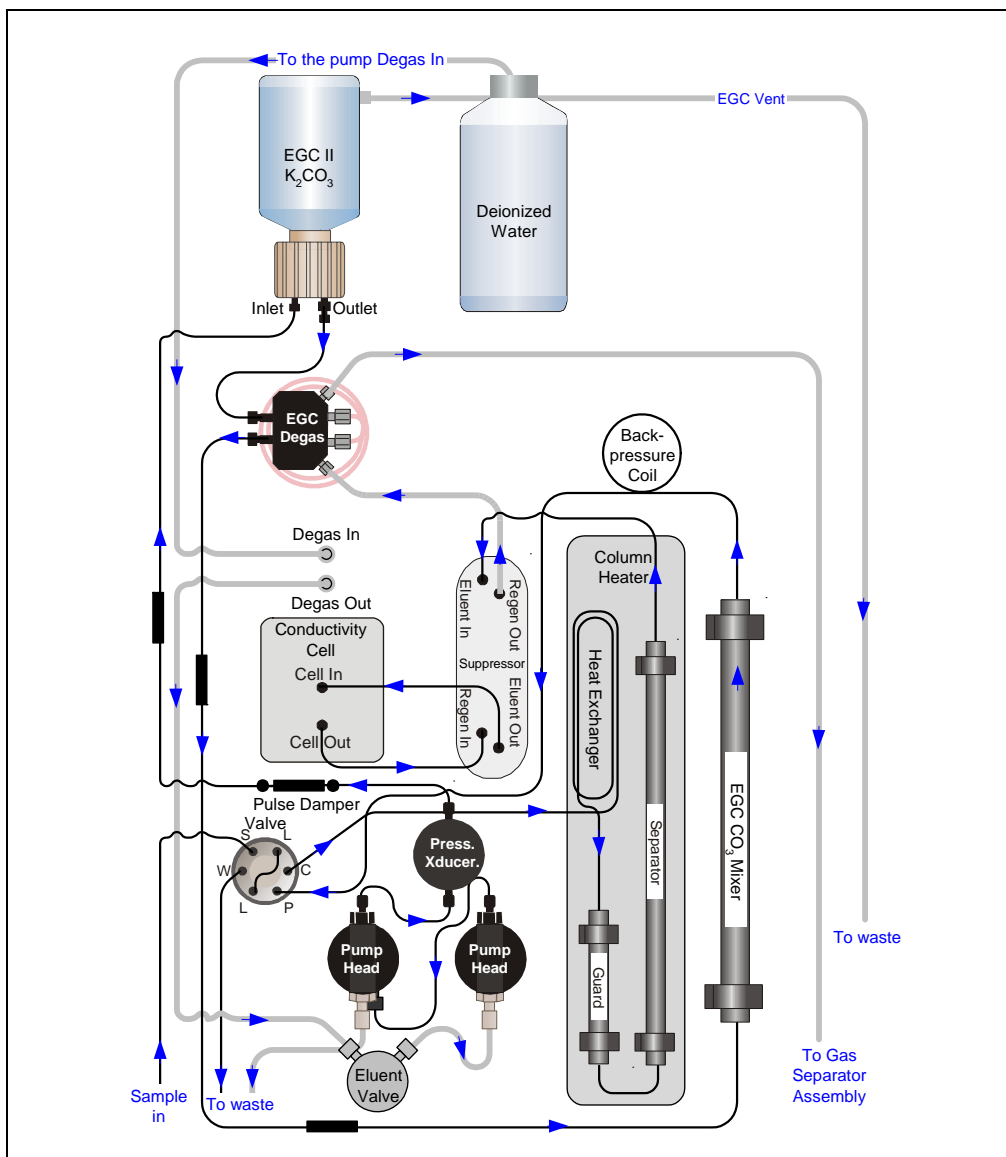
Figure 91. ICS-2000 Flow Schematic: Carbonate Eluent Generation

1. Connect the **TO INJ VALVE IN - P/ELUENT OUT** line to the coupler
    attached to the mixer inlet line. Route this line along the back of the
    drip tray to prevent it from being pinched when the ICS-2000 door is
    opened and closed.

2. Route the mixer outlet line to the back of the component panel (see
    Figure 92).

3. Connect the mixer outlet line to port **P** (**2**) on the injection valve.

Figure 92. Mixer Outlet Routed to the Back of the Component Panel

> **NOTE** **Backpressure tubing may be required between the
> injection valve and the EGC CO_3 Mixer outlet. The
> EluGen cartridge requires 14 to 16 MPa (2000 to
> 2300 psi) of system backpressure for removal of
> electrolysis gas from the eluent produced by the
> cartridge. See Section 16.1 for details.**

Go on to Section 15.

15 Setting Up a Chromeleon Application

Chromeleon provides application templates that let you quickly get started running. To use the application templates, you need to know the type of column and suppressor you will be using. This section shows how to create a *sequence* (a list of samples to be processed) and how to use an application template.

1. Identify the type of column and suppressor installed in the ICS-2000.

2. Start Chromeleon (select **Start>Programs>Chromeleon>Chromeleon**). The Chromeleon main window and Browser appear (see Figure 93).
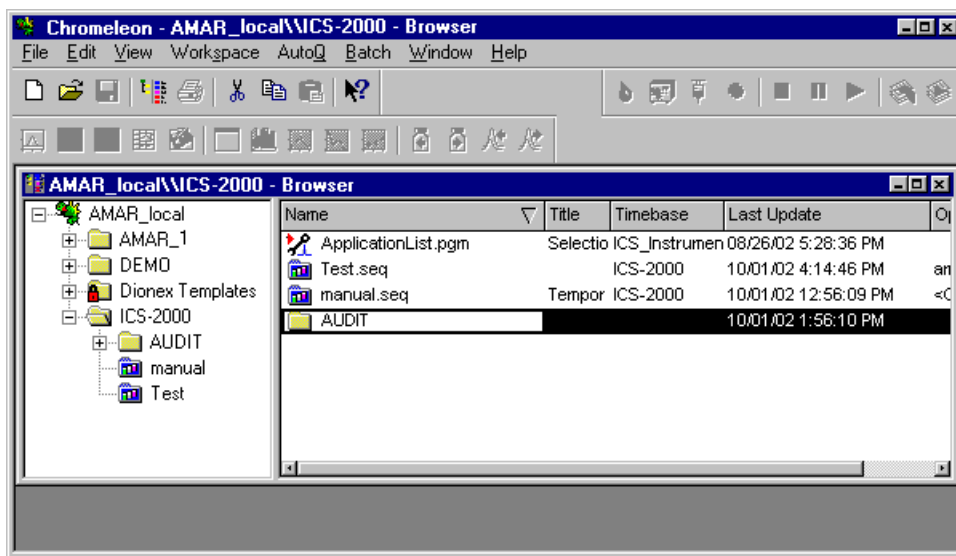
Figure 93. Chromeleon Main Window and Browser

3. In the Browser, select **File>New** and select **Sequence (using Wizard)** (see Figure 94).
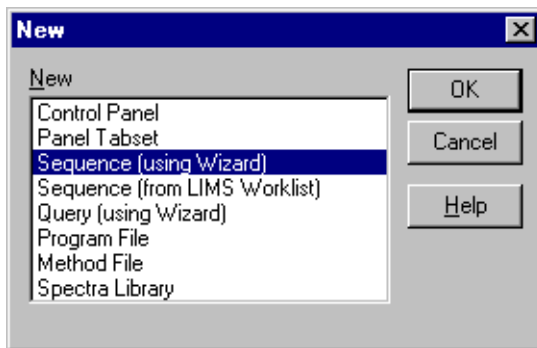
Figure 94. Creating a New Sequence

The Sequence Wizard Welcome page appears (see Figure).
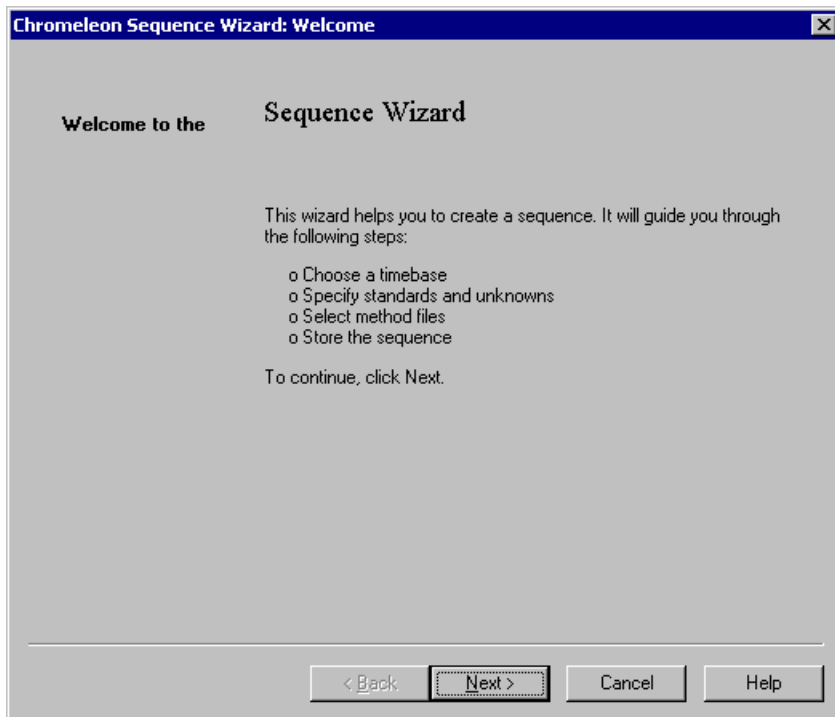
Figure 95. Sequence Wizard Welcome Page

> **NOTE** **For details about a Sequence Wizard step, click the Help
> button on the Sequence Wizard page.**

4. Click **Next>**.

    The Sequence Wizard Timebase page appears (see Figure 96).
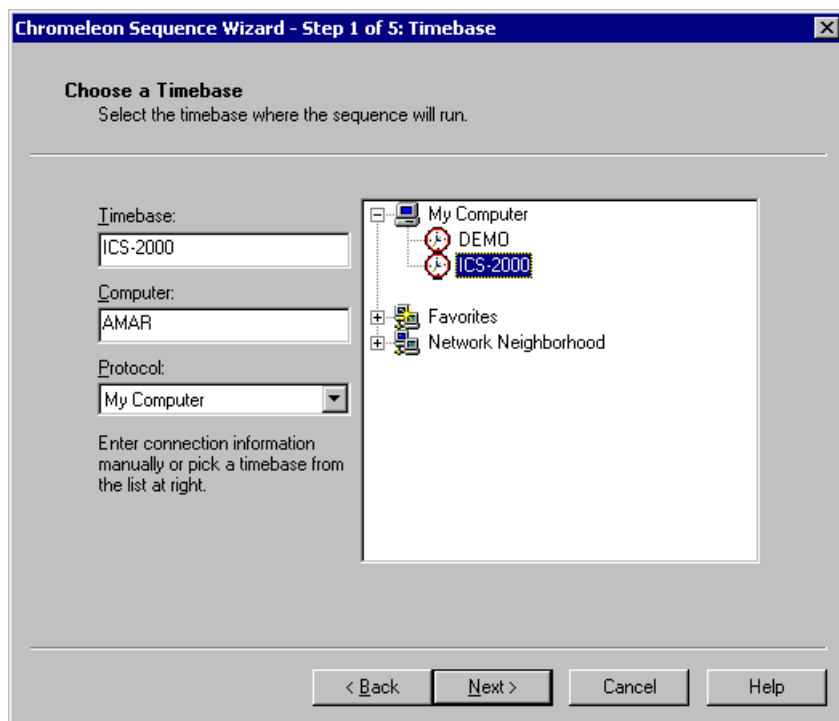
Figure 96. Example: Sequence Wizard Step 1

5. Select the ICS-2000 timebase and click **Next>**.

The Unknown Samples page appears (see Figure 97).

Figure 97. Example: Sequence Wizard Step 2

6. Select **Use Template** from the drop-down list.

7. In the **Template for Sample Name field**, type **Sample**, click the right arrow, and select **Sample Number #n**.

8. In the **Number of Vials** field, type **1**.

9. Use default settings for the remaining parameters on the page.

> **NOTE** **You can edit the sequence later, to add more samples and select the injection parameters appropriate for your application.**

10. Click **Apply>>**.

Figure 98 shows Sequence Wizard Step 2 after a sample is defined.

Figure 98. Example: Sequence Wizard Step 2 with Sample Defined

11. Click **Next>**.

The Standard Samples page appears (see Figure 99).

Figure 99. Example Sequence Wizard Step 3

12. Click **Next>** to omit this step and define standard injections later. Or, define one or more standard injections, and then click **Next>**.

   The Methods & Reporting page appears.

13. Select the **Use Application Template** check box.

14. From the drop-down lists, select the type of suppressor to be installed and then select the column.

   In the example in Figure 100, the 4-mm ASRS suppressor and AS17 column are selected.

Figure 100. Example: Sequence Wizard Step 4

15. To select a report template, click the **Browse** button, go to the Dionex Templates/Reports folder, and select a template (for example, **default)**.

16. Click **Next>**.

   The Saving the Sequence page appears.

17. Enter a name for the sequence and a location (see the example in <u>Figure 101</u>).

Figure 101. Example: Sequence Wizard Step 5

18. Click **Finish>** and then click **Done** on the last page of the Sequence Wizard.

The Browser appears, displaying the sequence you created (see Figure 102). Notice the three files in the top pane of the Browser window.
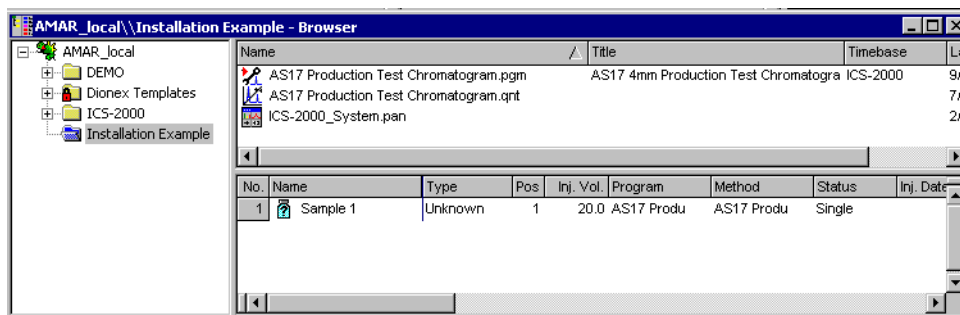
Figure 102. Example Browser with Open Sequence

• The .pgm file (program) contains commands and parameters for controlling the ICS-2000, controlling the autosampler (if used), and acquiring sample data.

• The .qnt file (quantification method) contains peak identification and area determination parameters.

• The .pan file (Control panel) lets you control and/or monitor the ICS-2000 and other modules that are connected to the timebase.

> **NOTE** **The sequence that you create here is intended as a starting point only. You can add additional samples to the sequence, change injection parameters, and edit the .pgm and .qnt files. Refer to the Chromeleon online Help for details.**

> **NOTE** **After completing the installation, see Chapter 3 in the ICS-2000 operator's manual (Document No. 031857) for how to process the samples and standards in the sequence. The manual is on the Dionex Reference Library CD-ROM (P/N 053891).**

19. Double-click the .pan file to open the Control panel for your system (see the example in Figure 103).

Figure 103. ICS-2000 System Control Panel Example

NOTE   **If the Connected check box is not selected, click the box to connect the ICS-2000 to the Control panel.**

15.1   Verifying Chromeleon Communication

Verify that Chromeleon is communicating with the ICS-2000 by clicking the **Inject** and then the **Load** button on the Control panel. If communication is occurring, you will hear the valve actuate as it changes position. Go on to Section 12.

16   Equilibrating the System

1. After priming the pump, turn on the pump and set the flow to the operating rate.

2. Flush the system for about 5 minutes to equilibrate.

3. Monitor the system pressure reading from the Chromeleon Control panel.

    The EluGen cartridge requires at least 14 MPa (2000 psi) of system backpressure for removal of electrolysis gas from the eluent produced by the cartridge. A system backpressure of 16 MPa (2300 psi) is ideal. If the pressure is too low, install a backpressure coil (see Section 16.1).

IMPORTANT	**The recommended maximum operating pressure for the eluent generator is 21 MPA (3000 psi). Excessive backpressure may rupture the tubing in the EGC degas tubing assembly.**

4. Check that liquid is flowing out of the suppressor **REGEN OUT** waste line and that the pressure is stable.

5. Monitor the baseline conductivity. In general, it should be <30 μS for a system set up for anion analyses, and <2 μS for a system set up for cation analyses. Equilibration time varies and it can take some time to reach these expected values.

6. Go on to Section 17.

16.1   EluGen Cartridge Backpressure Requirements

The EluGen cartridge requires at least 14 MPa (2000 psi) of backpressure for optimal removal of electrolysis gas from the eluent produced by the cartridge. During system equilibration (see Section 16), monitor the system pressure and verify that it is between 14 and 20 MPa (2000 and 3000 psi). A system backpressure of 16 MPa (2300 psi) is ideal.

If the pressure is too low, install a backpressure coil between the injection valve and the eluent outlet. The backpressure coils listed in the table below are included in the ICS-2000 Ship Kit (P/N 064375).

Connect one end of the backpressure coil to port **P** (**2**) on the injection valve; connect the other end to the **TO INJ VALVE IN - P/ELUENT OUT** line or to the mixer outlet, if an EGC CO3 Mixer is installed.

Part Number	Description	Flow Rate	Approximate Back-pressure Added
053763	4-mm Backpressure Coil (red)	2.00 mL/min 1.00 mL/min	7 MPa (1000 psi) 3.5 MPa (500 psi)
053762	4-mm Backpressure Coil (red)	2.00 mL/min 1.00 mL/min	3.5 MPa (500 psi) 1.75 MPa (250 psi)
053765	2-mm Backpressure Coil (yellow)	0.50 mL/min 0.25 mL/min	7 MPa (1000 psi) 3.5 MPa (500 psi)
053764	2-mm Backpressure Coil (yellow)	0.50 mL/min 0.25 mL/min	3.5 MPa (500 psi) 1.75 MPa (250 psi)

17   Verifying Operational Status

After the system has equilibrated, verify the actual pump pressure and stability by monitoring the pump pressure reading on the Chromeleon Control panel (or the touch screen **HOME** page). Write down the short-term pressure fluctuations; they should be less than 0.13 MPa (20 psi).

18 Connecting an AS or AS50 (USB) Autosampler (Optional)

To use an AS or AS50 (USB) autosampler with the ICS-2000, the following requirements must be met:

- The ICS-2000 injection valve must be linked to the AS or AS50 (USB) in the Chromeleon timebase (see <u>Section 18.2</u>)

- An injection valve should not be installed in the AS or AS50 (USB) (see the note below)

After the AS or AS50 (USB) is connected to the ICS-2000 and the valve is linked in Chromeleon, all autosampler injection valve commands will control the ICS-2000 injection valve (whether issued from the AS or AS50 (USB) front panel or from Chromeleon). In addition, all AS or AS50 (USB) modes of injection (full-loop, partial-loop, partial-loop limited-sample, and others) are supported.

> **NOTE** **Dionex recommends using AS or AS50 (USB) models that do not have injection valves (see the list below). If a valve is installed in the autosampler, it is switched at the same time as the valve in the ICS-2000. This causes unnecessary wear on the autosampler valve. If required, the autosampler valve can be disconnected from the AS or AS50 (USB) electronics. If you wish to do this, contact Dionex for assistance. The AS or AS50 (USB) electronics components cannot be serviced by the user.**

The following AS50 (USB) and AS models can be used with an ICS-2000:

Part Number	Autosampler Model	Injection Valve	Sample Preparation	Sample Tray Cooling
061130	AS50 (USB)	No	No	Yes
061132	AS50 (USB)	No	Yes	Yes
061134	AS50 (USB)	No	No	No
061136	AS50 (USB)	No	Yes	No
063102	AS	No	No	No
063103	AS	No	Yes	No
063106	AS	No	No	Yes
063107	AS	No	Yes	Yes

NOTE **The ICS-2000 and the AS or AS50 (USB) can be set up for stand-alone (front-panel) operation. This requires a TTL cable connection between the AS or AS50 (USB) and the ICS-2000. See the TTL appendix in the ICS-2000 operator's manual for stand-alone setup instructions.**

18.1 AS or AS50 (USB) Connections

1. Place the autosampler to the left of the ICS-2000 on the workbench.

2. Open the ICS-2000 and autosampler doors.

3. The needle seal line that extends from the inject port in the autosampler is coiled inside the autosampler door, on the right side. Route this line through the autosampler right side slot (see Figure 104) and the ICS-2000 left side slot to the ICS-2000 injection valve.

|IMPORTANT| **The needle seal line from the autosampler inject port to the ICS-2000 injection valve is calibrated for use with the ICS-2000. To ensure injection precision, do not shorten (by cutting) or lengthen this line, or replace it with a different (uncalibrated) line.**
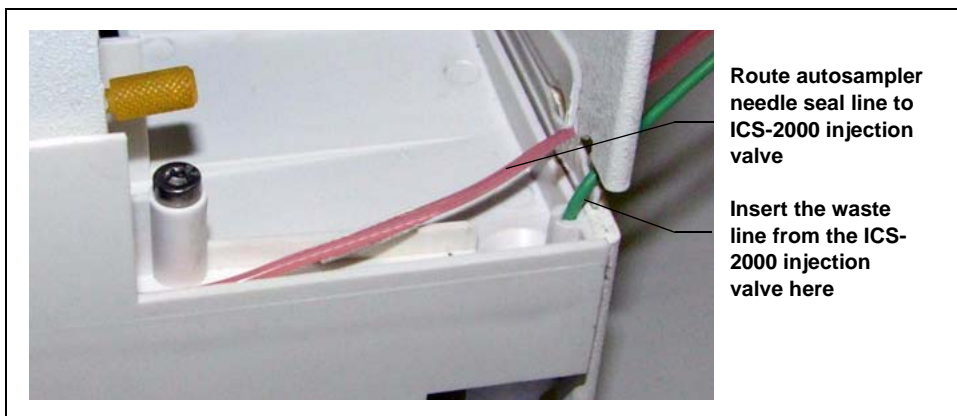

Route autosampler needle seal line to ICS-2000 injection valve

Insert the waste line from the ICS-2000 injection valve here

Figure 104. Autosampler Drip Tray

4. Connect the needle seal line from the autosampler to port **S (5)** on the injection valve (see Figure 105).

    The green waste line that is connected to port **W (6)** on the injection valve (see Figure 105) is connected with a coupler to a Teflon waste line (see Figure 106) and routed through the tubing chase to the ICS-2000 rear panel.
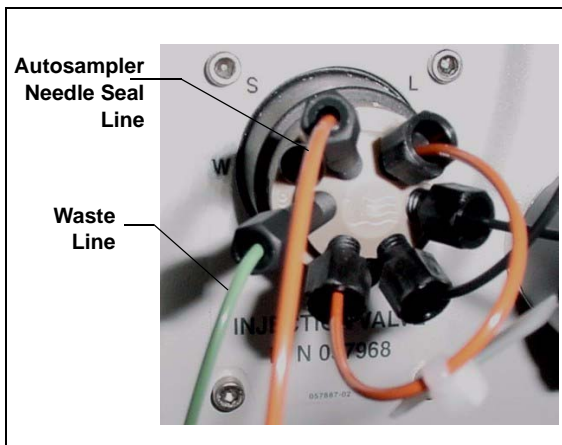

Figure 105. ICS-2000 Injection Valve

5. Disconnect the green waste line (labeled **AS/AS50 TRAY**) from the coupler and route the line to the drip tray in the autosampler compartment.

    You can either leave the disconnected Teflon waste line and coupler in the tubing chase, or pull the line out from the front.
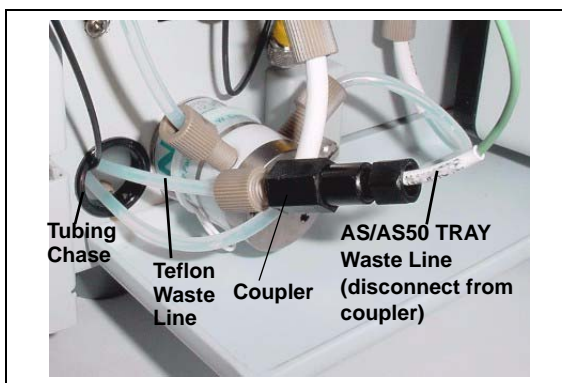
Figure 106. Injection Valve Waste Line Coupler

6. Push the end of the green **AS/AS50 TRAY** line into the small round opening on the right side of the AS or AS50 (USB) tray (see Figure 104).

IMPORTANT

Make sure the injection valve waste line is not elevated above the injection valve at any point between the valve and the autosampler drip tray.

> **NOTE** **Bend the waste line tubing about 5-mm from the end to ensure it stays in place in the opening in the drip tray. When bending the tubing, be sure not to restrict the inner diameter.**

18.2   AS or AS50 (USB) Chromeleon Setup

1. If you have not already done so, add the autosampler to the Chromeleon timebase (see Section 8).

2. In the ICS-2000 Server Configuration properties, verify that the injection valve is controlled by the autosampler. To do this:

    a. Open the Chromeleon Server Configuration program and select the ICS-2000 device in the timebase.

    b. Select **Properties** on the **Edit** menu.

    c. Select the **Inject Valve** tab.

    d. Verify that the **Pump_InjectValve** check box is selected and that **AS** is listed in the **Controlled By** column (see Figure 107).

    e. If **ICS-2000** is listed in the **Controlled By** column, select the **Pump_InjectValve** name and press the **F2** key. A dialog box appears. Select **AS** in the **Controlled by** drop-down list.
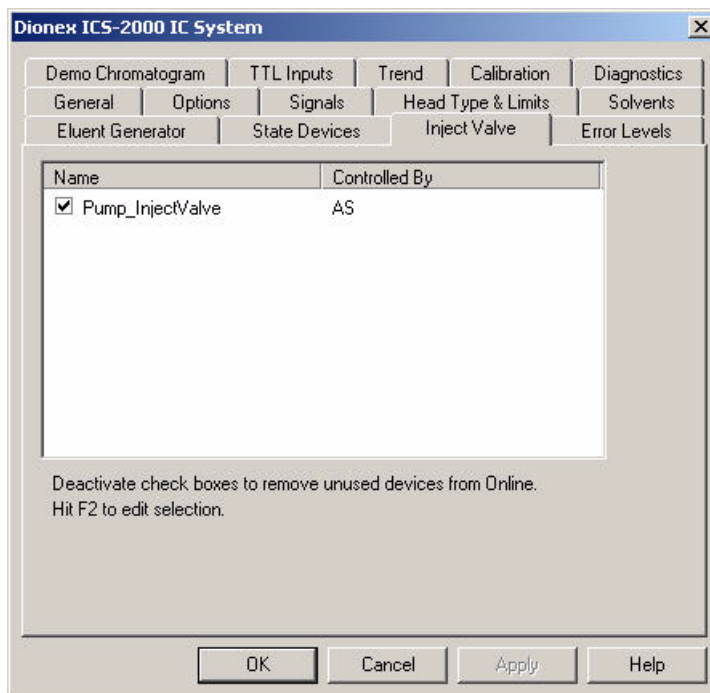

Figure 107. ICS-2000 Inject Valve Server Configuration Properties

19   Connecting an AS40 Automated Sampler (Optional)

1. Place the AS40 to the left of the ICS-2000 on the workbench.

2. Open the front door of the ICS-2000 and thread the outlet line from the AS40 through the left side slot at the front of the ICS-2000.

3. Connect the outlet line from the AS40 to port **S (5)** of the injection valve (see Figure 108).
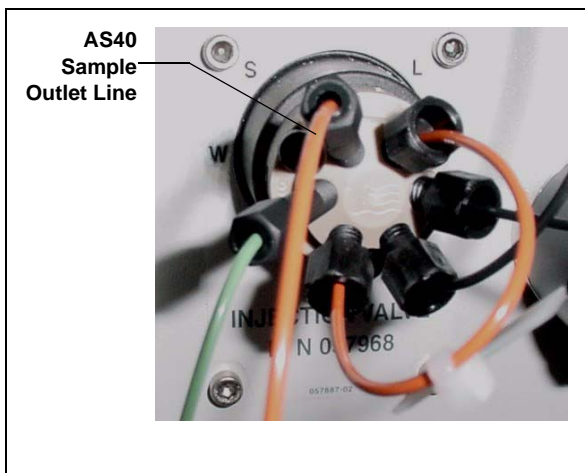

Figure 108. ICS-2000 Injection Valve

4. Locate the relay control cable (P/N 047946) supplied with the AS40.

5. Remove the 2-position connector plug from the pair of wires labeled **LOAD** on the relay control cable.

6. Locate the 12-position connector plug (P/N 923686) in the ICS-2000 Ship Kit (P/N 064375) (see Figure 109).

7. Attach the red wire from the relay control cable to position 1 on the plug, and attach the green wire to position 2. This will be used to connect the AS40 **LOAD** relay to **RELAY OUT 1** on the ICS-2000.
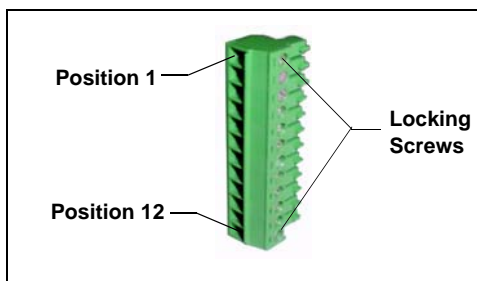

Figure 109. 12-Position Connector Plug

To attach a wire to the plug, strip the end of the wire, insert it into the plug, and use a screwdriver to tighten the locking screw.

⚠ **CAUTION**   **When attaching wires to the connector plug, be careful not to allow stray strands of wire to short to the adjoining position on the connector.**

> **NOTE** **If RELAY OUT 1 is not available, you can connect to RELAY OUT 2 or to one of the TTL outputs. For RELAY OUT 2, connect the red wire to position 3 and the green wire to position 4. For TTL OUT 1, connect the red wire to position 5 and the green wire to position 11. For TTL OUT 2, connect the red wire to position 6 and the green wire to position 12.**

8.   Connect the relay control cable's 10-position connector plug to the **RELAY CONTROL** connector on the AS40 rear panel (see Figure 110).

9.   Plug the 12-position connector plug into the TTL and relay connector on the ICS-2000 rear panel (see Figure 110). Make sure the red wire connects to position 1 and the green wire connects to position 2.
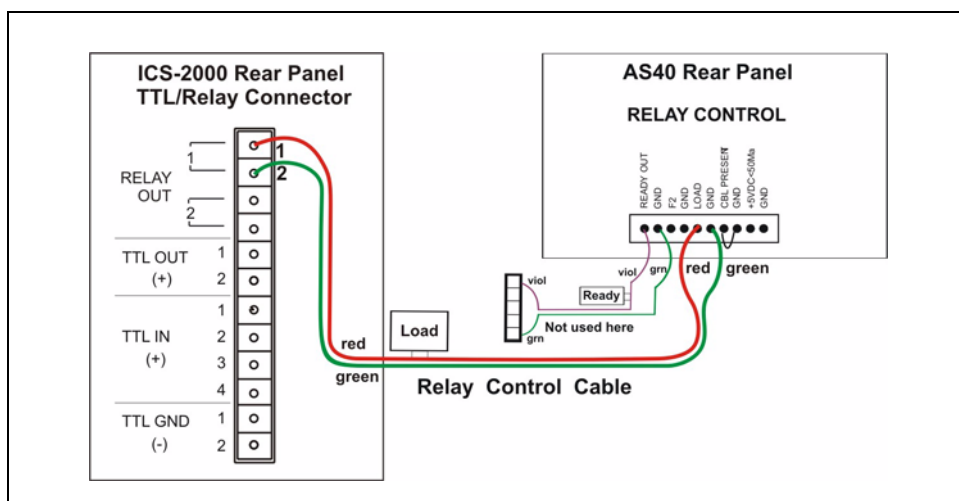

Figure 110. Example AS40 Autosampler Connection

The AS40 Load relay is now dedicated to the ICS-2000 **RELAY OUT 1**. Use this relay for running with Chromeleon. When you set up the ICS-2000 application (see Section 15), commands for controlling the AS40 Load relay and switching

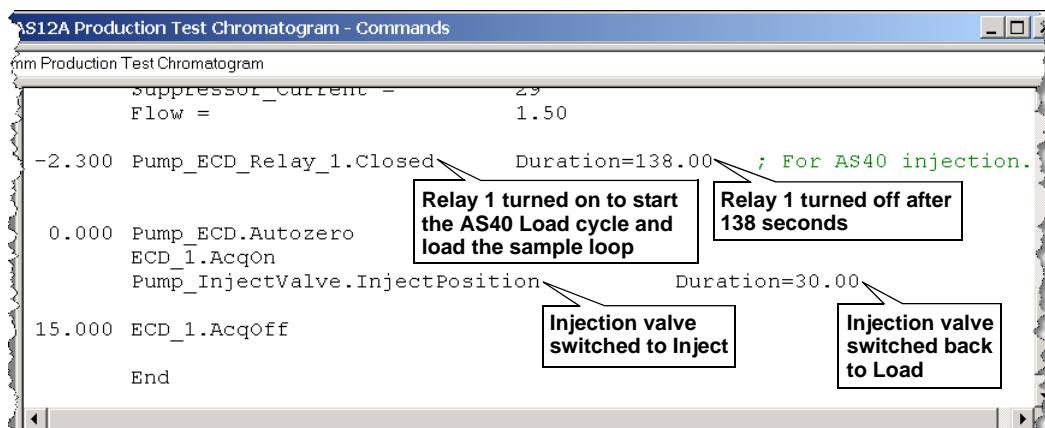the ICS-2000 injection valve are included by default in the program file (see
Figure 111).

Figure 111. Example Program for AS40 Control

20 Connecting the Analog Output (Optional)

The analog output connector on the ICS-2000 rear panel outputs an analog voltage
signal proportional to the conductivity measured by the cell. The selected data rise
time filters the output. The analog output can be connected to an analog-to-digital
converter such as an integrator or other recording device. Refer to the
documentation for the device for connection instructions.

Analog output is 0 to 1V, scaled to the selected range.

For an example setup for ICS-2000 stand-alone operation with an AS or AS50
(USB) autosampler, see the TTL appendix in the ICS-2000 operator's manual.

21 Pressurizing the Eluent Reservoir (Optional)

The ICS-2000 does not require pressurized reservoirs. However, if eluent is
manually degassed or is sensitive to contamination, Dionex recommends
pressurizing the reservoir with helium or nitrogen. The air regulator accessory
bracket and other items needed for pressurizing the eluent reservoir must be
ordered separately (P/N 060054).

21.1   Connect the Gas Source

1. Locate the barbed fitting (P/N 030071), pipe thread reducer (P/N 030087), 3-mm (1/8-in) ID tubing (P/N 040793), and ICS-2000 air regulator accessory (P/N 060054). These parts must be ordered separately.

2. Use the barbed fitting and pipe thread reducer to connect the 3-mm (1/8-in) ID tubing to a clean gas source, regulated to between 0.55 and 0.83 MPa (80 and 120 psi).

3. Push the other end of the tubing onto the inlet of the air regulator (see Figure 112).

4. Remove the eluent reservoir cap.

5. Connect the gas line from the eluent reservoir cap to the gas line on the air regulator outlet.s

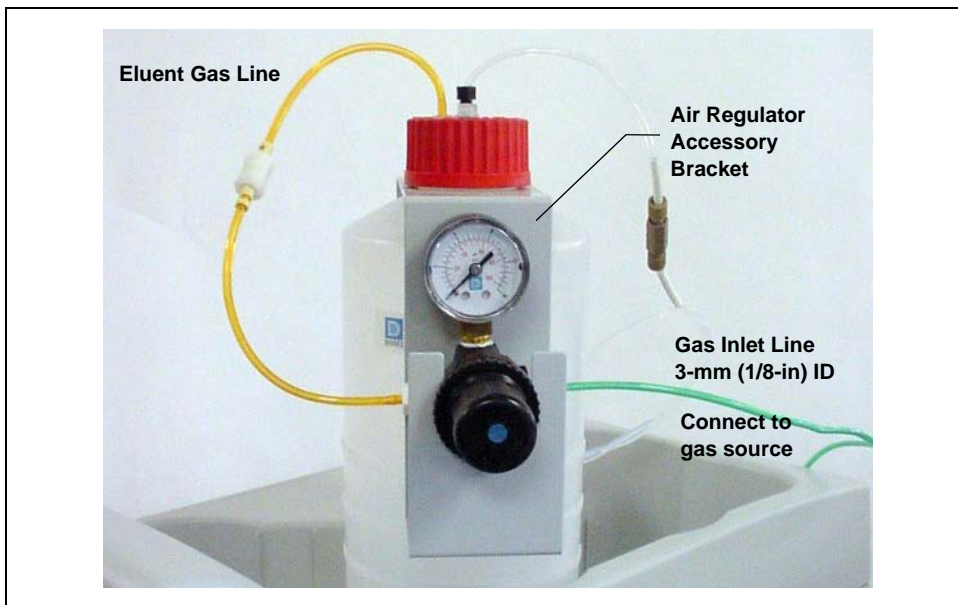6. Slip the air regulator accessory bracket over the neck of the eluent reservoir (see Figure 112).

Figure 112. ICS-2000 Pressurized Eluent Reservoir Connections (Optional)

21.2 Pressurize the Eluent Reservoir

> **NOTE Do not pressurize the ICS-2000 until after the reservoir is plumbed.**

1. Pull out the air regulator knob and turn it fully counterclockwise to ensure there is no pressure to the reservoir when the gas source is turned on.

2. Turn on the gas source.

3. Pull out the air regulator knob and turn it clockwise to pressurize the eluent reservoir.

4. Adjust the pressure to between 0.03 and 0.04 MPa (5 and 6 psi). Push the regulator knob back in.

Do not pressurize the eluent reservoir above 0.07 MPa (10 psi).

Ne mettez jamais les réservoirs d'éluants sous une pression supérieure à 0,07 MPa (10 lb/po²).

Setzen Sie den Eluentbehälter auf keinen Fall einem Druck über 0,07 MPa aus.

22   Pump Continuous Seal Wash Connections (Optional)

The pump includes a seal wash assembly that can be set up to continuously rinse the back of the piston seals to remove salt crystals and prolong the life of the seals. Follow the steps below to set up this feature.

1. Fill a flush bottle with either deionized water or a combination of deionized water and 10% or 20% isopropyl alcohol. (Isopropyl alcohol will inhibit bacterial growth in the water.)

2. Place the flush bottle on top of the ICS-2000. During operation, gravity maintains flow through the pump heads.

3. The flush solution is carried to the piston seal wash assembly and out to waste via 1.5-mm (0.06-in) ID tubing (P/N 055847). Locate this tubing in the ICS-2000 Ship Kit (P/N 064375)and cut the tubing into three unequal pieces in the following lengths:

   • 117 cm (46 in)

   • 152 cm (60 in)

   • 15 cm (6 in)

4. Install the tubing as follows (see Figure 113 and Figure 114):

   a. Push the 117-cm (46-in) piece of clear tubing onto the drain tube on the bottom of the *secondary* pump head. Place the free end of this tubing in the flush bottle. Make sure the end of the tubing is near the bottom of the bottle.
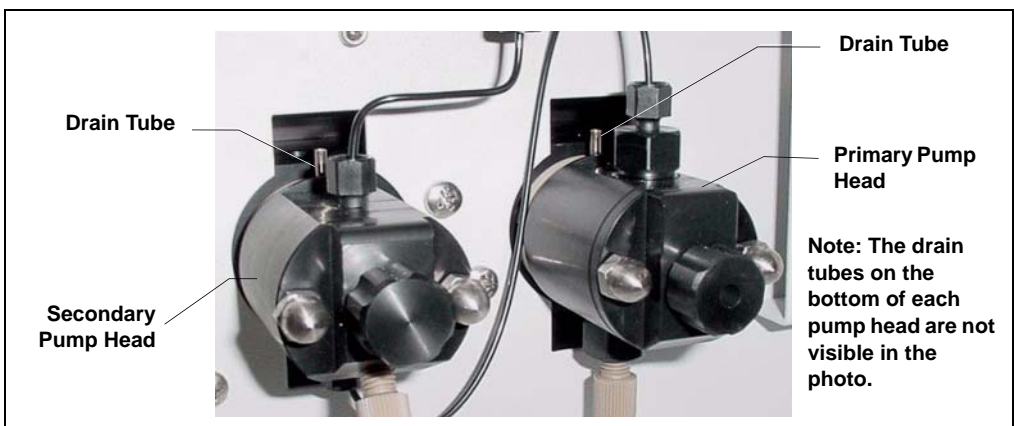

Figure 113. Primary and Secondary Pump Heads with Drain Tubes

b. Push the 152-cm (60-in) piece of clear tubing onto the drain tube on the top of the *primary* pump head. This is the waste line. Route this waste line through the lower tubing chase and out the back of the ICS-2000.

c. Push the 15-cm (6-in) piece of clear tubing over the drain tube on the top the *secondary* pump head. Push the other end of the tubing over the drain tube on the bottom of the *primary* pump head.

d. Place a 10 mL syringe (P/N 054578) at the end of the waste line, press the syringe against the line to form a seal, and draw out all of the air.

e. Push approximately 5 cm (2 in) of black 0.25-mm (0.01-in) ID tubing (P/N 057057) into the end of the waste line.

> **NOTE** **The black tubing creates a flow restriction. Assuming a height difference of about 76 cm (30 in) between the flush bottle and the waste container, this setup provides a flow of one drop of flush solution every 5 to 30 seconds.**

f. Place the end of the waste line in a waste container.

g. This completes the piston seal wash installation. Periodically refill the flush bottle and empty the waste container as required.
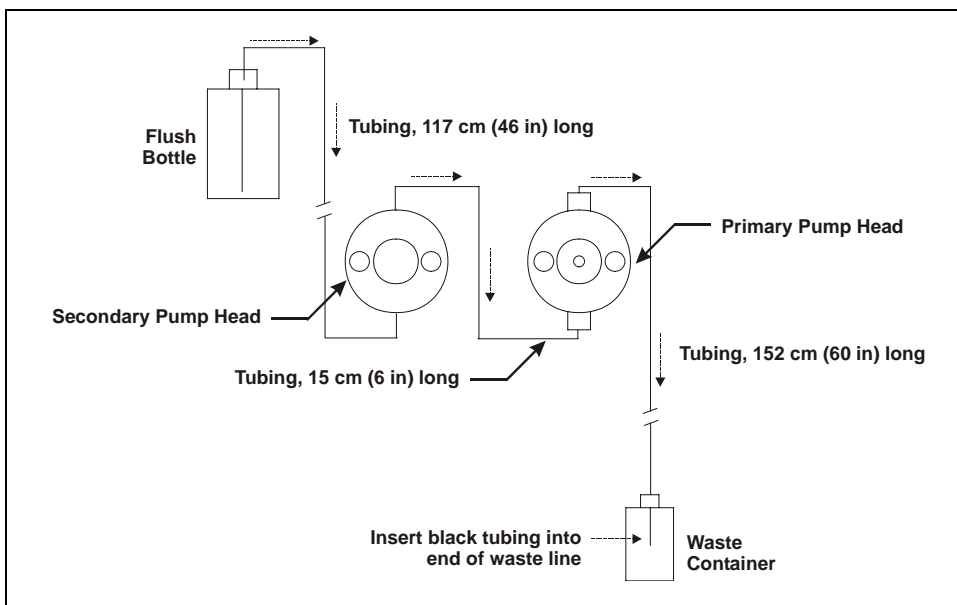

Figure 114. Piston Seal Wash Flow Schematic

23   Manually Connecting to a Control Panel

This section describes how to manually connect the ICS-2000 to a Control panel if you do not use the application templates described in <u>Section 15</u>.

1. In the Browser, expand the **Dionex Templates\Panels\Dionex_IC\ICS-2000 System Panels** folder. Several System Control panels, corresponding to various system configurations, are provided.

2. Open the panel for your system configuration by double-clicking its name in the list. For example, if your system includes an ICS-2000 and an AS50 autosampler, double-click either **ICS-2000_System_AS50.pan** or **ICS-2000_Traditional_System_AS50.pan**.

> **NOTE**   **The two types of panels (system and traditional system) are similar in function, but have different "looks." You can select either style, depending on your personal preference.**

When the Control panel opens, the controls on the panel are not enabled (see <u>Figure 115</u>).
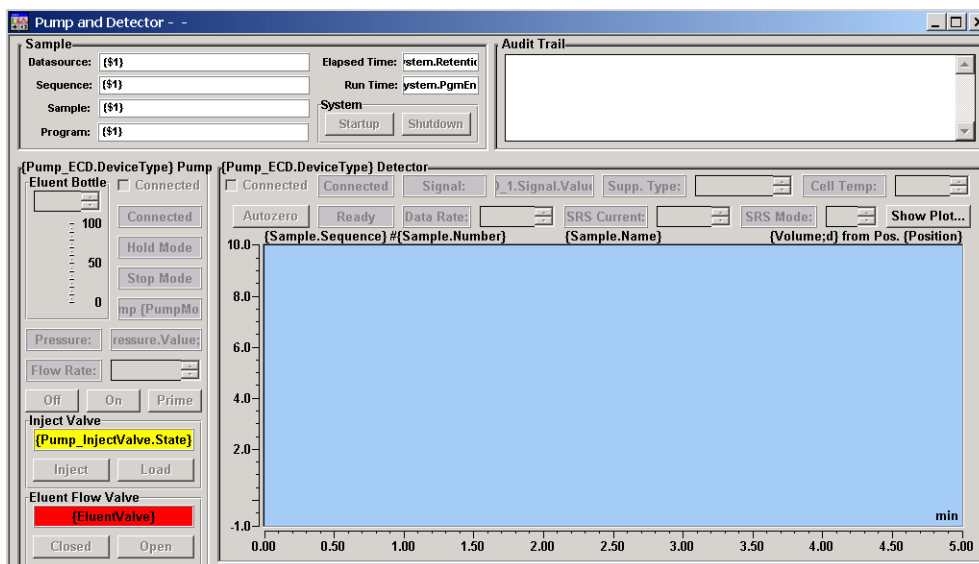

Figure 115. ICS-2000 Traditional System Control Panel (Unconnected)

3. To connect the Control panel to the ICS-2000, open the **Control** menu and click the name of the ICS-2000 timebase at the bottom of the menu.

    The Control panel is now connected to the ICS-2000 and the controls are enabled (see Figure 116).
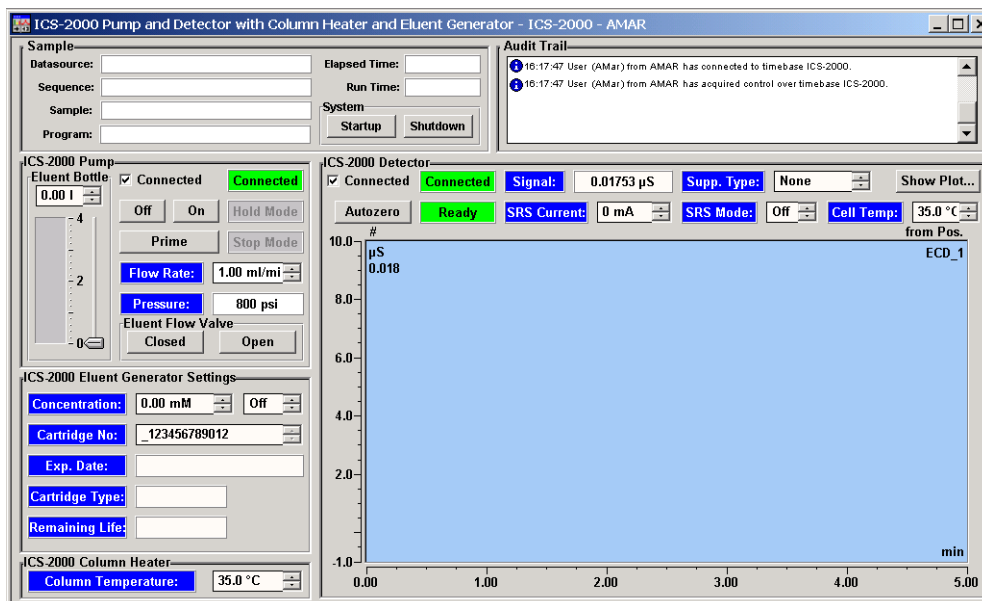

Figure 116. ICS-2000 Traditional System Control Panel (Connected to the ICS-2000)

This completes the ICS-2000 installation procedure. For routine operation, refer to *ICS-2000 Ion Chromatography System Operator's Manual* (Document No. 031857). The manual is on the Dionex Reference Library CD-ROM (P/N 053891).

24   Installation Troubleshooting

Problem: When the ICS-2000 power is turned on for the first time, a Windows message box appears asking for a USB configuration file (cmwdmusb.inf).

Possible Cause: The USB cable was connected and the power turned on before Chromeleon was installed.

Solutions:

Follow these steps to resolve the problem:

1. Click **Cancel** in the Windows message box.

2. Turn off the power to the USB device and unplug the USB cable from the computer.

3. Install Chromeleon (see Section 4).

4. Reconnect the USB cable to the computer and turn on the power to the device. Windows will now automatically recognize the USB device.