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Installing the RFIC-ER Startup Kit for Dionex ICS-1100 and ICS-1600 Ion Chromatography Systems

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For Research Use Only. Not for use in diagnostic procedures.

Contents

Installing the RFIC-ER Startup Kit for the Dionex ICS-1100/ICS-1600

1. Introduction

Reagent-Free™ Ion Chromatography with Eluent Regeneration (RFIC-ER™) is a low-cost alternative to RFIC™ Eluent Generation (RFIC-EG™) systems. Rather than generating eluent electrolytically from water, using an eluent generator with an electrolyte solution, RFIC-ER uses the recycled eluent mode of operation of the electrolytic suppressor to regenerate the starting eluent.

The starting eluent for the RFIC-ER system is prepared manually, as usual. After suppression and regeneration, the eluent passes through a series of purification columns before being returned to the eluent bottle. With the closed-loop RFIC-ER system, the original 4 liters of eluent can be used for up to four weeks of continuous operation.

The Thermo Scientific Dionex™ ICS-1100 and ICS-1600 Ion Chromatography Systems are RFIC-ER–ready when shipped from the factory. To complete the installation, order the appropriate kit for your application:

- RFIC-ER Anion Startup Kit, Dionex ICS-1100/ICS-1600 (P/N 069570)
- RFIC-ER Cation Startup Kit, Dionex ICS-1100/ICS-1600 (P/N 069569)

Each Startup Kit includes one Installation Kit and one Consumables Kit. Together, these kits contain all the consumable and non-consumable items required to operate an RFIC-ER system nonstop for 6 to 12 months.

NOTE The SRS™ 300 Suppressor is the only suppressor compatible with RFIC-ER.

NOTE For information about installing an AC-ER Anion Concentrator Column in the RFIC-ER system and operating in concentrator mode, see Section 12.

2. Safety Information

The ER Controller (ERC 10) is an integral element of the RFIC-ER system. The ERC 10 electronics monitor the volume of electrolysis gases (such as hydrogen and oxygen) in the eluent stream. If the predefined safety limit is exceeded, the ERC 10 shuts down the pump to prevent the buildup of gases in the eluent bottle.

2.1 Safety Messages

This manual contains warnings and precautionary statements that, when followed properly, can prevent personal injury and/or damage to the ERC 10. Safety messages appear in bold type and are accompanied by icons, as shown below.

Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

Indicates a potentially hazardous situation which, if not avoided, may result in death or serious injury.

Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

Indicates that the function or process of the instrument may be impaired. Operation does not constitute a hazard.

Messages d'avertissement en français

Signale une situation de danger immédiat qui, si elle n'est pas évitée, entraînera des blessures graves à mortelles.

Signale une situation de danger potentiel qui, si elle n'est pas évitée, pourrait entraîner des blessures graves à mortelles.

Signale une situation de danger potentiel qui, si elle n'est pas évitée, pourrait entraîner des blessures mineures à modérées. Également utilisé pour signaler une situation ou une pratique qui pourrait gravement endommager l'instrument mais qui n'entraînera pas de blessures.

Warnhinweise in Deutsch

Bedeutet unmittelbare Gefahr. Mißachtung kann zum Tod oder schwerwiegenden Verletzungen führen.

Bedeutet eine mögliche Gefährdung. Mißachtung kann zum Tod oder schwerwiegenden Verletzungen führen.

Bedeutet eine mögliche Gefährdung. Mißachtung kann zu kleineren oder mittelschweren Verletzungen führen. Wird auch verwendet, wenn eine Situation zu schweren Schäden am Gerät führen kann, jedoch keine Verletzungsgefahr besteht.

Informational messages also appear throughout this manual. These are labeled **NOTE** and are in bold type:

NOTE NOTES call attention to certain information. They alert users to an unexpected result of an action, suggest how to optimize instrument performance, etc.

2.2 ERC 10 Labels

The TUV GS and cTUVus Mark safety labels and the CE Mark label on the ERC 10 indicate that the ERC 10 is in compliance with the following standards and directives.

EMC Susceptibility and Immunity

- EN 61326 1997 + A1:1998 + A2:2001
- Low-Voltage Equipment Directive 73/23/EEC
- EMC Directive 89/336/EEC

Safety

- EN 61010-1:2001
- CAN/CSA-C22.2 No. 61010-1:2004
- UL 61010-1:2004

These symbols appear on the ERC 10 or on ERC 10 labels:

Alternating current

Protective conductor terminal

Power supply is on

Indicates a potential hazard. Refer to the user manual for an explanation of the hazard and how to proceed.

2.3 ERC 10 Specifications

Main Power	5 volts DC Typical input power: 25 mW Typical line draw: 5 mA
Operating Temperature	4 to 40 °C (40 to 104 °F)
Operating Humidity	5% to 95% relative humidity, noncondensing
Dimensions	Height: 18.7 cm (7.375 in) Width: 5.7 cm (2.25 in) Depth: 3.4 cm (1.375 in)
Weight	0.38 kg (0.83 lb)

3. Functional Description

This section presents a brief overview of key RFIC-ER components. For more information about the trap columns, refer to the column manual provided on the Thermo Scientific Reference Library DVD (P/N 053891).

Figure 1 illustrates the liquid flow path through an RFIC-ER system.

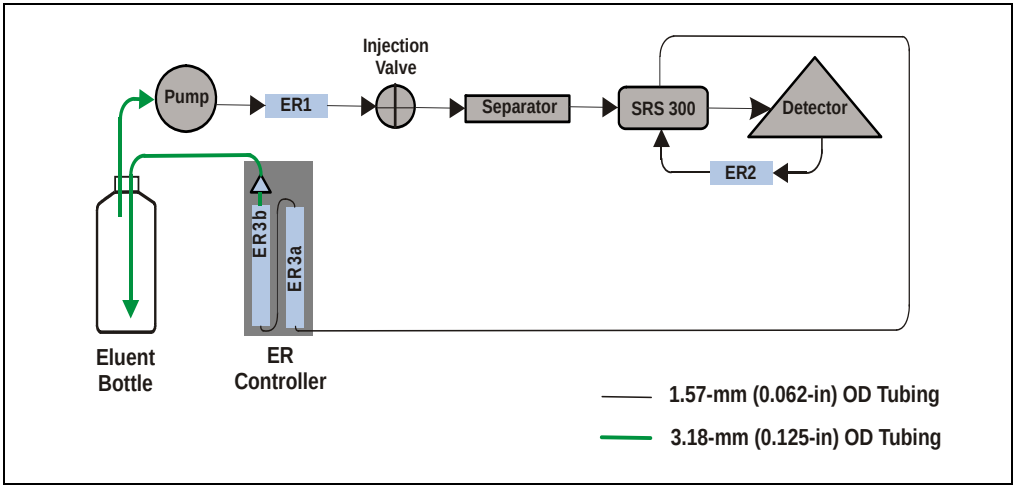


Figure 1. RFIC-ER System Fluid Schematic

The key to RFIC-ER is operating the suppressor in the recycled eluent mode. During the suppression operation, the suppressor exchanges the counterion of the eluent and analyte for hydronium (in anion systems) or hydroxide (in cation systems); during the regeneration operation, the counterion is returned to the eluent and the excess hydronium or hydroxide is neutralized. Thus, the ion balance is maintained throughout the entire suppression-regeneration process.

- The **ER1** is a Thermo Scientific Dionex IonPac™ Eluent Purification Column (anion column, AEP-ER1; cation column, CEP-ER1). The ER1 is a mixed-bed column that includes matrix trap material. The ER1 traps any contaminant species that may be liberated from the separator column or suppressor (or introduced by the sample), thus ensuring the purity of the regenerated eluent. The ER1 has a secondary purpose of trapping the matrix counterions introduced by the sample.

- The **ER2** is a Dionex IonPac Analyte Trap Column (anion column, AAT-ER2; cation column, CAT-ER2). When a sample is injected into the system, it is important that the ions introduced in the sample do not enter the eluent bottle. Analyte ions in the sample can increase the background conductivity of the eluent, while counterions can affect the recovery of certain analytes. The ER2 traps all analyte ions from the eluent stream, allowing the eluent to be regenerated for reuse.

  The anion ER2 contains high-capacity microporous anion exchange resin in the bicarbonate form. The cation ER2 contains high-capacity microporous cation exchange resin in the hydronium form.

- The **ER Controller** (**ERC 10**) is a gas monitor built into the Dionex ICS-1100 or Dionex ICS-1600. The ERC 10 tracks the volume of gas exiting the two ER3 Dionex IonPac Catalyzer Columns.

  During the suppression-regeneration process, water is electrolyzed to hydrogen and oxygen gases. In order to maintain the volume of the eluent, these gases need to be converted back to water. The **ER3a** column provides a delay that allows the most electroactive by-products to decay; the **ER3b** column has a platinum catalyst to complete the breakdown of any remaining electrolytic by-products and to reform water from the oxygen and hydrogen gases.

  If the volume of gas exiting the ER3 columns exceeds the predefined safety limit, the ERC 10 shuts down the pump.

- The 4-liter **eluent bottle** has a dual-line cap. The outlet line is directed from near the top of the eluent bottle, while the inlet line is directed to the bottom of the eluent bottle. Thus, eluent is pumped from the top of the bottle and returned to the bottom. Two gas vents in the eluent bottle cap ensure that any gases produced by the suppressor are safely vented to the atmosphere.

The eluent bottle and cap provided in the RFIC-ER Installation Kit are designed specifically for use with RFIC-ER systems. Do not operate the system with any other eluent bottle or cap.

La bouteille d'éluant et son bouchon fournis dans le kit d'installation du système RFIC-ER sont conçus spécifiquement pour les systèmes RFIC-ER. N'utilisez aucun autre type de bouteille ou de bouchon avec le système RFIC-ER.

Die Eluentenflasche und der Deckel aus dem RFIC-ER Installationskit sind speziell für die Verwendung mit einem RFIC-ER System bestimmt. Verwenden Sie mit diesem System keine anderen Eluentenflaschen oder Deckel.

4. Unpacking and Inspection

Unpack the shipping containers and verify that all items listed on the packing list are on hand.

The **RFIC-ER Anion Startup Kit, Dionex ICS-1100/ICS-1600** (P/N 069570) consists of:

- RFIC-ER Anion Installation Kit, Dionex ICS-1100/ICS-1600 (P/N 069568)
- RFIC-ER Anion Consumables Kit (P/N 067791)

The **RFIC-ER Cation Startup Kit, Dionex ICS-1100/ICS-1600** (P/N 069569) consists of:

- RFIC-ER Cation Installation Kit, Dionex ICS-1100/ICS-1600 (P/N 069567)
- RFIC-ER Cation Consumables Kit (P/N 067792)

Each Installation Kit contains all non-consumable items required for an RFIC-ER system, including the ER1 and ER2 mounting clips, ER3a and ER3b columns, and eluent bottle assembly.

Each Consumables Kit contains four ER1 columns and one ER2 column.

IMPORTANT **Substitution of non-Dionex/Thermo Fisher Scientific parts may impair system performance and void the product warranty. For details, refer to the warranty statement in the Dionex Terms and Conditions.**

5. Procedure Overview

These are the main steps in the RFIC-ER installation procedure:

- Install the ER3a and ER3b columns
- Install the eluent bottle
- Plumb the ER1 column for conditioning
- Condition the ER1 column
- Complete the ER1 column tubing connections
- Install the ER2 column
- Test the system for leaks
- Complete the tubing connections
- Update the Thermo Scientific Dionex Chromeleon® 7 or Chromeleon® 6.8 Chromatography Data System software, if necessary
- Configure device properties in the Instrument Configuration program (Chromeleon 7) or Server Configuration program (Chromeleon 6.8)
- For a new or freshly-regenerated SRS 300 only: Condition the SRS 300 for 16 hours

6. Initial Setup for Dionex ICS-1100/ICS-1600 Systems

To ensure that the eluent returned to the eluent bottle is identical in composition to the starting eluent, several RFIC-ER system components must be equilibrated before initial operation. This section describes the temporary connections required for equilibration.

6.1 Installing the ER3a and ER3b Columns

1. Verify that the Dionex ICS-1100 or Dionex ICS-1600 is set up as directed in the operator's manual. The manuals are included on the Thermo Scientific Reference Library DVD (P/N 053891).

2. Remove the ERC 10 from the instrument (Chromeleon 7) or timebase (Chromeleon 6.8) that contains the Dionex ICS-1100 or Dionex ICS-1600. **Do not remove the IC system from the instrument or timebase.**

IMPORTANT **During the initial setup, the pump in the Dionex ICS-1100 or Dionex ICS-1600 is used to condition the ER1 column and test the system for leaks. In order to use this pump, the ERC 10 must not be present in the instrument or timebase.**

3. Remove the coiled tubing and four straight pieces of tubing from the clip on the Dionex ICS-1100 or Dionex ICS-1600 rear panel (see Figure 2).

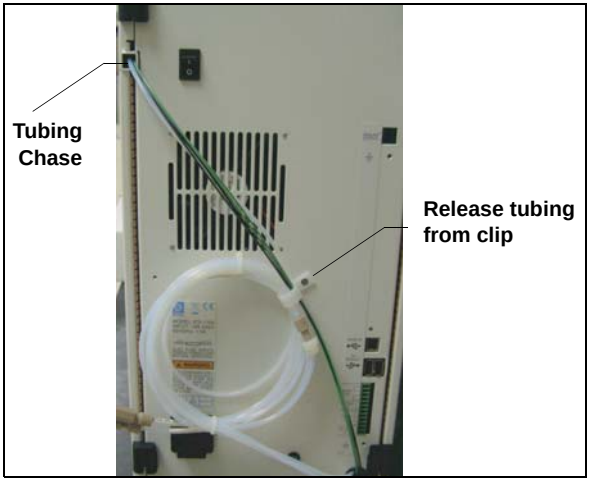


Figure 2. RFIC-ER Tubing and Tubing Clip

4. Lift up and remove the panel covering the RFIC-ER compartment on the right side of the Dionex ICS-1100 or Dionex ICS-1600 (see Figure 3).

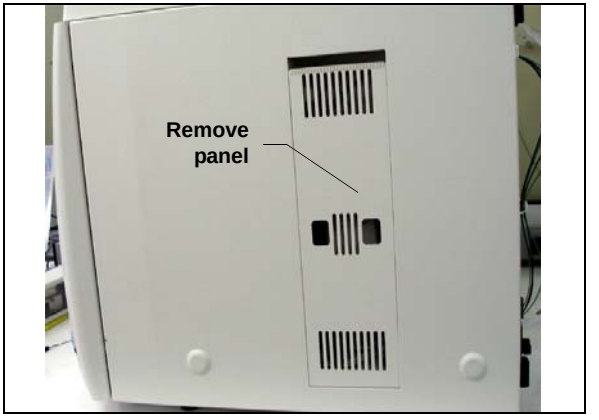


Figure 3. RFIC-ER Compartment Panel

5. Release the tubing from the clip on the left wall of the RFIC-ER compartment (see Figure 4).

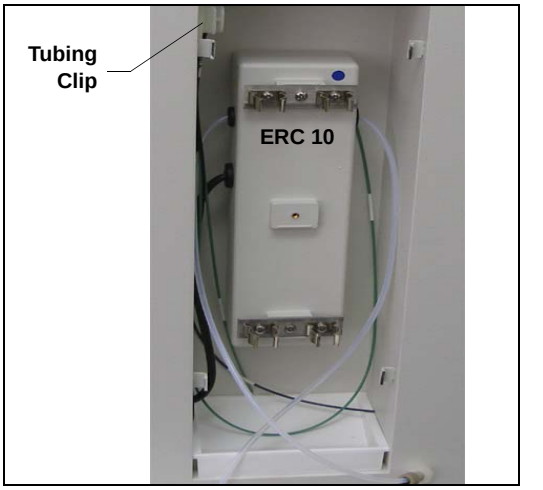


Figure 4. RFIC-ER Compartment Tubing Clip

6. Locate the ER3a and ER3b column assembly (anion assembly, P/N 068202; cation assembly, P/N 067803) in the RFIC-ER Installation Kit (see Figure 5).

   Tubing is connected to the ER3a column inlet and from the ER3a column outlet to the ER3b column inlet. **Do not remove this tubing or loosen the fittings.**

Figure 5. ER3a/ER3b Column Assembly

7. Remove the plug from the ER3b column outlet. Connect the short 1/8-in OD PTFE (polytetrafluoroethylene) tube from the left side of the ERC 10 (in the RFIC-ER compartment) to the ER3b column outlet.

8. Remove the acorn nut, fitting, and ferrule from the long 1/8-in OD PTFE tube connected to the right side of the ERC 10. (The tubing is labeled **To Eluent Bottle In**.) Feed this tube through the chase in the upper right corner of the RFIC-ER compartment until it emerges from the tubing chase in the upper left corner of the rear panel.

   NOTE Save the fitting and ferrule; you will use them in Section 6.7. You may discard the acorn nut.

9. Note the arrow on the ER3a and ER3b column labels. Install the columns, with the arrows pointing upward, on the mounting clips located on the ERC 10. Install the ER3a column on the right side of the compartment and the ER3b column on the left side (see Figure 6).

   NOTE The arrow on the column label indicates the direction of flow.

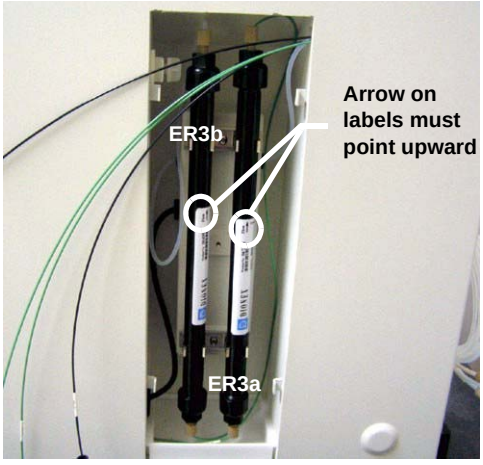


Figure 6. Installing the ER3a and ER3b Columns in the RFIC-ER Compartment

10. Remove the acorn nut, fitting, and ferrule from the green tubing connected to the ER3a column inlet. (The tubing is labeled **SRS Regen Out**.) Insert this end of the tubing into the waste drain hole in the RFIC-ER compartment (see Figure 7) and push the tubing until it emerges from the drain tubing in the component panel (see Figure 8).

    If a column heater is installed, you will need to remove it temporarily to avoid blockage of the green tubing.

    NOTE Save the fitting and ferrule. You may discard the acorn nut.

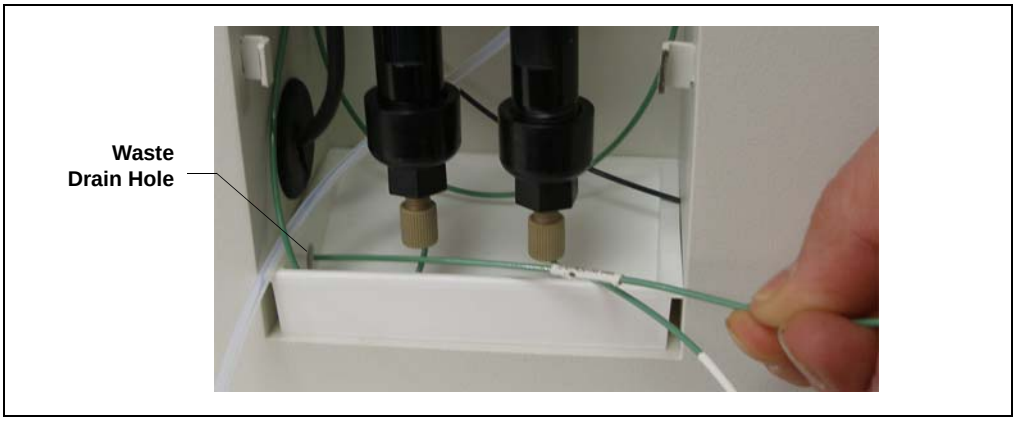


Figure 7. Routing the ER3a Column Inlet Tubing

11. Reinstall the fitting and ferrule onto the tubing connected to the inlet of the ER3a column. Connect the end of the green tubing labeled **SRS Regen Out** to the suppressor **Regen Out** port, and route the tubing behind the column holder for neatness (see Figure 8).
12. If you removed the column heater in Step 10, reinstall it now.

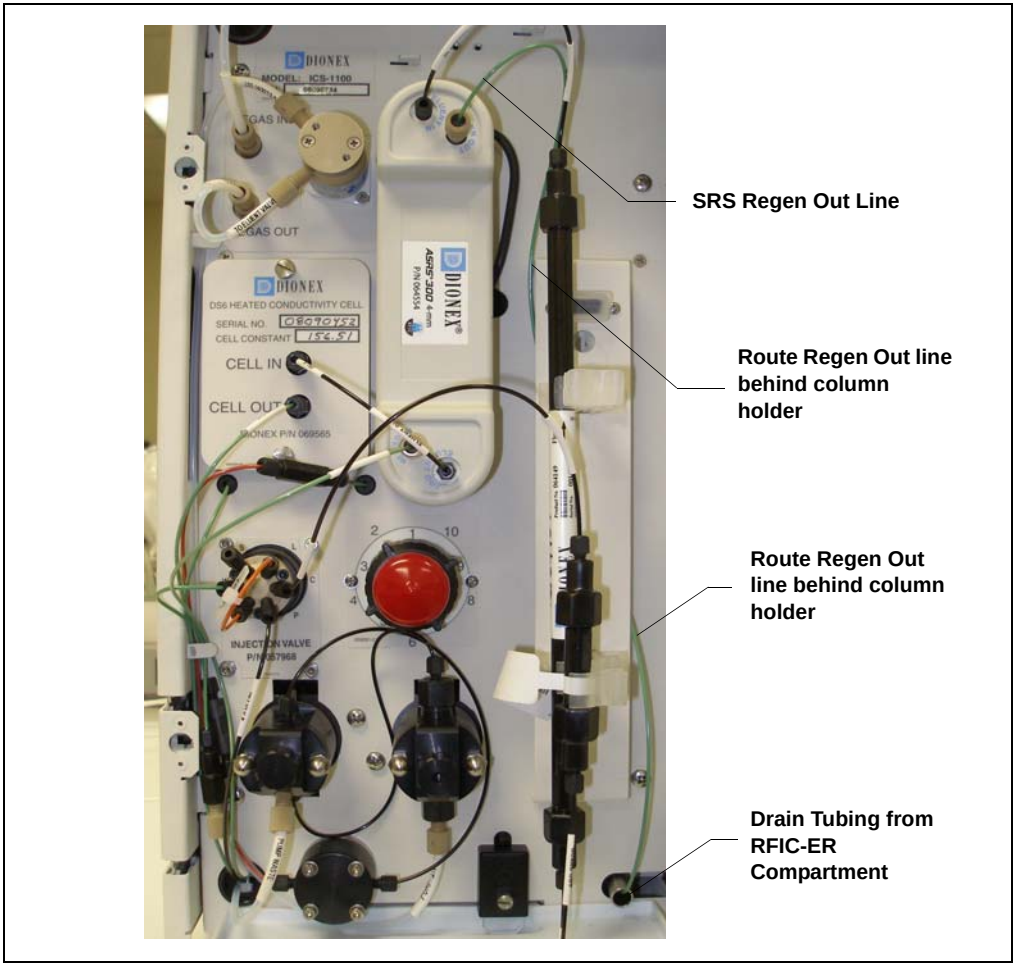


Figure 8. Connecting the SRS Regen Out Tubing (Dionex ICS-1100 Shown)

6.2 Installing the Eluent Bottle

1. Prepare 4 liters of the eluent required for the application. Always use ASTM Type I (18 megohm-cm) filtered, deionized water when preparing eluent.
2. Note the minimum and maximum fill marks on the eluent bottle (see Figure 9). Add fresh eluent up to the maximum fill mark.

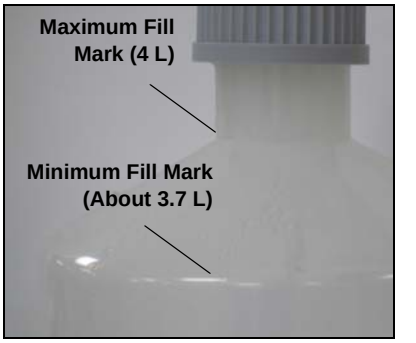


Figure 9. Eluent Bottle Fill Marks

IMPORTANT **If the eluent level falls below the minimum fill mark, the outlet tubing may not reach the fluid level and the pump may lose prime.**

3. Screw the cap onto the eluent bottle. Check that the two gas vents are seated in the cap and are free of obstructions (see Figure 10).

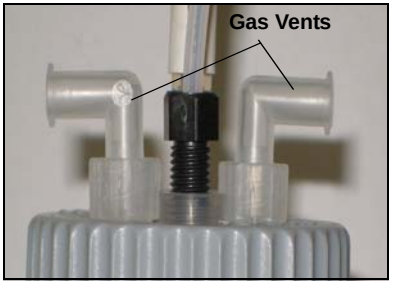


Figure 10. Gas Vents in Eluent Bottle Cap

CAUTION

Do not block the gas vents in the eluent bottle cap. If the ERC 10 malfunctions, the gas vents must be able to discharge any hydrogen and oxygen gases produced by the electrolytic suppressor to the atmosphere.

MISE EN GARDE

N'obturez pas les évents du bouchon de la bouteille d'éluant. En cas de défaillance de l'ERC 10, les évents doivent pouvoir évacuer vers l'atmosphère l'hydrogène et l'oxygène produits par le suppresseur électrolytique.

VORSICHT

Blockieren Sie keinesfalls die Öffnungen im Deckel der Eluentenflasche. Wenn der ERC 10 nicht korrekt arbeitet, müssen die vom elektrolytischen Supressor erzeugten Wasserstoff- und Sauerstoffgase über diese Öffnungen in die Atmosphäre gelangen können.

4. Push the **Eluent Bottle Out** tubing down so that the tubing label is against the cap, and then connect the tubing to the pump inlet line.
5. Prime the pump.
6. Make sure the suppressor has been hydrated as instructed in the *SRS 300 QuickStart*. Suppressor manuals are provided on the Thermo Scientific Reference Library DVD (P/N 053891).

6.3 Plumbing the ER1 Column for Conditioning

1. Disconnect the tubing labeled **TO INJ VALVE IN - P** from port **P (2)** on the injection valve.
2. Locate the tubing/coupler assembly labeled **PUMP OUT** in the lower left tubing chase of the component panel. Connect the tubing just removed from the injection valve to the tubing/coupler assembly (see Figure 11).

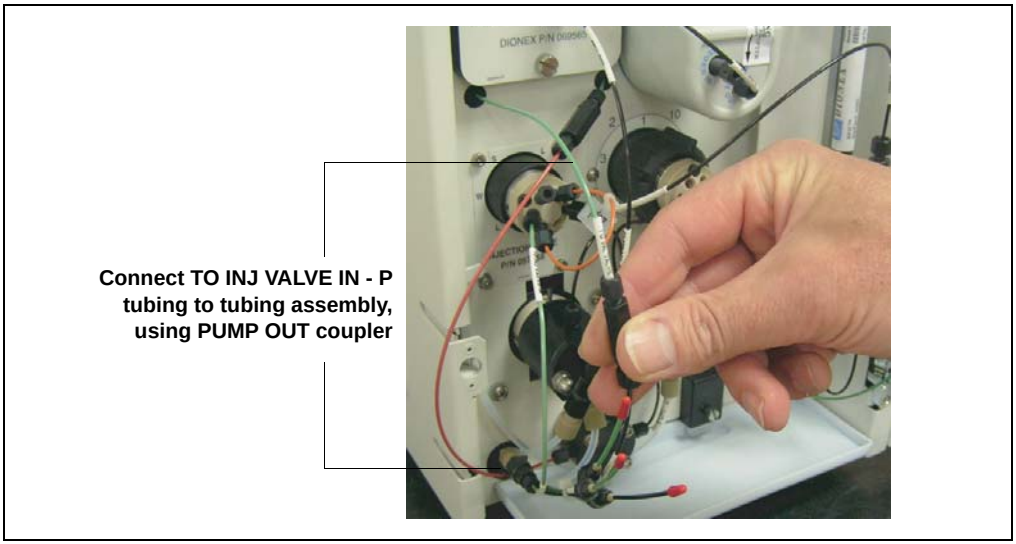


Figure 11. Connecting the ER1 Column for Conditioning

3. Locate the ER1 column in the RFIC-ER Consumables Kit.
4. In the RFIC-ER compartment, remove the coupler connecting the two black tubes (**ER1 IN** and **ER1 OUT**). Connect the tubing labeled **ER1 IN** to the ER1 column inlet. Connect the tubing labeled **ER1 OUT** to the ER1 column outlet.
5. Mount the ER1 column (with the inlet end at the top) onto the ER3a column, using one of the two ER1/ER2 bracket clips (P/N 069671) provided in the RFIC-ER Installation Kit. Install the ER1 column to the right of the ER3a and ER3b column assembly (see Figure 12).

Figure 12. Mounting the ER1 Column in the RFIC-ER Compartment

6. Note the tubing labeled **InjVlv P** extending from the lower tubing chase on the component panel. Direct the end of this tubing to a small waste container (see Figure 13).

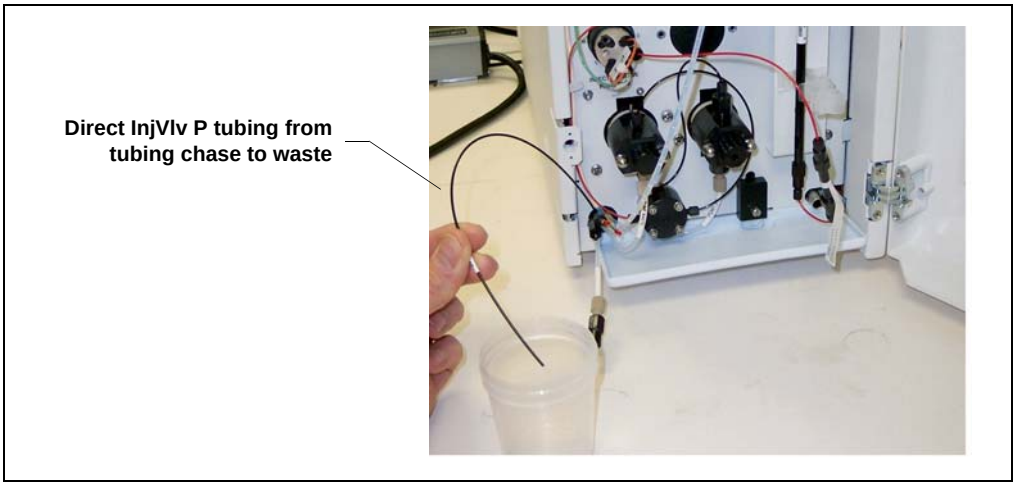


Figure 13. Completing Connections for ER1 Column Conditioning

6.4 Conditioning the ER1 Column

1. Verify that the suppressor is off.

IMPORTANT **To avoid damaging the suppressor, always turn off the suppressor before conditioning the ER1 column. Although the pump flow is on during conditioning, no flow will reach the suppressor.**

2. Set the pump flow rate to 2.0 mL/min and turn on the pump.
3. Rinse the ER1 column with eluent for 30 minutes. **Make sure the suppressor is not activated during this time.**
4. After 30 minutes, turn off the pump.

6.5 Completing the ER1 Column Connections

Remove the tubing labeled **InjVlv P** from the waste container. Connect the tubing to port **P (2)** on the injection valve (see Figure 14).

Figure 14. Connecting the ER1 Column to the Injection Valve

6.6 Installing the ER2 Column

1. Disconnect the black PEEK™ tubing that connects the **Cell Out** port of the detector cell to the suppressor **Regen In** port.
2. Note the green tubing labeled **Cell Out** extending from the lower left tubing chase on the component panel. Connect this tubing to the **Cell Out** port of the detector cell (see Figure 15).

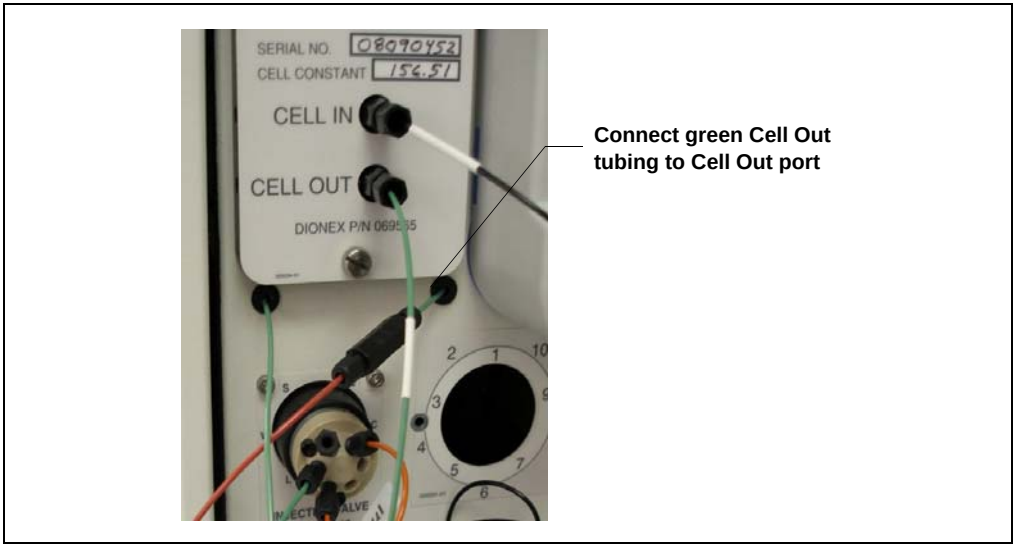


Figure 15. Connecting the ER2 Column to the Detector Cell

3. In the RFIC-ER compartment, remove the coupler connecting the two pieces of green tubing (**ER2 IN** and **ER2 OUT**).
4. Connect the tubing labeled **ER2 IN** to the inlet of the ER2 column.
5. Connect the tubing labeled **ER2 OUT** to the outlet of the ER2 column. Connect the other end of this tubing (which is labeled **SRS REGEN IN** and extends from the lower left tubing chase) to the suppressor **Regen In** port.

6. Mount the ER2 column (with the inlet end at the top) onto the ER3b column, using the remaining ER1/ER2 bracket clip (P/N 069671) from the RFIC-ER Installation Kit. Install the ER2 column to the left of the ER3a and ER3b column assembly (see Figure 16).

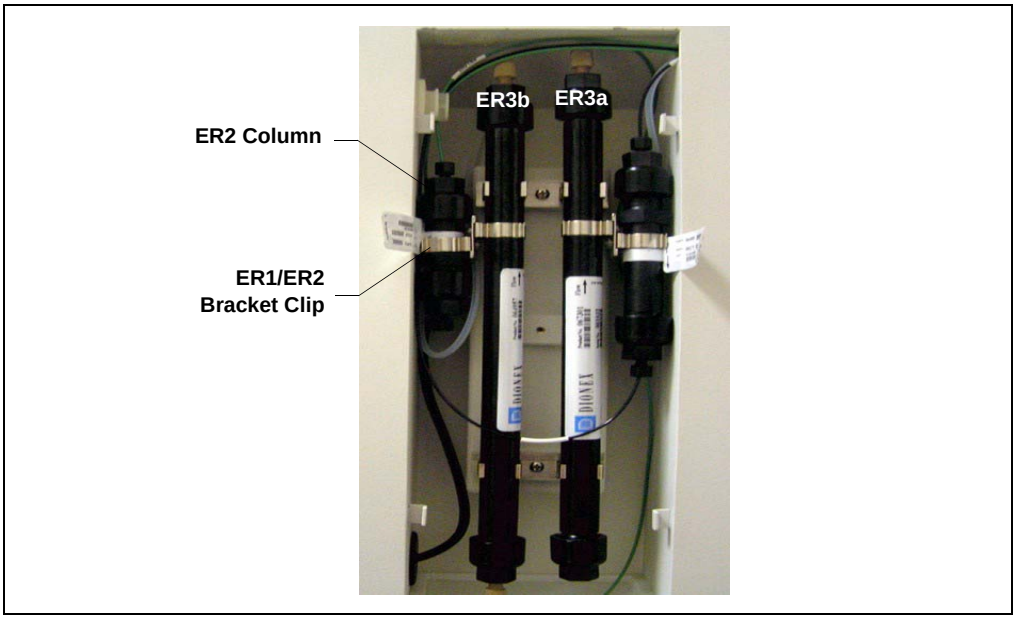


Figure 16. Mounting the ER2 Column in the RFIC-ER Compartment

7. Gather together all of the loose tubing in the RFIC-ER compartment, press the tubing into the clip on the left wall, and close the clip (see Figure 17).

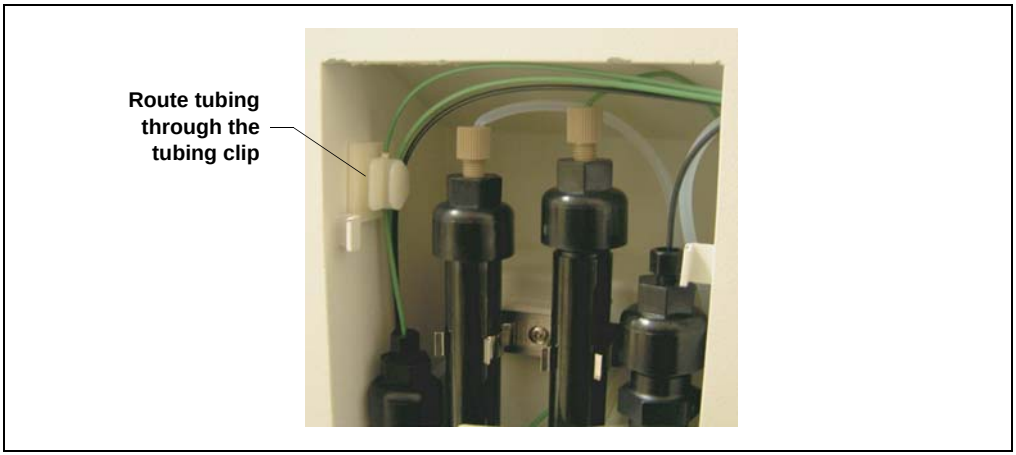


Figure 17. Routing the Tubing Through the Tubing Clip

6.7 Directing the ERC 10 Eluent Line to Waste

In Section 6.1, Step 8, you routed the 1/8-in OD PTFE tube (labeled **To Eluent Bottle In**) from the ERC 10 to the tubing chase in the upper left corner of the Dionex ICS-1100 or Dionex ICS-1600 rear panel (see Figure 2).

Now, direct the free end of the PTFE tube to a small waste container.

6.8 Testing for Leaks

1. Turn on the pump and suppressor at the appropriate flow rate and current (see the following table).

NOTE The CS16 Cation Separator has a 5-mm ID. All other columns listed here have a 4-mm ID.

Separator Column	Recommended Flow Rate	Maximum Suppressor Current
AS4A-SC Anion Separator	2.0 mL/min	27 mA
AS9-HC Anion Separator	1.0 mL/min	45 mA
AS12A Anion Separator	1.5 mL/min	25 mA
AS14 Anion Separator	1.2 mL/min	25 mA
AS14A Anion Separator	1.0 mL/min	43 mA
AS22 Anion Separator	1.2 mL/min	31 mA
AS23 Anion Separator	1.0 mL/min	25 mA
CS12A Cation Separator	1.0 mL/min	59 mA
CS16 Cation Separator	1.0 mL/min	88 mA

2. Begin operating the system for 3 hours (i.e., with the system not operating in the recycled mode of operation). During this time, periodically check all tubing connections for leaks. Tighten any connections that leak.

   After 1.5 hours, check the eluent bottle. If the eluent level is below the minimum fill mark (see Figure 9), turn off the system, refill the eluent bottle, and restart the system.

IMPORTANT **If the eluent level falls below the minimum fill mark, the outlet tubing may not reach the fluid level and the pump may lose prime.**

3. After 3 hours of total operation time, shut down the system.
4. Remove the 1/8-in OD PTFE tube (labeled **To Eluent Bottle In**) from the waste container. Allow the fluid in the tubing to drain into the waste container.
5. Disconnect the green tubing labeled **SRS REGEN OUT** from the suppressor **SRS Regen Out** port and allow the fluid to drain into a waste container.
6. Connect the end of the green tubing you just disconnected to a 1/4-28 union (P/N 039056), a luer adapter (P/N 024305), and a 10 cc syringe (P/N 079803) (see Figure 18). Pull all remaining fluid (about 16 cc) from the ERC 10 until only air is exiting the controller.

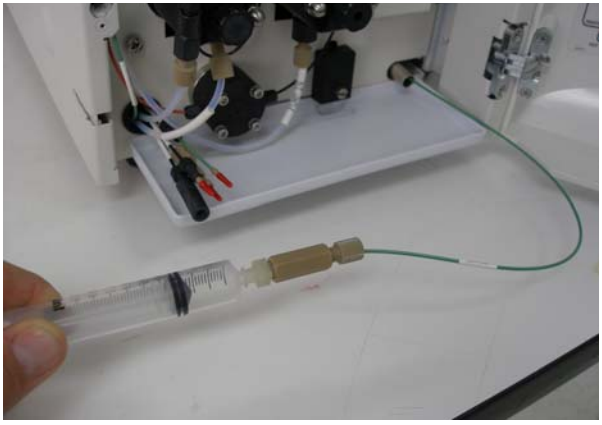


Figure 18. Drawing Fluid from the ERC 10

7. Remove the union, luer adapter, and syringe from the tubing labeled **SRS REGEN OUT.**
8. Reconnect the green tubing to the suppressor **SRS Regen Out** port.
9. Install the fitting and ferrule removed in Section 6.1, Step 8, on the end of the long 1/8-in OD PTFE tube labeled **To Eluent Bottle In**. Connect this end of the tube to the fitting and coupler on the **Eluent In** line to the eluent bottle.
10. Add eluent up to the maximum fill mark on the eluent bottle (see Figure 9).

7. Chromeleon Setup

7.1 RFIC-ER System Requirements

The RFIC-ER system consumables have limited life spans and require periodic replacement or regeneration. The Chromeleon RFIC-ER Wellness feature tracks the usage of the consumables and notifies you when they approach the end of their useful life spans. When Chromeleon is disconnected from the Dionex ICS-1100 or Dionex ICS-1600, the IC system firmware monitors the consumables usage and stores the tracking information in its permanent memory.

In order to operate in the RFIC-ER mode, you need an ERC 10 (standard on all Dionex ICS-1100 and Dionex ICS-1600 instruments), as well as the appropriate software version:

- Chromeleon 7 DU0b (or later)

– or –

- Chromeleon 6.8 SR6a (or later)

Chromeleon automatically activates the RFIC-ER features in the firmware when it detects the presence of an ERC 10.

7.2 Updating Chromeleon

Check the Chromeleon release installed on the PC. If necessary (see Section 7.1), run Chromeleon Setup to install the software update.

7.3 Configuring the ERC 10 Properties

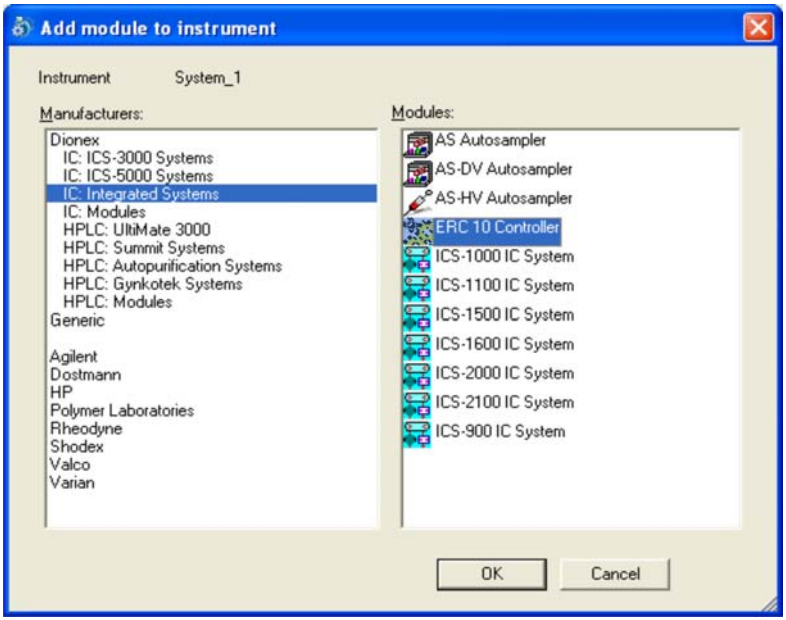
NOTE If the ERC 10 driver was installed during initial installation of the Dionex ICS-1100 or Dionex ICS-1600, go directly to Step 3 now to add the ERC 10 to an instrument (Chromeleon 7) or a timebase (Chromeleon 6.8).

1. The ERC 10 is connected to a USB connector inside the Dionex ICS-1100 or Dionex ICS-1600. When the IC system is connected to the PC, Microsoft Windows will immediately detect the ERC 10 and launch the Found New Hardware Wizard. Follow the instructions in

the wizard to install the ERC 10 driver. During installation, select the following options:

- If asked whether Windows can connect to Windows update to search for software, select **No, not this time**.
- Accept the default option (**Install the software automatically**) and click **Next >**. (It is not necessary to insert a hardware installation CD-ROM.)

2. When the ERC 10 driver has been installed, click **Finish**.
3. In the Chromeleon 7 Instrument Configuration program: Right-click the instrument that contains the RFIC-ER system and select **Add Module**. The Add module to instrument dialog box (see below) appears.

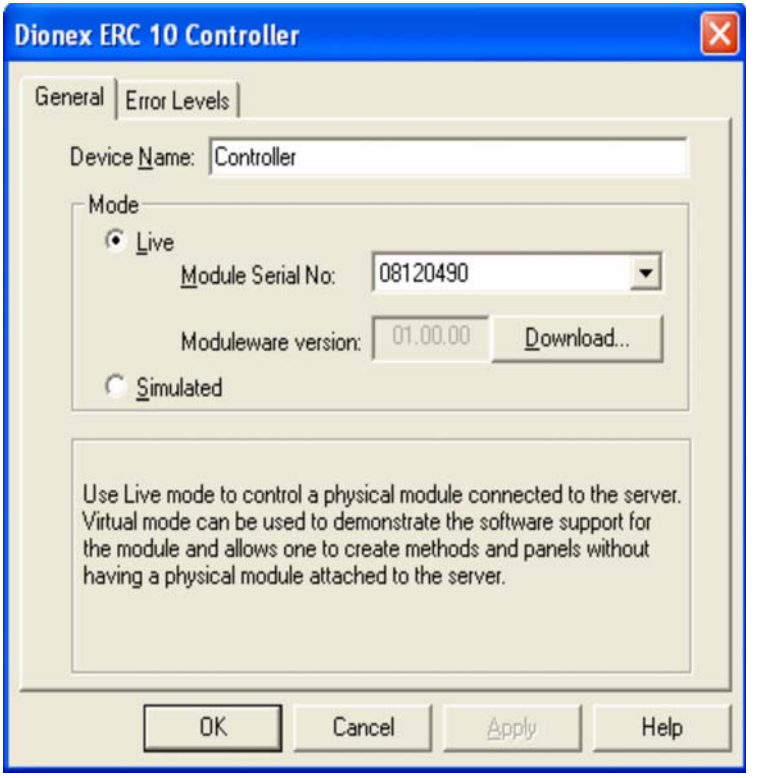


In the Chromeleon 6.8 Server Configuration program: Right-click the timebase that contains the RFIC-ER system and select **Add Device**. The Add device to timebase dialog box appears.

4. In the **Manufacturers** list box, select **Dionex IC: Integrated Systems**.

5. In the **Modules** (Chromeleon 7) or **Devices** (Chromeleon 6.8) list box, select **ERC 10 Controller**.
6. Click **OK** to add the ERC 10 to the instrument or timebase.

   The ERC 10 Properties dialog box appears.

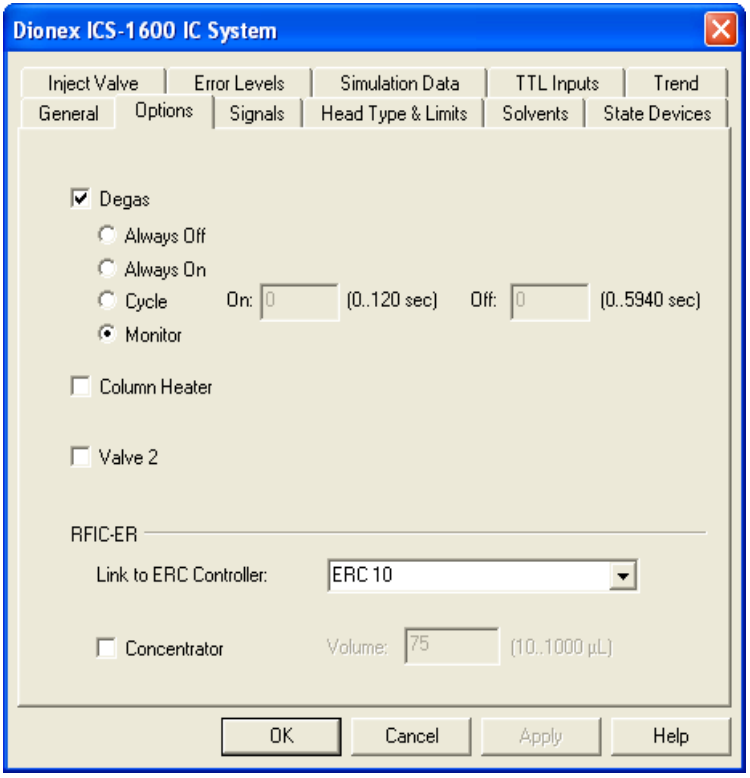


7. On the **General** tab, make sure that **Live** mode is selected.
8. If more than one ERC 10 is connected to the server, select the correct ERC 10 from the **Module Serial No.** list. (The serial number is on the ERC 10 label.)
9. Click **OK**.

NOTE **If two ERC 10 controllers are to be placed in the same instrument or timebase, rename the second controller "Controller_2."**

7.4 Configuring the Dionex ICS-1100/ICS-1600 Properties

1. In the Instrument Configuration program (Chromeleon 7) or Server Configuration program (Chromeleon 6.8), right-click the Dionex ICS-1100 or Dionex ICS-1600 to open the system Properties dialog box.
2. Click the **Options** tab in the Properties dialog box. (In this example, the system is a Dionex ICS-1600 and the chromatography data system is Chromeleon 7.)



3. Under **Degas**, verify that **Monitor** is selected.
4. Under **Link to ERC Controller**, select the controller installed in the system.
5. Click **OK**.

6. Exit the Instrument Configuration program or Server Configuration program. When asked whether to save the configuration changes, click **Save**.

NOTE Go on to Section 8 to check the RFIC-ER Wellness panel settings.

8. Confirming the RFIC-ER Wellness Settings

8.1 Chromeleon 7 Wellness Settings

1. To start the Chromeleon 7 client, click **Start > All Programs > Chromeleon 7 > Chromeleon 7**.

   The Chromeleon Console (including the ePanel Set for the Dionex ICS-1100 or Dionex ICS-1600) appears.

2. On the Dionex ICS-1100 or Dionex ICS-1600 ePanel, under **ERC 10 Controller**, click **More Details** to view the RFIC-ER Wellness panel (see Figure 19).

3. Check the following RFIC-ER Wellness panel settings:

   a. Verify that the **Chemistry Type** matches the column chemistry you plan to run.

   b. Under **ER1 Expiration Information**, **ER2 Expiration Information**, and **Eluent Expiration Information**, verify that the counters are set to zero. If a counter is set to a value other than zero, click the corresponding **Reset** button.

   c. Check that the current status (displayed in the upper left corner) is **Connected**.

   d. Under **ERC 10 Controller**, verify that the **Mode** is either **Operation** or **Power-up**.

   e. Click the **Reboot ERC 10** button.

   If a *new or freshly-regenerated* SRS 300 Suppressor is installed in the RFIC-ER system, go on to Section 9 to condition the suppressor.

If the installed suppressor is not new or freshly-regenerated, this completes the RFIC-ER installation procedure. Before starting operation, review the operating guidelines in Section 10.

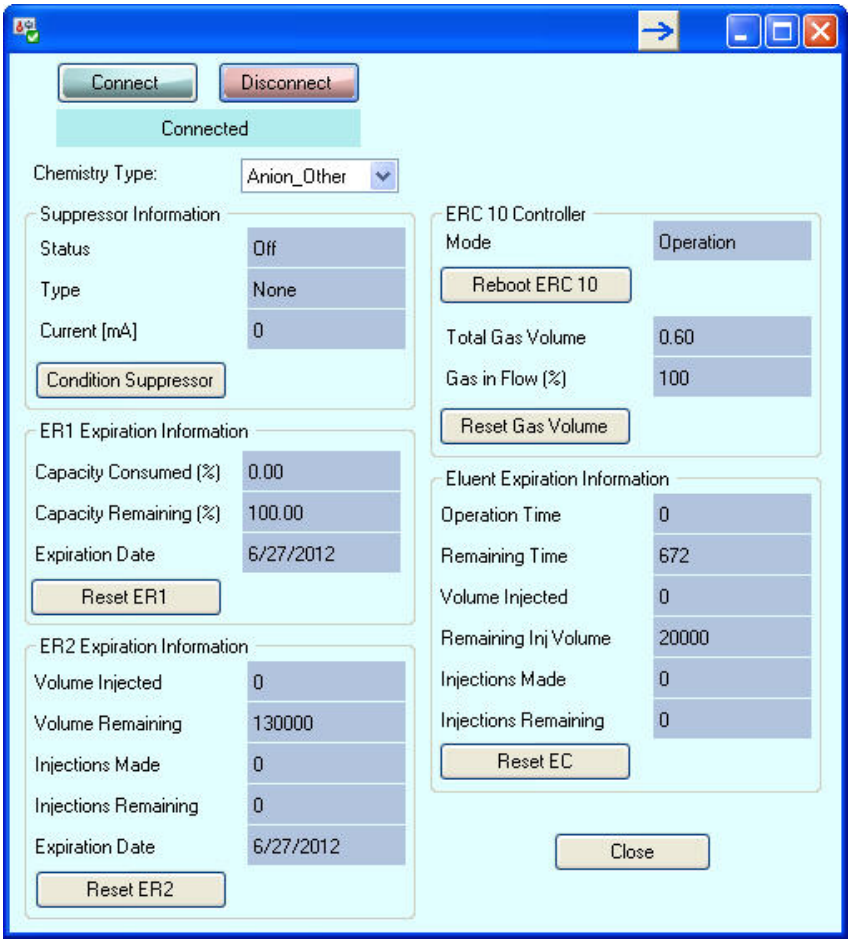


Figure 19. Example Chromeleon 7 RFIC-ER Wellness Panel

8.2 Chromeleon 6.8 Wellness Settings

1. To start the Chromeleon 6.8 client, click **Start > All Programs > Chromeleon > Chromeleon**.

   The main window and Browser appear.

2. Select **View > Default Panel Tabset** to display the panel tabset for the Dionex ICS-1100 or Dionex ICS-1600.

3. Click the **RFIC-ER Wellness** tab on the panel tabset to view the RFIC-ER Wellness panel (see Figure 20).

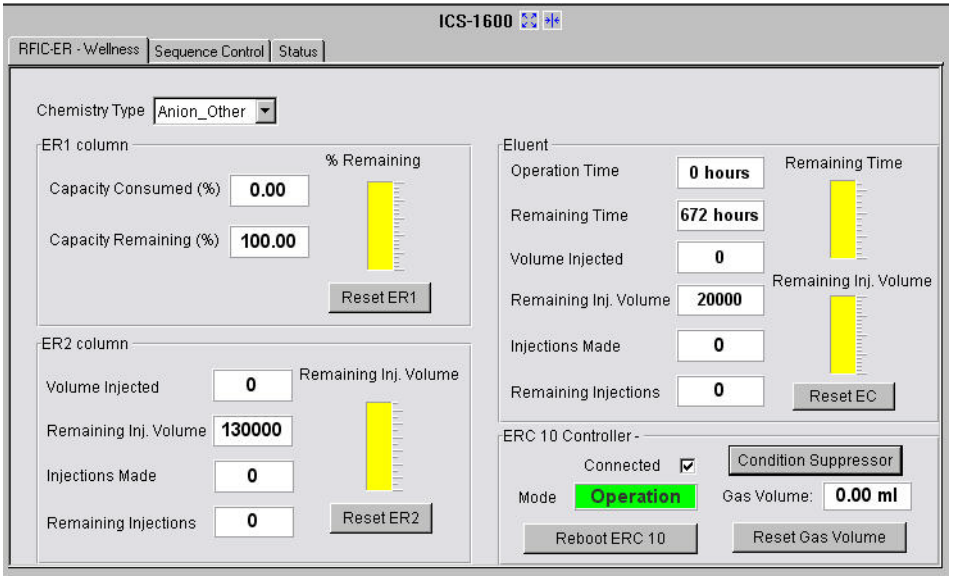


Figure 20. Example Chromeleon 6.8 RFIC-ER Wellness Panel

4. Check the following Wellness panel settings:

   a. Verify that the **Chemistry Type** matches the column chemistry you plan to run.

   b. Under **ER1 column**, **ER2 column**, and **Eluent**, verify that the counters are set to zero. If a counter is set to a value other than zero, click the corresponding **Reset** button.

   c. Under **ERC 10 Controller**, verify that the **Connected** check box is selected and that the **Mode** is either **Operation** or **Power-up**.

d. Click the **Reboot ERC 10** button.

If a *new or freshly-regenerated* SRS 300 Suppressor is installed in the RFIC-ER system, go on to Section 9 to condition the suppressor.

If the installed suppressor is not new or freshly-regenerated, this completes the RFIC-ER installation procedure. Before starting operation, review the operating guidelines in Section 10.

9. Conditioning the Suppressor

A new (or freshly-regenerated) SRS 300 Suppressor must be conditioned for 16 hours before it is ready for operation in the recycled eluent mode. During this conditioning procedure, the SRS 300 screens and membranes are equilibrated into the state required for compatibility with RFIC-ER operation.

1. Turn on the pump and suppressor at the flow rate and current settings recommended for the installed separator column (see Section 6.8).
2. If the RFIC-ER Wellness panel is not already displayed, display it now. For instructions, see Section 8.1 (Chromeleon 7) or Section 8.2 (Chromeleon 6.8).
3. To start the conditioning procedure, click **Condition Suppressor** under **Suppressor Information** (Chromeleon 7) or **ERC 10 Controller** (Chromeleon 6.8) on the RFIC-ER Wellness panel.
4. While conditioning is underway, periodically check all tubing connections for leaks; tighten any connections that leak. To monitor the status of the conditioning procedure, check the **Remaining Time** under **Eluent Expiration Information** (Chromeleon 7) or **Eluent** (Chromeleon 6.8).

   If the pump unexpectedly stops running and Chromeleon displays the “Pump stopped due to RFIC” message in the Audit Trail, follow the appropriate steps to resume the conditioning procedure.

   a. Click **Reset Gas Volume** (under **ERC 10 Controller**) to enable the pump again.

   b. Click **Reboot ERC 10** to prevent the ERC 10 from deactivating the pump for 3 hours.

5. When the conditioning procedure finishes, the system automatically shuts down and Chromeleon displays the following message in the Audit Trail: "The eluent has expired and needs to be replaced now. The pump has been shut down to protect the guard and analytical columns."
6. Dispose of the used eluent in the eluent bottle. Prepare 4 liters of fresh eluent and add eluent up to the maximum fill mark on the bottle (see Figure 9).
7. Disconnect the ERC 10 outlet line from the eluent bottle and direct it to a waste container. Operate the system for 30 minutes to flush out the expired eluent.
8. After 30 minutes, turn off the pump. Reconnect the **Eluent Bottle In** tubing to the ERC 10 outlet.
9. Add eluent up to the maximum fill mark on the eluent bottle (see Figure 9).

IMPORTANT **If the eluent level falls below the minimum fill mark, the outlet tubing may not reach the fluid level and the pump may lose prime.**

The RFIC-ER system is now ready for up to four weeks of nonstop operation. Before starting operation, review the operating guidelines in Section 10.

10. RFIC-ER System Operating Guidelines

For complete operating instructions, refer to the operator's manual for the Dionex ICS-1100 or Dionex ICS-1600. The guidelines here are intended to supplement, not to replace, the information in the operator's manuals.

- RFIC-ER is compatible with carbonate/bicarbonate eluents (for anion separations) and methanesulfonic acid eluents (for cation separations) only.
- RFIC-ER can only regenerate the original eluent; therefore, RFIC-ER is compatible with isocratic separations only and cannot be used with detection systems that alter the eluent composition, such as post-reagent delivery and the CRD 300.
- RFIC-ER is not compatible with any eluents containing organic solvents. The eluents in an RFIC-ER system must be 100% aqueous.
- The capacities of the various trap columns in the RFIC-ER system are limited; therefore, RFIC-ER is compatible only with low-contaminant water samples such as drinking water, surface water, and ground water.

- During an injection on an RFIC-ER system, the equivalent volume of eluent is exchanged with the sample injected. Because sample ions are trapped by the columns, the eluent is diluted. The RFIC-ER system is designed to handle a pre-defined volume of injected samples before the eluent needs replacement. Injections of samples in excessive volumes—whether due to a large number of small injections or a smaller number of injections with large sample loops—will dilute the eluent and cause unacceptable retention time drift. Chromeleon monitors the sample volume injected and displays a warning to replace the eluent when the limit is approached.
- When running sequences, the RFIC-ER Wellness feature uses the current injection volume to monitor the volume of sample that is injected into the system and to calculate the number of injections that remain. Before the first injection, Chromeleon may be unable to calculate the number of remaining injections; however, the affected eluent and trap column counters on the RFIC-ER Wellness panel will correct themselves when the first injection is made.
- When injecting samples manually, or with a Thermo Scientific Dionex AS-DV Autosampler, be sure the injection volume specified in the Chromeleon sequence matches the sample loop size.

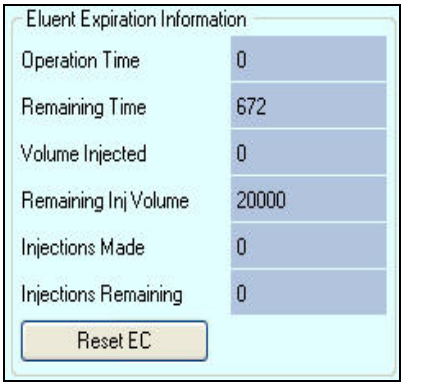
IMPORTANT **Entering the wrong injection volume in the sequence will impair the accuracy of the eluent and trap column counters on the RFIC-ER Wellness panel; this will impair proper operation of the RFIC-ER system.**

- It is not necessary to re-equilibrate the system unless you replace the eluent or one of the trap columns. Because the RFIC-ER system remains on continuously, the system is always equilibrated and ready for operation.

11. RFIC-ER System Maintenance

11.1 Replacing the Eluent

When to replace the eluent



The RFIC-ER Wellness feature in Chromeleon monitors eluent use and the total volume of sample injected into the system. When the limit for either of these parameters is reached, an Audit Trail message will inform you that it is time to replace the eluent.

You can check the life expectancy of the eluent at any time by reviewing the status information on the RFIC-ER Wellness panel. (The example screen shot here is from Chromeleon 7.) For details about these parameters, see the following table.

Operation Time	The number of hours the eluent has been in use.
Remaining Time	The number of hours until the eluent expires. After 672 hours (28 days), the eluent will expire and must be replaced. **Note:** This time limitation is independent of pump operation; the eluent will expire after 672 hours (28 days) even if the system is not operated during this time.
Volume Injected	The volume of sample injected since the last eluent change. When the **Volume Injected** is 20,000 µL, the eluent has expired and must be replaced. **Note:** Repeated sample injections cause eluent dilution. Operating the system with diluted eluent will cause excessive retention time drift; for details, see Section 10.
Remaining Inj. Volume	The volume of sample that can be injected before the eluent expires. Resetting the eluent counter resets the **Remaining Inj. Volume** to zero, also. When you start the next injection, the **Remaining Inj. Volume** will be updated to the correct value.

IMPORTANT	**To ensure the accuracy of the Remaining Inj. Volume, be sure to enter the correct injection volume in the Inj. Vol. column of the sequence table.**
Injections Made	The number of sample injections since the last eluent change.
Injections Remaining (Chromeleon 7), **Remaining Injections** (Chromeleon 6.8)	The number of samples that can be injected before the eluent expires.
Reset EC	Clicking **Reset EC** resets the eluent counter, resetting the **Operation Time** and **Remaining Inj. Volume** to zero. Click **Reset EC** only after replacing the eluent.

How to replace the eluent

1. Check that the pump and suppressor are turned off.
2. Disconnect the **Eluent Bottle Out** tubing from the pump.
3. Disconnect the tubing from the ERC 10 (labeled **To Eluent Bottle In**) from the **Eluent Bottle In** line at the connection near the eluent bottle.
4. Remove the cap from the RFIC-ER eluent bottle and dispose of the expired eluent.

IMPORTANT **Always neutralize methanesulfonic acid eluents before disposal.**

5. Prepare 4 liters of the eluent required for the application. Always use ASTM Type I (18 megohm-cm) filtered, deionized water when preparing eluent.
6. Add eluent up to the maximum fill mark on the bottle (see Figure 9).

IMPORTANT **For optimal RFIC-ER system operation, do not reuse expired eluent.**

7. On the RFIC-ER Wellness panel, under **Eluent Expiration Information** (Chromeleon 7) or **Eluent** (Chromeleon 6.8), click the **Reset EC** button. This resets the **Operation Time** to zero and resets the **Remaining Time** to 672 hours.

8. Reconnect the pump inlet line to the **Eluent Bottle Out** tubing. Direct the ERC 10 outlet tubing to a waste container.
9. Prime the pump. (If you need instructions, refer to Chapter 5 of the operator's manual for the Dionex ICS-1100 or Dionex ICS-1600.)
10. After priming the pump, check that the eluent level is above the minimum fill mark on the eluent bottle (see Figure 9). If necessary, add more eluent to the bottle.

IMPORTANT **If the eluent level falls below the minimum fill mark, the outlet tubing may not reach the fluid level and the pump may lose prime.**

11. Select the standard flow rate and current settings for the application. Operate the system for 30 minutes to flush the expired eluent from the system. If the pump stops running and Chromeleon displays the "Pump stopped because the total gas volume has exceeded the limit" message in the Audit Trail, follow the appropriate steps below.
    a. On the RFIC-ER Wellness panel, under **ERC 10 Controller**, click **Reset Gas Volume** (Chromeleon 7) or **Gas Volume Reset** (Chromeleon 6.8). This resets the gas volume to 0.00 mL.
    b. Restart the pump and suppressor and monitor the **Total Gas Volume** (Chromeleon 7) or **Gas Volume** (Chromeleon 6.8) reading. If the value begins to climb toward 0.60 mL, click **Reboot ERC 10**. This disables the gas monitor for 3 hours.
    c. If, after 3 hours, the gas volume reading is still increasing, shut down the system. For troubleshooting assistance, contact Technical Support for Dionex products. In the U.S., call 1-800-346-6390. Outside the U.S., call the nearest Thermo Fisher Scientific office.

IMPORTANT **Do not operate the system with the gas monitor deactivated for an extended period of time.**

12. After 30 minutes of flushing eluent from the system, turn off the pump.
13. Remove the ERC 10 outlet tubing from the waste container. Connect the outlet of the ERC 10 to the **Eluent Bottle In** tubing.

14. Add eluent up to the maximum fill mark on the eluent bottle (see Figure 9).
15. Restart the pump and suppressor. The system is now ready for routine operation.

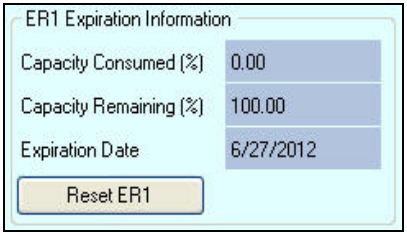
11.2 Replacing the ER1 Column

When to replace the ER1 column

The RFIC-ER Wellness feature in Chromeleon monitors the use of the ER1 column. An Audit Trail message will inform you when it is time to replace the column. (The ER1 column cannot be regenerated.)

IMPORTANT **Never operate an ER1 column beyond its expiration; this may result in irreversible loss of capacity to the guard and analytical columns.**

You can check the life expectancy of the ER1 column at any time by reviewing the status information on the RFIC-ER Wellness panel. (The example screen shot here is from Chromeleon 7.) For details about these parameters, see the following table.



Capacity Consumed (%)	The percentage of the ER1 column that has been consumed. When the **Capacity Consumed** is 100%, the ER1 column has expired and must be replaced.
Capacity Remaining (%)	The percentage of the ER1 column that is remaining. When the **Capacity Remaining** is 0%, the ER1 column has expired and must be replaced.
Expiration Date (Chromeleon 7)	The final day of operation for the ER1 column.
Reset ER1	Clicking **Reset ER1** resets the ER1 column counters, resetting the parameters above to 0%. Click **Reset ER1** only after replacing the ER1 column.

How to replace the ER1 column

1. Check that the pump and suppressor are turned off.
2. Remove the old ER1 column from the ER1/ER2 column bracket clip in the RFIC-ER compartment.
3. Remove the tubing from the inlet and outlet of the old ER1 column. Discard the column.
4. Remove the column plugs from the new ER1 column.
5. In the RFIC-ER compartment, connect the tubing labeled **ER1 IN** to the inlet of the new ER1 column. Connect the tubing labeled **ER1 OUT** to the outlet of the new ER1 column.
6. Mount the new ER1 column (with the inlet end at the top) onto the ER3a column, using the ER1/ER2 bracket clip. Install the ER1 column to the right of the ER3a and ER3b column assembly (see Figure 12).
7. Disconnect the tubing labeled **InjVlv P** from port **P (2)** on the injection valve. Direct the end of this tubing to a small waste container (see Figure 13).
8. Set the pump flow rate to 2.0 mL/min and begin pumping the operating eluent through the ER1 column for 20 minutes. **Make sure the suppressor does not activate during this time.**

   If the pump stops running and Chromeleon displays the "Pump stopped because the total gas volume has exceeded the limit" message in the Audit Trail, follow the appropriate steps below.

   a. On the RFIC-ER Wellness panel, under **ERC 10 Controller**, click **Reset Gas Volume** (Chromeleon 7) or **Gas Volume Reset** (Chromeleon 6.8). This resets the gas volume to 0.00 mL.

   b. Restart the pump and suppressor and monitor the **Total Gas Volume** (Chromeleon 7) or **Gas Volume** (Chromeleon 6.8) reading. If the value begins to climb toward 0.60 mL, click **Reboot ERC 10**. This disables the gas monitor for 3 hours.

   c. If, after 3 hours, the gas volume reading is still increasing, shut down the system. For troubleshooting assistance, contact Technical Support for Dionex products. In the U.S., call 1-800-

346-6390. Outside the U.S., call the nearest Thermo Fisher Scientific office.

IMPORTANT **When the gas monitor is deactivated, do not operate the system for an extended period of time.**

9. After rinsing the ER1 column for 20 minutes, turn off the pump.
10. Remove the tubing labeled **InjVlv P** from the waste container. Connect the tubing to port **P (2)** on the injection valve.
11. On the RFIC-ER Wellness panel, under **ER1 Expiration Information** (Chromeleon 7) or **ER1** (Chromeleon 6.8), click **Reset ER1**.
12. Add eluent up to the maximum fill mark on the eluent bottle (see Figure 9).

IMPORTANT **If the eluent level falls below the minimum fill mark, the outlet tubing may not reach the fluid level and the pump may lose prime.**

13. Restart the pump and suppressor. The system is now ready for routine operation.

11.3 Replacing the ER2 Column

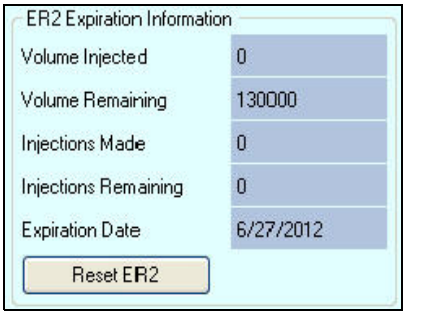
When to replace the ER2 column

The RFIC-ER Wellness feature in Chromeleon monitors the use of the ER2 column. An Audit Trail message will inform you when it is time to replace the column.

Thermo Scientific recommends replacing the ER2 column when it expires. However, it is possible to regenerate the column. For instructions on replacing the ER2 column, see page 41. For instructions on regenerating the ER2 column, see page 42.

IMPORTANT **Never operate an ER2 column beyond its expiration; this may result in a buildup of sample co-ions in the eluent, leading to increased background conductivity and reduced peak areas.**

You can check the life expectancy of the ER2 column at any time by reviewing the status information on the RFIC-ER Wellness panel. (The example screen shot here is from Chromeleon 7.) For details about these parameters, see the following table.



Volume Injected	The total sample volume injected since the ER2 column was installed. When the **Volume Injected** is 120,000 µL, the ER2 column has expired.
Volume Remaining (Chromeleon 7), **Remaining Inj. Volume** (Chromeleon 6.8)	The volume of sample that can be injected before the sample volume limit (120,000 µL) is reached. When the **Volume Remaining** or **Remaining Inj. Volume** is 0 µL, the ER2 column has expired. Resetting the ER2 counter resets the **Volume Remaining** or **Remaining Inj. Volume** to zero, also. When you start the next injection, the **Volume Remaining** or **Remaining Inj. Volume** will be updated to the correct value.
IMPORTANT	**To ensure the accuracy of the Volume Remaining or Remaining Inj. Volume, be sure to enter the correct injection volume in the Inj. Vol. column of the sequence table.**
Injections Made	The total number of sample injections since the ER2 column was installed.
Injections Remaining (Chromeleon 7), **Remaining Injections** (Chromeleon 6.8)	The number of sample injections that can be performed before the sample volume limit (120,000 µL) is reached. The **Injections Remaining** (or **Remaining Injections**) value is based on the volume of the last injected sample; if no sample has been injected yet, the reading is zero.
Expiration Date (Chromeleon 7)	The final day of operation for the ER2 column.
Reset ER2	Clicking **Reset ER2** resets the ER2 column counters, resetting **Volume Injected** and **Injections Made** to zero. Click **Reset ER2** only after replacing or regenerating the ER2 column.

How to replace the ER2 column

1. Check that the pump and suppressor are turned off.
2. Remove the old ER2 column from the ER1/ER2 column bracket clip in the RFIC-ER compartment.
3. Remove the tubing from the inlet and outlet of the old ER2 column. Discard the column.
4. Remove the column plugs from the new ER2 column.
5. In the RFIC-ER compartment, connect the tubing labeled **ER2 IN** to the inlet of the new ER2 column. Connect the tubing labeled **ER2 OUT** to the outlet of the new ER2 column.
6. Mount the new ER2 column (with the inlet end at the top) onto the ER3b column, using the ER1/ER2 bracket clip. Install the ER2 column to the left of the ER3a and ER3b column assembly (see Figure 16).
7. Select the standard flow rate and current settings for the application. Turn on the pump and suppressor and begin pumping the operating eluent through the ER2 column for 30 minutes.

   If the pump stops running and Chromeleon displays the “Pump stopped because the total gas volume has exceeded the limit” message in the Audit Trail, follow these steps:

   a. On the RFIC-ER Wellness panel, under **ERC 10 Controller**, click **Reset Gas Volume** (Chromeleon 7) or **Gas Volume Reset** (Chromeleon 6.8). This resets the gas volume to 0.00 mL.

   b. Restart the pump and suppressor and monitor the **Total Gas Volume** (Chromeleon 7) or **Gas Volume** (Chromeleon 6.8) reading. If the value begins to climb toward 0.60 mL, click **Reboot ERC 10**. This disables the gas monitor for 3 hours.

   c. If, after 3 hours, the gas volume reading is still increasing, shut down the system. For troubleshooting assistance, contact Technical Support for Dionex products. In the U.S., call 1-800-346-6390. Outside the U.S., call the nearest Dionex Thermo Fisher Scientific office.

IMPORTANT **When the gas monitor is deactivated, do not operate the system for an extended period of time.**

8. After rinsing the ER2 column for 30 minutes, turn off the pump.
9. Under **ER2 Column** on the RFIC-ER Wellness panel, click **Reset ER2**.
10. Add eluent up to the maximum fill mark on the eluent bottle (see Figure 9).

IMPORTANT **If the eluent level falls below the minimum fill mark, the outlet tubing may not reach the fluid level and the pump may lose prime.**

11. Restart the pump and suppressor. The system is now ready for routine operation.

How to regenerate the ER2 column

1. Check that the pump and suppressor are turned off.
2. Remove the ER2 column from the ER1/ER2 column bracket clip in the RFIC-ER compartment.
3. Disconnect the tubing from the inlet and outlet of the ER2 column.
4. If the ER2 column is an anion column, follow these steps:
   a. Prepare fresh 0.5 M sodium bicarbonate solution. Use either reagent-grade sodium bicarbonate or undiluted Dionex Sodium Bicarbonate Concentrate (0.5 Molar) (P/N 037163).
   b. Pump 200 mL of 0.5 M sodium bicarbonate solution through the ER2 column. Use either the Trap Column/Suppressor Cleanup Kit (P/N 059659) or an accessory pump at 5.0 mL/min. Direct the column effluent to a waste container.
   c. Pump 40 mL of deionized water through the ER2 column. Use one of the following: the Trap Column/Suppressor Cleanup Kit (P/N 059659), an accessory pump at 5.0 mL/min, or a syringe. Direct the column effluent to a waste container.
   d. Go on to Step 6.

5. If the ER2 column is a cation column, follow these steps:
   a. Prepare fresh 0.4 M methanesulfonic acid solution. Use either reagent-grade methanesulfonic acid or undiluted Dionex CS12A Eluent Concentrate (0.4 Molar) (P/N 057562).
   b. Pump 200 mL of 0.4 M methanesulfonic acid solution through the ER2 column. Use the Trap Column/Suppressor Cleanup Kit (P/N 059659) or an accessory pump at 5.0 mL/min. Direct the column effluent to a waste container.
   c. Pump 40 mL of deionized water through the ER2 column. Use one of the following: the Trap Column/Suppressor Cleanup Kit (P/N 059659), an accessory pump at 5.0 mL/min, or a syringe. Direct the column effluent to a waste container.
   d. Go on to Step 6.
6. Reconnect the tubing labeled **ER2 IN** to the inlet of the ER2 column. Reconnect the tubing labeled **ER2 OUT** to the outlet of the ER2 column.
7. Mount the ER2 column on the ER1/ER2 column bracket clip in the RFIC-ER compartment.
8. On the RFIC-ER Wellness panel, under **ER2 Expiration Information** (Chromeleon 7) or **ER2** (Chromeleon 6.8), click **Reset ER2**.

12. Adding an Anion Concentrator for Eluent Regeneration (AC-ER)

The Anion Concentrator for Eluent Regeneration (AC-ER) column (P/N 072778) is a general purpose, extremely low-pressure anion-exchange concentrator with a low void volume (approximately 70 µL) and a capacity of 12.0 µeq/column. The AC-ER is housed in a 4 × 16 mm column body to reduce the delay volume and maximize the number of injections that can be made between eluent exchanges.

With an AC-ER concentrator column installed in an RFIC-ER system, each injection adds only 75 µL of sample matrix (70 µL plus 5 µL for connecting tubing) into the eluent. Thus, 266 injections can be performed before the eluent needs to be replaced, regardless of the amount of sample loaded onto the AC-ER. Also, by using a matrix elimination step with the AC-ER column in place,

solvents can be directly injected onto the AC-ER and then flushed off before injection into the RFIC-ER system.

The AC-ER column brings a host of new applications within range of RFIC-ER systems, including analysis of bromate to 5 ppb in drinking water and analysis of common anions in ethanol.

IMPORTANT **Do not inject ethanol or other solvents directly into an RFIC-ER system. Before injection, load solvents onto the AC-ER column and perform a matrix elimination step to remove the solvent matrix.**

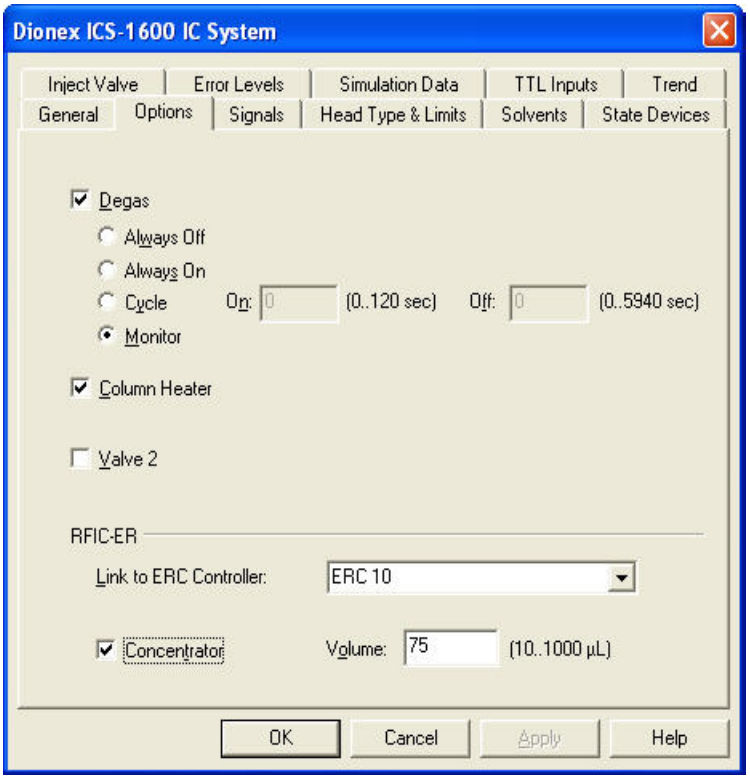
12.1 Installing the AC-ER Concentrator Column

1. Turn off the pump and suppressor.
2. Remove the old injection loop or concentrator column from the system injection valve.
3. Cut two short (about 10 cm [or 4 in]) lengths of 0.25-mm (0.010-in) ID black tubing. (Tubing not provided.)
4. Connect a length of tubing to both the inlet and outlet ports of the AC-ER column.
5. Connect the inlet of the AC-ER column to port 4 of the injection valve. Check that the Thermo Scientific Dionex AS-AP Autosampler or AS Autosampler is connected to port 3 of the injection valve.
6. Connect the outlet of the AC-ER column to port 1 of the injection valve. Check that the waste line is connected to port 2 of the injection valve.

12.2 Configuring the AC-ER Concentrator Column Properties

1. Check that data acquisition on all instruments (Chromeleon 7) or timebases (Chromeleon 6.8) is turned off.
2. In the Instrument Configuration program (Chromeleon 7) or Server Configuration program (Chromeleon 6.8), right-click the Dionex ICS-1100 or Dionex ICS-1600 to open the system Properties dialog box.

3. Click the **Options** tab in the Properties dialog box. (In this example, the system is a Dionex ICS-1600 and the chromatography data system is Chromeleon 7.)



4. Select the **Concentrator** check box.
5. In the **Volume** field, enter 75. (This is the void volume of the AC-ER column (70 µL) plus 5 µL for connecting tubing.)
6. Click **OK**.
7. Exit the Instrument Configuration program or Server Configuration program. When asked whether to save the configuration changes, click **Save**.

12.3 Confirming the RFIC-ER Wellness Settings

1. On the RFIC-ER Wellness panel (Chromeleon 7, see Figure 19; Chromeleon 6.8, see Figure 20), verify that the **Connected** check box

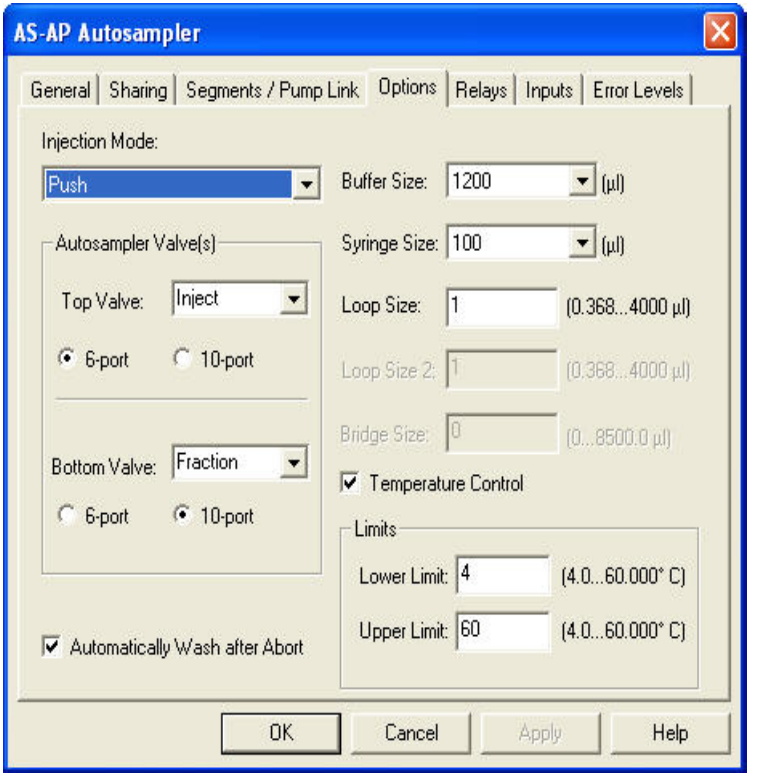
is selected. The check box is either in the upper left corner (Chromeleon 7) or under **ERC 10 Controller** (Chromeleon 6.8).

2. Under **ERC 10 Controller**, verify that the **Mode** is either **Power-up** or **Operation**.

12.4 Configuring the Dionex AS-AP Autosampler (Optional)

To select the configuration injection mode

1. In the Instrument Configuration program (Chromeleon 7) or Server Configuration program (Chromeleon 6.8), right-click the AS-AP to open the autosampler Properties dialog box.
2. Click the **Options** tab in the Properties dialog box.



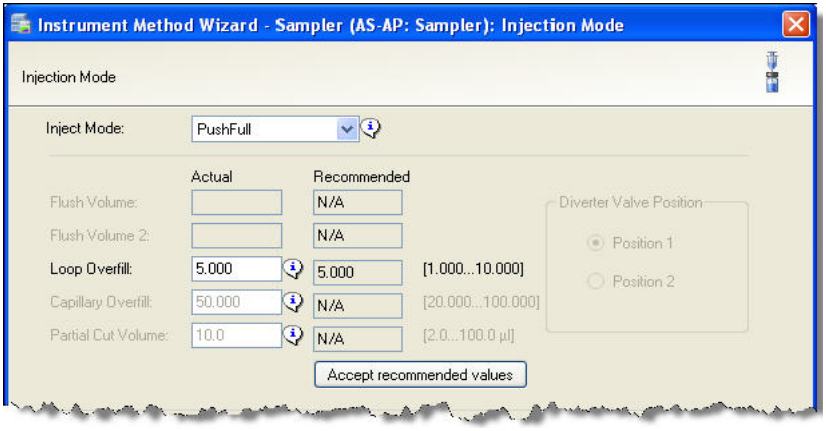
3. Under **Injection Mode**, select **Push**.

   NOTE The option selected here determines the injection modes available in the Instrument Method Wizard or Program Wizard in the Chromeleon client.

4. Click **OK**.
5. Exit the Instrument Configuration program or Server Configuration program. When asked whether to save the configuration changes, click **Save**.

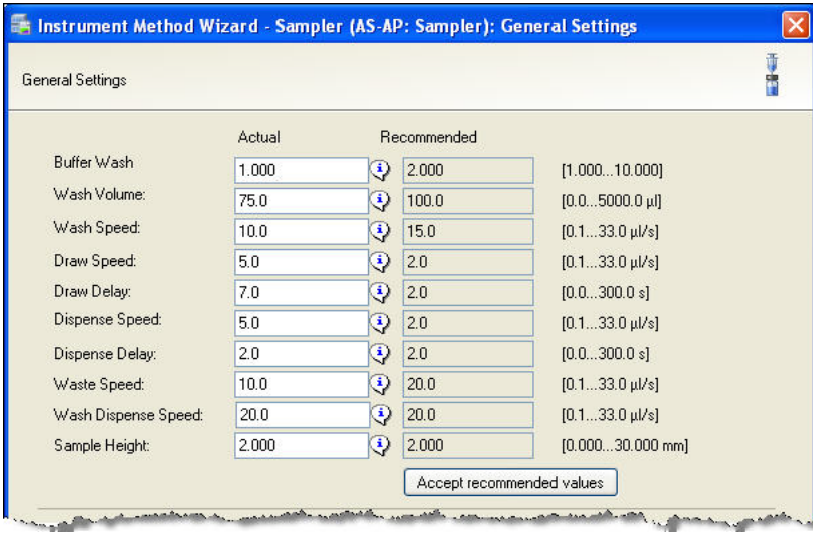
To select the injection mode and syringe speed

1. In Chromeleon 7: Launch the Instrument Method Wizard. Click **Next >** to go to the Injection Mode page.



   In Chromeleon 6.8: Launch the Program Wizard. Click **Next >** to go to the first Sampler Options page.

2. Select the **Inject Mode** option.
3. Click **Next >** to go to the General Settings page (Chromeleon 7) or the second Sampler Options page (Chromeleon 6.8).



The page lists speed recommendations that are based on the selected injection mode, syringe size, and loop size. In most cases, you can click Accept recommended values to accept the default settings. To change the speed for an option, enter a new value in the corresponding Actual box. For a description of each option, click the Help button on the page.

12.5 Configuring the Dionex AS Autosampler (Optional)

1. From the **MAIN STATUS** screen, press the **Menu** button to display the **MENU of SCREENS**.
2. Press **5** to go to the **MODULE SETUP MENU**.
3. Press **5** again to go to the **SYSTEM PARAMETERS** screen (see Figure 21).

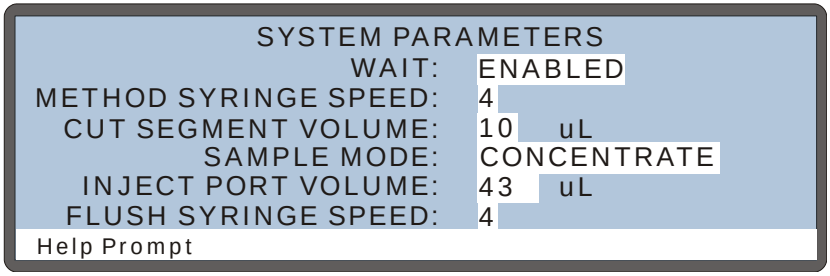


Figure 21. System Parameters Screen

4. Move the cursor to the **METHOD SYRINGE SPEED** field and select the speed for the type of sample syringe installed. For guidelines on selecting the correct syringe speed, refer to Section 3.8 of the *AS Autosampler Operator's Manual*. The AS manual is provided on the Thermo Scientific Reference Library DVD (P/N 053891).
5. Move the cursor to the **SAMPLE MODE** field and select **CONCENTRATE**.
6. To return to the **MAIN STATUS** screen:
   a. Press **Menu** twice.
   b. Press **Enter** or **1**.

12.6 Operating Guidelines for Concentrator Mode

When operating an RFIC-ER system in concentrator mode, Chromeleon uses the **Concentrator Volume** selected in the Instrument Configuration program or Server Configuration program (see Section 12.2) to increment the eluent counter and ER2 counter. Use the sequence table to set the volume of sample to be loaded onto the AC-ER concentrator column.

For complete operating instructions for the AC-ER, refer to the *IonPac UTAC 2 and AC-ER Product Manual*. The manual is provided on the Thermo Scientific Reference Library DVD (P/N 053891).

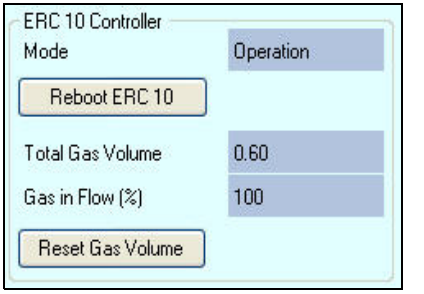
13. Troubleshooting

13.1 Pump Stops Unexpectedly

The ERC 10 electronics monitor the volume of hydrogen gas in the eluent stream. If the safety limit is exceeded, the ERC 10 shuts down the pump and Chromeleon displays the following message in the Audit Trail: "Pump stopped because the total gas volume has exceeded the limit."

To return to normal operation

1. If the RFIC-ER Wellness panel is not already displayed, display it now. For instructions, see Section 8.1 (Chromeleon 7) or Section 8.2 (Chromeleon 6.8).
2. Check the controls under **ERC 10 Controller**. (The example screen shot here is from Chromeleon 7.)

   If the **Total Gas Volume** (Chromeleon 7) or **Gas Volume** (Chromeleon 6.8) reading is 0.60 mL (or higher) *or* if the **Mode** is **Gas Volume Error**, it indicates that the volume of gas exceeds the allowable limit.

   Click the **Reset Gas Volume** button to reset the **Total Gas Volume** or **Gas Volume** and return the **Mode** to **Operation**.
3. Restart the pump and suppressor and monitor the gas volume reading. If it begins to climb toward 0.60 mL, click **Reboot ERC 10**. This disables the gas monitor for 3 hours.

4. After 3 hours, check the RFIC-ER Wellness panel again. If the **Total Gas Volume** or **Gas Volume** reading is still increasing and the **Mode** is **Gas Volume Error**, shut down the system.

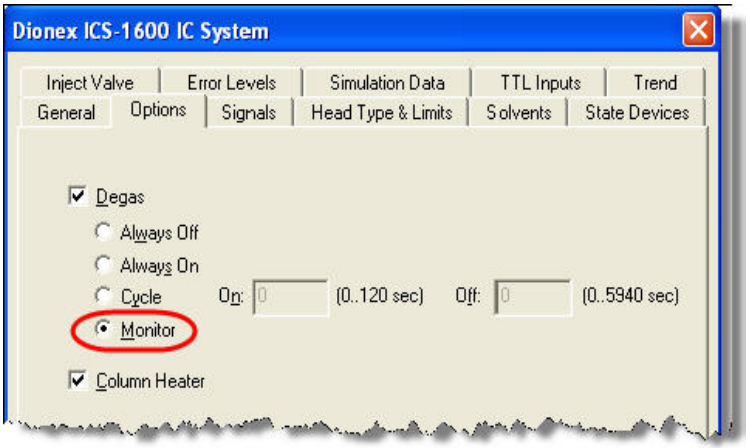
   For troubleshooting assistance, contact Technical Support for Dionex products. In the U.S., call 1-800-346-6390. Outside the U.S., call the nearest Thermo Fisher Scientific office.

13.2 Unstable Retention Times

Unstable retention times may indicate that the vacuum degas assembly is not operating in **Monitor** mode.

To select the correct degas mode

1. In the Instrument Configuration program or Server Configuration program, right-click the Dionex ICS-1100 or Dionex ICS-1600 to open the system Properties dialog box.
2. Click the **Options** tab in the Properties dialog box. (In this example, the system is a Dionex ICS-1600 and the chromatography data system is Chromeleon 7.)



3. Under **Degas**, select **Monitor**.
4. Click **OK**.

5. Exit the Instrument Configuration program or Server Configuration program. When asked whether to save the configuration changes, click **Save**.