Thermo Scientific

Dionex Aquion RFIC Ion Chromatography System

Operator's Manual

22176-97006 Revision 02 January 2024

Thermo SCIENTIFIC

Release history:

Revision 01, March 2019: Initial system release.
Revision 02, January 2024: Removed references to constant voltage procedures.

Software version: Chromeleon 7.2.9 DUa and later

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

Contents

Preface

This manual provides instructions for the operation of the Thermo Scientific™ Dionex™ Aquion™ RFIC™ Ion Chromatography System.

Contents

Related Documentation

In addition to this manual, the following documents are available on the Thermo Fisher Scientific website or from your local office:

- *Dionex Aquion RFIC Ion Chromatography System Installation Instructions* (Document No. 22176-97005)
- Manuals for consumable products (including columns, suppressors, and eluent generator cartridges)
- *Chromeleon 7 Installation Guide* (Document No. 7229.0003); also provided on the Thermo Scientific™ Dionex™ Chromeleon™ 7 Chromatography Data System DVD
- *Dionex AS-AP Autosampler Operator's Manual* (Document No. 065361)
- *Dionex AS-DV Autosampler Operator's Manual* (Document No. 065259)

Access Documentation

Full documentation (including installation guides, operation manuals, and so on) is also maintained in the Thermo Scientific Chromatography and Mass Spectrometry portal. This portal is regularly updated with the latest content, including video tutorials.

To access the doc portal, go to docs.thermofisher.com/ArdiaPlatform.

Safety Information

The Dionex Aquion RFIC is manufactured for Thermo Fisher Scientific at the following location:

Jabil Circuit de Chihuahua S. de R.L. de C.V.
Complejo Industrial Chihuahua
Av. Alejandro Dumas No. 11341
31109 Chihuahua, Chihuahua
Mexico

The Dionex Aquion RFIC is designed for IC (ion chromatography) applications and should not be used for any other purpose. Operation of a Dionex Aquion RFIC in a manner not specified by Thermo Fisher Scientific may result in personal injury.

If there is a question regarding appropriate usage, contact Technical Support for Dionex products. In the U.S. and Canada, call 1-800-532-4752. Outside the U.S. and Canada, call the nearest Thermo Fisher Scientific office.

Safety and Special Notices

Make sure you follow the precautionary statements presented in this manual. Safety notices and special notices appear in boxes. These notices include the following:

DANGER Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury. Each DANGER notice is accompanied by an appropriate DANGER symbol.

CAUTION Highlights hazards to humans, property, or the environment. Each CAUTION notice is accompanied by an appropriate CAUTION symbol.

IMPORTANT Highlights information necessary to prevent damage to the system or software, loss of data, or invalid test results; or might contain information that is critical for optimal performance of the system.

Note Highlights information of general interest.

Tip Highlights helpful information that can make a task easier.

Safety Symbols

These symbols appear on the Dionex Aquion RFIC or on labels affixed to the system:


Alternating current.


Primary protective conductor terminal.


Secondary protective conductor terminal.

Power supply is on.


Power supply is off.


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

Regulatory Compliance

Thermo Fisher Scientific performs complete testing and evaluation of its products to ensure full compliance with applicable domestic and international regulations. When the system is delivered to you, it meets all pertinent electromagnetic compatibility (EMC) and safety standards as described in this section.

Changes that you make to your system may void compliance with one or more of these EMC and safety standards. Changes to your system include replacing a part or adding components, options, or peripherals not specifically authorized and qualified by Thermo Fisher Scientific. To ensure continued compliance with EMC and safety standards, replacement parts and additional components, options, and peripherals must be ordered from Thermo Fisher Scientific or one of its authorized representatives.

The regulatory symbols on the Dionex Aquion RFIC model/data label indicate that the system is in compliance with the following EMC and safety standards:

- EN 61010-1:2010
- UL 61010-1:2012
- CAN/CSA-C22.2 No. 61010-1-12
- EN 61326-1:2013

The CE mark on the Dionex Aquion RFIC model/data label indicates that the system is in compliance with the following European Community Directives as is evidenced by compliance to the associated standard where appropriate:

- Low Voltage/Safety Directive: 2014/35/EU by conforming to EN61010-1:2013
- EMC Directive: 2014/30/EU by conforming to EN61326-1:2013

Notice on Lifting and Handling of Thermo Scientific Instruments

For your safety, and in compliance with international regulations, the physical handling of this Thermo Fisher Scientific instrument ***requires a team effort*** to lift and/or move the instrument. This instrument is too heavy and/or bulky for one person alone to handle safely.

Notice on the Proper Use of Thermo Scientific Instruments

In compliance with international regulations: This instrument must be used in the manner specified by Thermo Fisher Scientific to ensure protections provided by the instrument are not impaired. Deviations from specified instructions on the proper use of the instrument include changes to the system and parts replacement. Accordingly, order replacement parts from Thermo Fisher Scientific or one of its authorized representatives.

Notice on the Susceptibility to Electromagnetic Transmission

Your instrument is designed to work in a controlled electromagnetic environment. Do not use radio frequency transmitters, such as mobile phones, in close proximity to the instrument.

For manufacturing location, see the label on the instrument.

WEEE Compliance

This product complies with the European Union's Waste Electrical & Electronic Equipment (WEEE) Directive 2002/96/EC. It is marked with the following symbol:

Thermo Fisher Scientific is registered with B2B Compliance (B2Bcompliance.org.uk) in the UK and with the European Recycling Platform (ERP-recycling.org) in all other countries of the European Union and in Norway.

If this product is located in Europe and you want to participate in the Thermo Fisher Scientific B2B (Business-to-Business) Recycling Program, send an email request to weee.recycle@thermofisher.com with the following information:

- WEEE product class
- Name of the manufacturer or distributor (where you purchased the product)

- Number of product pieces, and the estimated total weight and volume
- Pick-up address and contact person (including contact information)
- Appropriate pick-up time
- Declaration of decontamination, stating that all hazardous fluids or material have been removed from the product

For additional information about the Restriction on Hazardous Substances (RoHS) Directive for the European Union, search for RoHS on the Thermo Fisher Scientific European language websites.

Conformité DEEE

Ce produit est conforme avec la directive européenne (2002/96/EC) des Déchets d'Equipements Electriques et Electroniques (DEEE). Il est marqué par le symbole suivant:

Thermo Fisher Scientific s'est associé avec une ou plusieurs sociétés de recyclage dans chaque état membre de l'Union Européenne et ce produit devrait être collecté ou recyclé par celle(s)-ci. Pour davantage d'informations, rendez-vous sur la page www.thermoscientific.fr/rohs.

WEEE Konformität

Dieses Produkt entspricht der EU Waste Electrical & Electronic Equipment (WEEE) Richtlinie 2002/96/EC. Es ist mit dem folgenden Symbol gekennzeichnet:

Thermo Fisher Scientific hat Vereinbarungen mit Verwertungs-/Entsorgungsfirmen in allen EU-Mitgliedsstaaten getroffen, damit dieses Produkt durch diese Firmen wiederverwertet oder entsorgt werden kann. Weitere Informationen finden Sie unter www.thermoscientific.de/rohs.

Deionized Water Requirements for IC

For electrolytic eluent generation, or when manually preparing eluent and regenerant, use ASTM Type I (18 megohm-cm) filtered and deionized water that meets the specifications listed in Table 1.

Table 1. ASTM filtered, Type I deionized water specifications for ion chromatography

Contaminant	Specification
Ions–Resistivity	>18.0 megohm-cm
Organics–TOC	<10 ppb
Iron/Transition Metals*	<1 ppb
Pyrogens	<0.03 (Eu/mL)
Particulates > 0.2 µm	<1 (units/mL)
Colloids–Silica	<10 ppb
Bacteria	<1 (cfu/mL)
* Iron/transition metal content not specified for ASTM Type I water	

Contacting Us

❖ **For Technical Support for Dionex products**

In the U.S. and Canada, call 1-800-532-4752.

Outside the U.S. and Canada, call the nearest Thermo Fisher Scientific office.

❖ **For additional contact information**

Go to www.thermofisher.com/us/en/home/technical-resources/contact-us.html.

CAUTION Symbol	CAUTION	VORSICHT	PRECAUCIÓN	MISE EN GARDE
	**Risk electric shock:** This instrument uses voltages that can cause electric shock and/or personal injury. Before servicing, shut down the instrument and disconnect it from line power. While operating the instrument, keep covers on. Do not remove the protective covers from the printed circuit board assemblies (PCBAs).	**Stromschlaggefahr:** Dieses Gerät arbeitet mit Spannungen, die Stromschläge und/oder Personenverletzungen verursachen können. Vor Wartungsarbeiten muss das Gerät abgeschaltet und vom Netz getrennt werden. Betreiben Sie das Gerät nicht mit abgenommenen Abdeckungen. Nehmen Sie die Schutzabdeckungen von Leiterplatten nicht ab.	**Riesgo de descargas eléctricas:** Este instrumento utiliza voltajes que pueden causar descargas eléctricas y/o lesiones personales. Antes de revisar o reparar el instrumento, apáguelo y desconéctelo de la red eléctrica. Mantenga colocadas las cubiertas mientras se utiliza el instrumento. No retire las cubiertas protectoras del circuito impreso completo (PCBA).	**Risque de choc électrique :** l'instrument utilise des tensions susceptibles de provoquer une électrocution et/ou des blessures corporelles. Il doit être arrêté et débranché de la source de courant avant toute intervention. Ne pas utiliser l'instrument sans ses couvercles. Ne pas enlever les capots de protection des cartes à circuit imprimé (PCBA).
	**Chemical hazard:** Wear gloves and other protective equipment, as appropriate, when handling toxic, carcinogenic, mutagenic, corrosive, or irritant chemicals. Use approved containers and proper procedures to dispose of waste oil and when handling wetted parts of the instrument.	**Gefahr durch Chemikalien:** Tragen Sie beim Umgang mit toxischen, karzinogenen, mutagenen, ätzenden oder reizenden Chemikalien Schutzhandschuhe und weitere geeignete Schutzausrüstung. Verwenden Sie bei der Entsorgung von verbrauchtem Öl und beim Umgang mit medienberührenden Komponenten die vorgeschriebenen Behälter, und wenden Sie ordnungsgemäße Verfahren an.	**Peligro por sustancias químicas:** Cuando manipule sustancias químicas, tóxicas, carcinogénicas, mutágenas, corrosivas o irritantes, utilice guantes y otro equipo de protección. Utilice siempre recipientes homologados y siga los procedimientos adecuados cuando deseche aceite residual o manipule partes mojadas del instrumento.	**Danger lié aux produits chimiques :** porter des gants et d'autres équipements de protection appropriés pour manipuler les produits chimiques toxiques, cancérigènes, mutagènes, corrosifs ou irritants. Utiliser des récipients homologués et des procédures adéquates pour la mise au rebut des huiles usagées et lors de la manipulation des pièces de l'instrument en contact avec l'eau.
	**Hot surface:** Before touching, allow any heated components to cool.	**Heiße Oberflächen:** Lassen Sie heiße Komponenten vor der Berührung abkühlen.	**Superficies calientes:** Antes de tocar los componentes calientes, espere a que se enfríen.	**Surface chaude :** laisser refroidir les composants chauffés avant toute manipulation.
	**Flammable substances hazard:** Use care when operating the system in the presence of flammable substances.	**Gefahr durch entzündbare Substanzen:** Beachten Sie die einschlägigen Vorsichtsmaßnahmen, wenn Sie das System in Gegenwart von entzündbaren Substanzen betreiben.	**Peligro por sustancias inflamables:** Tenga mucho cuidado cuando utilice el sistema cerca de sustancias inflamables.	**Danger lié aux substances inflammables :** agir avec précaution lors de l'utilisation du système en présence de substances inflammables.
	**Risk of eye injury:** Eye injury could occur from splattered chemicals, airborne particles, or sharp objects. (Sharp objects that customers might install in the instrument include fused-silica tubing, the autosampler needle, and so on.) Wear safety glasses when handling chemicals or servicing the instrument.	**Augenverletzungsrisiko:** Verspritzte Chemikalien, Schwebstoffpartikel oder scharfe Objekte können Augenverletzungen verursachen. (Scharfe Objekte, die Kunden möglicherweise im Gerät installieren, sind z. B. Quarzglas-Kapillaren, die Nadel des Autosamplers, usw.) Tragen Sie beim Umgang mit Chemikalien oder bei der Wartung des Gerätes eine Schutzbrille.	**Riesgo de lesiones oculares:** Las salpicaduras de sustancias químicas, las partículas flotantes en el aire y los objetos afilados pueden causar lesiones oculares. (Entre los objetos afilados que los clientes pueden instalar en el instrumento se encuentran tubos de sílice fundida, agujas del muestreador automático, etc.). Para manipular sustancias químicas o realizar tareas de mantenimiento, utilice gafas de seguridad.	**Risque de lésion oculaire :** les projections chimiques, les particules en suspension dans l'air et les objets tranchants peuvent entraîner des lésions oculaires. (Les objets tranchants pouvant être installés par les clients dans l'instrument comprennent les tubes en silice fondue, les aiguilles du passeur automatique, etc.). Porter des lunettes de protection lors de toute manipulation de produit chimique ou intervention sur l'instrument.
	**General hazard:** A hazard is present that is not included in the other categories. This symbol also appears on the instrument. For details about the hazard, refer to the instrument manual. When the safety of a procedure is questionable, contact Technical Support for Thermo Scientific Sunnyvale products.	**Allgemeine Gefahr:** Es besteht eine weitere Gefahr, die nicht in den vorstehenden Kategorien beschrieben ist. Dieses Symbol wird auch auf dem Gerät angebracht. Einzelheiten zu dieser Gefahr finden Sie in den Gerätehandbüchern. Wenn Sie sich über die Sicherheit eines Verfahrens im Unklaren sind, setzen Sie sich, bevor Sie fortfahren, mit dem technischen Support für Thermo Scientific Sunnyvale Produkte in Verbindung.	**Peligro general:** Existen peligros que no se incluyen en las otras categorías. Este símbolo también aparece en el instrumento. Si desea obtener más información sobre estos peligros, consulte el manual del instrumento. En caso de duda sobre la seguridad de un procedimiento, póngase en contacto con el personal de servicio técnico de los productos Thermo Scientific Sunnyvale.	**Danger d'ordre général :** indique la présence d'un risque n'appartenant pas aux catégories citées plus haut. Ce symbole figure également sur l'instrument. Pour plus de détails sur ce danger potentiel, se reporter au manuel de l'instrument. Si la sûreté d'une procédure est incertaine, contacter l'assistance technique pour les produits Thermo Scientific Sunnyvale.

CAUTION Symbol	CAUTION	VORSICHT	PRECAUCIÓN	MISE EN GARDE
	**Laser hazard:** This instrument uses a laser that is capable of causing personal injury. This symbol also appears on the instrument. For details about the hazard, refer to the instrument manual.	**Gefahr durch Laserstrahlen:** Der in diesem Gerät verwendete Laser kann zu Verletzungen führen. Dieses Symbol wird auch auf dem Gerät angebracht. Einzelheiten zu dieser Gefahr finden Sie in den Gerätehandbüchern.	**Peligro por láser:** Este instrumento utiliza un láser que puede producir lesiones personales. Este símbolo también aparece en el instrumento. Si desea obtener más información sobre el peligro, consulte el manual del instrumento.	**Danger lié au laser :** l'instrument utilise un laser susceptible de provoquer des blessures corporelles. Ce symbole figure également sur l'instrument. Pour plus de détails sur ce danger potentiel, se reporter au manuel de l'instrument.
	**Ultra violet light hazard:** Do not look directly at the ultra-violet (UV) light or into the UV source. Exposure can cause eye damage. Wear UV eye protection.	**Gefahr durch UV-Licht:** Richten Sie Ihren Blick nicht direkt auf ultraviolettes Licht (UV-Licht) oder in die UV-Quelle. Dies kann zu Augenschäden führen. Tragen Sie eine UV-Schutzbrille.	**Peligro por luz ultravioleta:** No mire directamente a una luz ultravioleta (UV) ni a una fuente UV. La exposición puede causar daños oculares. Lleve protección ocular para UV.	**Danger lié aux rayons ultraviolets :** ne jamais regarder directement la lumière ultraviolette (UV) ou la source d'UV. Une exposition peut entraîner des lésions oculaires. Porter des protections oculaires anti-UV.
	**Sharp object:** Avoid physical contact with the object.	**Scharfes Objekt:** Vermeiden Sie den physischen Kontakt mit dem Objekt.	**Objeto puntiagudo:** Evite el contacto físico con el objeto.	**Objet tranchant :** éviter tout contact physique avec l'objet.
	**Pinch point:** Keep hands away from this area.	**Quetschgefahr:** Halten Sie Ihre Hände von diesem Bereich fern.	**Puntos de pinzamiento:** Mantenga las manos apartadas de esta área.	**Risque de pincement :** éloigner les mains de cette zone.
	**Heavy objects:** Never lift or move the instrument by yourself; you can suffer personal injury or damage the equipment. For specific lifting instructions, refer to the instrument manual.	**Schweres Objekt:** Bewegen und heben Sie das Gerät niemals allein an; dies kann zu Verletzungen oder zur Beschädigung des Geräts führen. Spezifische Anweisungen zum Anheben finden Sie im Gerätehandbuch.	**Objeto pesado:** Nunca levante ni mueva el instrumento por su cuenta, podría sufrir lesiones personales o dañar el equipo. Para obtener instrucciones específicas sobre levantamiento, consulte el manual del instrumento.	**Objet lourd :** ne jamais soulever ou déplacer l'instrument seul sous peine de blessure corporelle ou d'endommagement de l'instrument. Pour obtenir des instructions de levage spécifiques, se reporter au manuel de l'instrument.
	**Trip obstacle:** Be aware of cords, hoses, or other objects located on the floor.	**Stolpergefahr:** Achten Sie auf Kabel, Schläuche und andere Objekte auf dem Fußboden.	**Tropiezo con obstáculos:** Tenga en cuenta los cables, mangueras u otros objetos colocados en el suelo.	**Risque de trébuchement :** faire attention aux câbles, tuyaux et autres objets situés sur le sol.
	When the safety of a procedure is questionable, contact Technical Support for Thermo Scientific Sunnyvale products.	Wenn Sie sich über die Sicherheit eines Verfahrens im unklaren sind, setzen Sie sich, bevor Sie fortfahren, mit Ihrer lokalen technischen Unterstützungsorganisation für Thermo Scientific Sunnyvale Produkte in Verbindung.	En caso de duda sobre la seguridad de un procedimiento, póngase en contacto con el personal de servicio técnico de los productos Thermo Scientific Sunnyvale.	Si la sûreté d'une procédure est incertaine, contacter l'assistance technique pour les produits Thermo Scientific Sunnyvale.

CAUTION Symbol	CAUTION	警告	危险警告
	**Risk electric shock:** This instrument uses voltages that can cause electric shock and/or personal injury. Before servicing, shut down the instrument and disconnect it from line power. While operating the instrument, keep covers on. Do not remove the protective covers from the printed circuit board assemblies (PCBAs).	**感電の危険性**: この機器では、感電および / または身体傷害を引き起こすおそれのある電圧を使用しています。整備点検の前には、機器の電源を切り、電源コードを抜いてください。機器の作動中は、カバーを付けたままにしてください。プリント基板アセンブリ (PCBA) から保護カバーを取り外さないでください。	**触电危险：**本仪器所用电压可能导致电击或人身伤害。进行维修服务前，务必关闭仪器电源并断开其电源连接。操作此仪器时，不要卸下顶盖。勿卸下印刷电路板组件 （PCBA）的保护盖。
	**Chemical hazard:** Wear gloves and other protective equipment, as appropriate, when handling toxic, carcinogenic, mutagenic, corrosive, or irritant chemicals. Use approved containers and proper procedures to dispose of waste oil and when handling wetted parts of the instrument.	**化学的危険性**: 毒性、発癌性、変異原性、腐食性、または刺激性のある化学薬品を取り扱うときは、必要に応じて手袋などの保護具を着用します。廃油を処分したり、機器の接液部品を取り扱うときは、認可された容器を使用し、適切な手順に従います。	**化学品危险：**当处理毒性、致癌性、致突变性、腐蚀性或者刺激性化学品时，佩戴手套和其他保护性设备。当处理浸湿的仪器部件以及废油时，使用认可的容器和合适的步骤。
	**Hot surface:** Before touching, allow any heated components to cool.	**高温面**: 触れる前に、加熱した部品を冷ましてください。	**热表面：**待高温部件冷却之后再进行维修。
	**Flammable substances hazard:** Use care when operating the system in the presence of flammable substances.	**可燃性物質の危険性**: 可燃性物質があるところでシステムを作動させる場合は十分注意してください。	**易燃物危险：**在有易燃物质的场地操作该系统时，务必小心谨慎。
	**Risk of eye injury:** Eye injury could occur from splattered chemicals, airborne particles, or sharp objects. (Sharp objects that customers might install in the instrument include fused-silica tubing, the autosampler needle, and so on.) Wear safety glasses when handling chemicals or servicing the instrument.	**眼外傷の危険性**: 飛散した化学薬品、浮遊粒子、または鋭利な物体によって眼外傷を負うおそれがあります (機器に取り付けられる可能性がある鋭利な物体は、ヒューズドシリカ、オートサンプラーニードルなどです)。化学薬品を取り扱ったり、機器を整備点検するときは、保護メガネを着用します。	**眼睛伤害风险：**眼睛受伤可能源自飞溅的化学品、空气中的颗粒，或者锋利的物体。（安装在仪器内的锋利物体包括熔融石英管、自动进样器的进样针等。）处理化学品或对仪器进行维修服务时，务必戴上防护眼镜。
	**General hazard:** A hazard is present that is not included in the other categories. This symbol also appears on the instrument. For details about the hazard, refer to the instrument manual. When the safety of a procedure is questionable, contact Technical Support for Thermo Scientific Sunnyvale products.	**一般的な危険性**: それぞれのカテゴリーに当てはまらない危険があります。この標識記号は機器にも表示されています。この危険の詳細については、機器のマニュアルを参照してください。 手順の安全性にご不明な点がある場合は、Thermo Scientific Sunnyvale 製品のテクニカルサポートまでお問い合わせください。	**普通危险：**未归入其他类别的危险。此符号也会在仪器上出现。有关此危险的详细信息，参阅适当的仪器手册。若对任何步骤的安全事项有疑问，联系 Thermo Scientific Sunnyvale 产品的技术支持中心。

CAUTION Symbol	CAUTION	警告	危险警告
	**Laser hazard:** This instrument uses a laser that is capable of causing personal injury. This symbol also appears on the instrument. For details about the hazard, refer to the instrument manual.	**レーザー光線の危険性**: この機器では、身体傷害を引き起こすおそれのあるレーザーを使用しています。この標識記号は機器にも表示されています。この危険の詳細については、機器のマニュアルを参照してください。	**激光危险：**本仪器所用激光会导致人身伤害。此符号也会在仪器上出现。有关此危险的详细信息，参阅适当的仪器手册。
	**Ultra violet light hazard:** Do not look directly at the ultra-violet (UV) light or into the UV source. Exposure can cause eye damage. Wear UV eye protection.	**紫外光の危険性**: 紫外 (UV) 光または UV 光源を直接見ないでください。照射によって眼損傷を引き起こすおそれがあります。UV 保護メガネを着用します。	**紫外光危险：**不要直视紫外 （UV）光或者紫外光源。直视可能导致眼睛伤害。佩戴紫外线防护眼镜。
	**Sharp object:** Avoid physical contact with the object.	**鋭利な物体**: 物体との身体的接触を避けてください。	**锋利物体：**避免直接接触锋利的物体。
	**Pinch point:** Keep hands away from this area.	**ピンチポイント**: この部分には手を挟まれないようにしてください。	**夹点：**勿将手放在此部位。
	**Heavy objects:** Never lift or move the instrument by yourself; you can suffer personal injury or damage the equipment. For specific lifting instructions, refer to the instrument manual.	**重量物**:1 人で機器を持ち上げたり移動しないでください。身体傷害を負ったり、機器を損傷するおそれがあります。具体的な持ち上げ方法については、機器のマニュアルを参照してください。	**重物：**切勿独自提起或移动本仪器；可能遭受人身伤害或损坏仪器。有关具体的提起说明，参阅仪器手册。
	**Trip obstacle:** Be aware of cords, hoses, or other objects located on the floor.	**作業の障害物**: 床にあるコード、ホース、その他の物体に注意してください。	**绊倒危险：**注意地面上的线、管或其他物品。
	When the safety of a procedure is questionable, contact Technical Support for Thermo Scientific Sunnyvale products.	手順の安全性にご不明な点がある場合は、Thermo Scientific Sunnyvale 製品のテクニカルサポートまでお問い合わせください。	如对安全程序有疑问，联系 Thermo Scientific Sunnyvale 产品的技术支持中心。

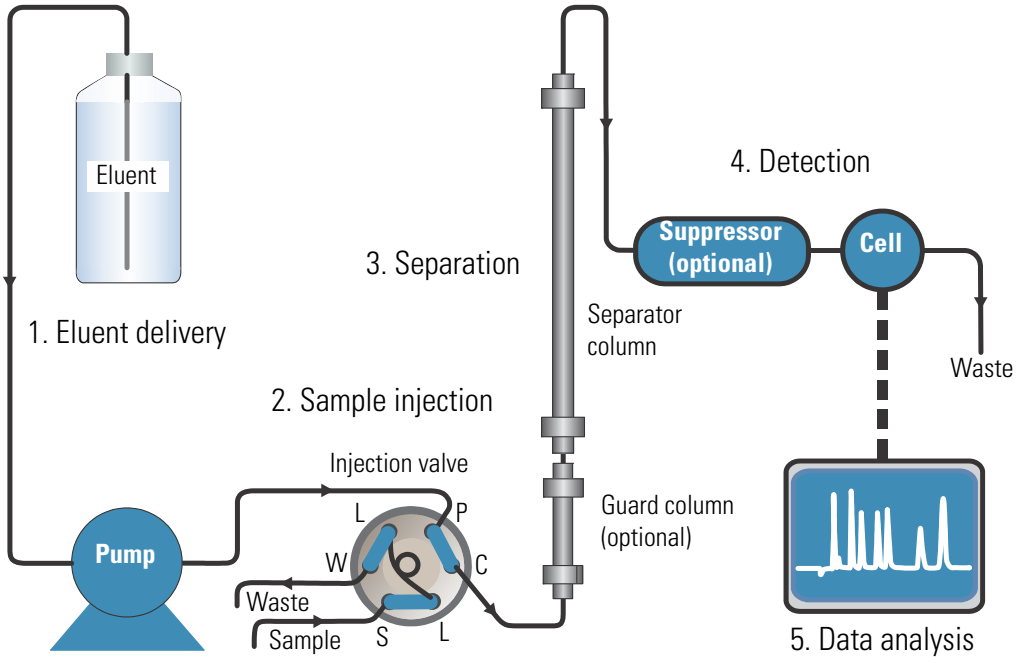
Introduction

Introduction to Ion Chromatography (IC)

The Dionex Aquion RFIC performs ion analyses using suppressed or non-suppressed conductivity detection. An ion chromatography system typically consists of a liquid eluent, a high-pressure pump, a sample injector, a guard and separator column, a chemical suppressor, a conductivity cell, and a data collection system.

Before running a sample, the ion chromatography system is calibrated using a standard solution. By comparing the data obtained from a sample to that obtained from the known standard, sample ions can be identified and quantitated. The data collection system, typically a computer running chromatography software, produces a chromatogram (a plot of the detector output vs. time). The chromatography software converts each peak in the chromatogram to a sample concentration and produces a printout of the results. A typical IC analysis consists of six stages (see Figure 1).

Figure 1. Ion process analysis



1. **Eluent Delivery**

   - Eluent, a liquid that helps to separate the sample ions, carries the sample through the ion chromatography system. The Dionex Aquion RFIC includes an eluent generator, which generates eluent online from deionized water.
   - The system can operate in two eluent delivery modes. In isocratic mode, the eluent composition and concentration remain constant throughout the run. In the one-step gradient mode, the eluent concentration changes over time. The delivery mode is defined in the Chromeleon Instrument Method Wizard. For more information, refer to the Chromeleon Help.

2. **Sample Injection**

   - The liquid sample is loaded into a sample loop manually or automatically (if an automated sampler is installed). When triggered, the Dionex Aquion RFIC injects the sample into the eluent stream.
   - The pump pushes the eluent and sample through the guard and separator columns (chemically-inert tubes packed with a polymeric resin). The guard column removes contaminants that might poison the separator column.

3. **Separation**

   - As the eluent and sample are pumped through the separator column, the sample ions are separated. In the Dionex Aquion RFIC, the mode of separation is called ion exchange. This is based on the premise that different sample ions migrate through the IC column at different rates, depending upon their interactions with the ion exchange sites.

4. **Suppression**

   - After the eluent and sample ions leave the column, they flow through a suppressor that selectively enhances detection of the sample ions while suppressing the conductivity of the eluent.

5. **Detection**

   - A conductivity cell measures the electrical conductance of the sample ions as they emerge from the suppressor and produces a signal based on a chemical or physical property of the analyte.

6. **Data Analysis**

   - The conductivity cell transmits the signal to a data collection system.
   - The data collection system (for the Dionex Aquion RFIC, this is the Chromeleon 7 Chromatography Data System) identifies the ions based on retention time, and quantifies each analyte by integrating the peak area or peak height. The data is quantitated by comparing the sample peaks in a chromatogram to those produced from a standard solution. The results are displayed as a chromatogram and the concentrations of ionic analytes can be automatically determined and tabulated.

Overview of the Dionex Aquion RFIC

The Dionex Aquion RFIC is an integrated ion chromatography system containing an eluent generator, pump, injection valve, and conductivity detector. Other system components, including a guard column, separator column, and suppressor vary, depending on the analyses to be performed.

If necessary, the Dionex Aquion RFIC can be configured with a column heater for temperature control of the column.

Dionex Aquion RFIC operation is controlled remotely by a personal computer running the Microsoft® Windows® 10 operating system and Chromeleon software (version 7.2.9 DUa or later). Chromeleon also provides data acquisition and data processing functions.

For communication with Chromeleon, the Dionex Aquion RFIC must be connected to a USB (Universal Serial Bus) port on the computer or a USB hub. For details, refer to the Dionex Aquion RFIC installation instructions.

2

Description

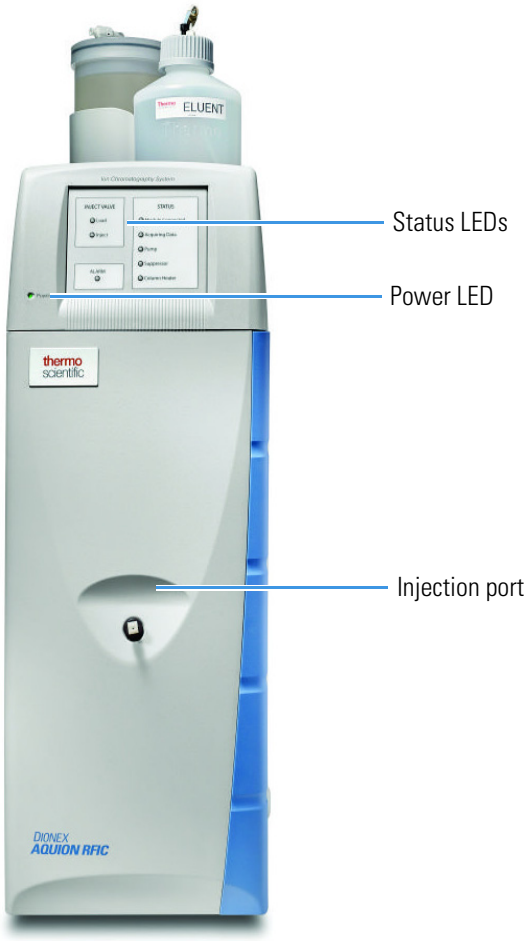
This chapter describes key features of the Dionex Aquion RFIC and introduces the Chromeleon user interface.

Contents

Operating Features

Front Panel

Figure 2. Dionex Aquion RFIC front panel



Injection Port

The sample to be analyzed can be injected manually into the injection port, using a syringe. For automated sample injection, the Dionex Aquion RFIC must be connected to an autosampler. For more information about sample injection, see "Operation Overview" on page 32.

LEDs

The **Power** LED indicates whether the Dionex Aquion RFIC power is on. Other LEDs indicate the status of various system functions. For details, see Table 2.

Figure 3. Dionex Aquion RFIC front panel LEDs

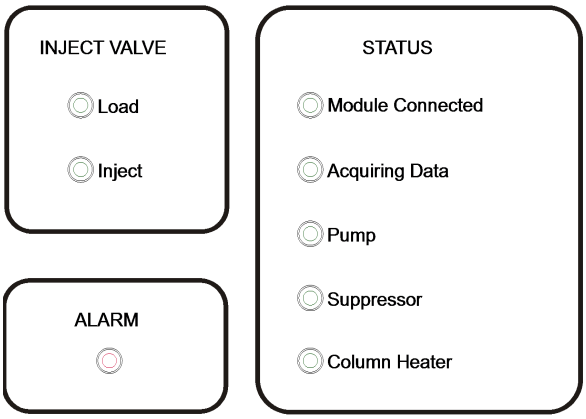


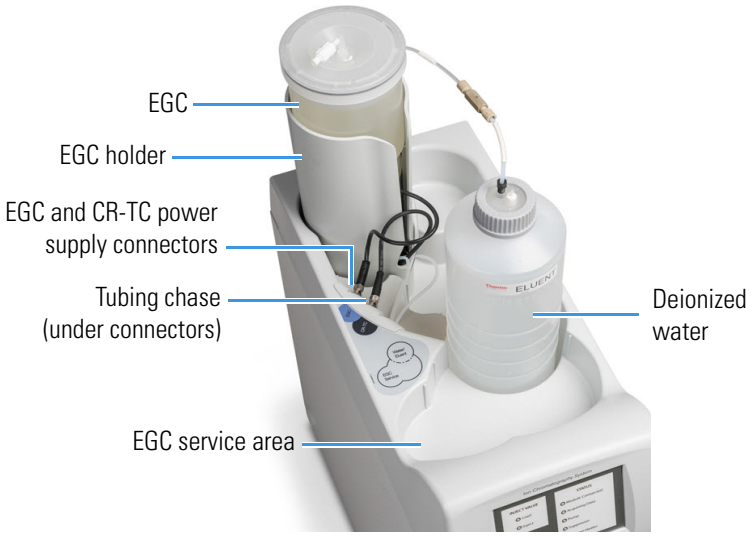
Table 2. Dionex Aquion RFIC front panel LED states

LED label	If on (green)	If flashing
Load	Injection valve is in Load position	Valve error detected
Inject	Injection valve is in Inject position	Valve error detected
Alarm	LED has no "on" (green) state	Error detected; check the Chromeleon audit trail for the cause
Module Connected	Dionex Aquion RFIC is connected to a Chromeleon instrument	LED does not flash
Acquiring Data	Sequence or manual data acquisition is in progress	Sequence stopped because an error was detected
Pump	Pump is on	High or low pressure limit exceeded (pump is turned off)
Suppressor	Suppressor is on and current is being applied to it	Continuity check failed, or suppressor is over the voltage, current, or power limit (suppressor is turned off)
Column Heater	Column heater is at set temperature	Column heater is transitioning to new temperature

Top Cover

Figure 4 shows the top cover of the Dionex Aquion RFIC.

Figure 4. Dionex Aquion RFIC top cover

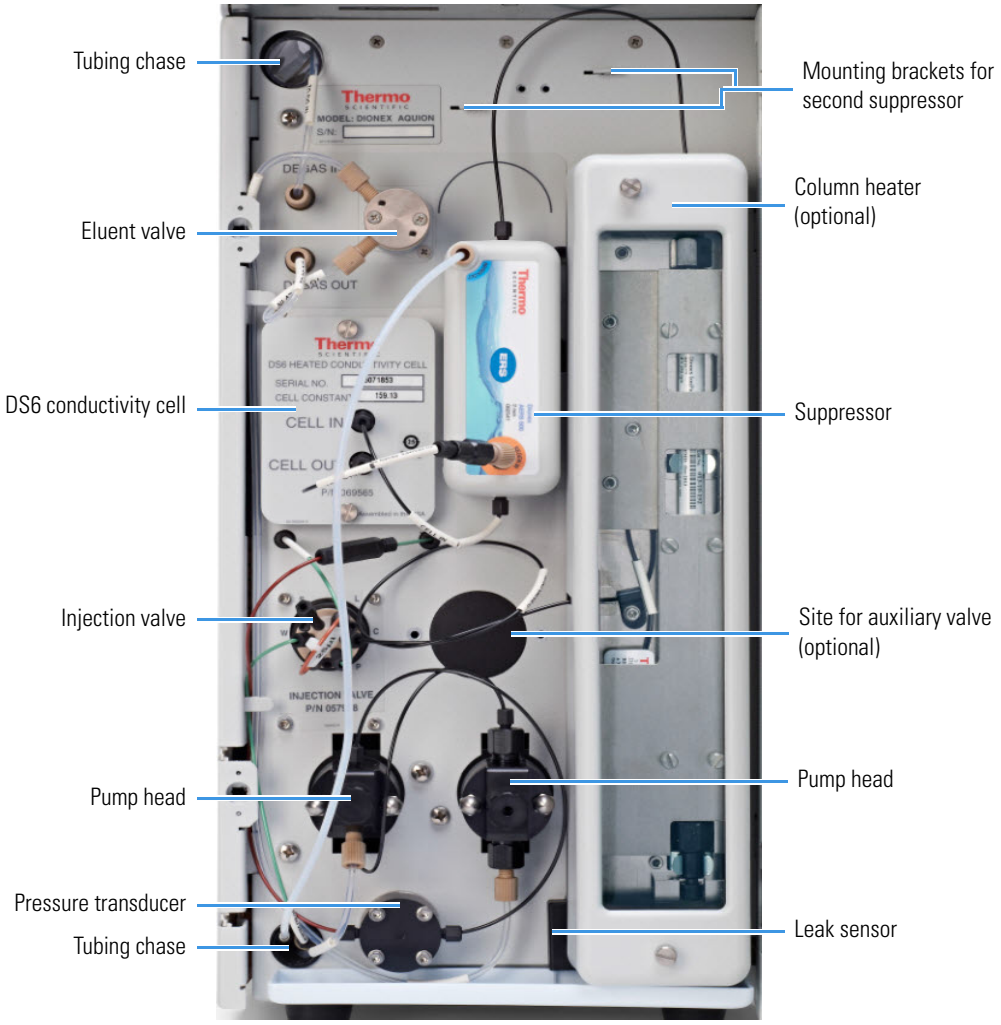


- Storage area for eluent generator cartridge and eluent reservoirs
  - The Dionex EGC (eluent generator cartridge) is installed in a holder that fits into the rear of the storage area. For more information about the Dionex EGC, see page 23.
  - Up to three 2-L plastic reservoirs (P/N 046548) or one 4-L plastic reservoir (P/N 039164) can be installed in the storage area.
- Power supply connectors
  - The electrical cable from the Dionex EGC connects to the **EGC** connector.
  - The electrical cable from the Thermo Scientific™ Dionex™ Continuously Regenerated Trap Column connects to the **CR-TC** connector. For more information about the Dionex CR-TC, see page 25.
  - The tubing chase under the connectors routes tubing from the eluent reservoir and Dionex EGC holder to the front of the Dionex Aquion RFIC.
- Dionex EGC service area
  - The service area holds the Dionex EGC during installation and replacement.

Component Panel

Figure 5 shows the user-accessible components installed on the component panel behind the Dionex Aquion RFIC front door.

Figure 5. Dionex Aquion RFIC component panel



Pressure Transducer

The pressure transducer measures the system backpressure.

Leak Sensor

A leak sensor is installed in the drip tray at the bottom of the component panel. If liquid accumulates in the tray, the front panel **Alarm** LED flashes and an error message is logged in the Chromeleon audit trail.

Pump Heads

The Dionex Aquion RFIC includes a dual-piston serial pump. The flow rate can be set to 0.00 mL/min or to between 0.05 and 5.00 mL/min. For optimum performance, set the flow rate to between 0.40 and 2.00 mL/min. Setting the flow rate to 0.00 mL/min turns off the pump. For more information, see "Pump" on page 21.

Injection Valve

The injection valve is a 6-port, electrically-activated Rheodyne™ valve. A 25-µL sample loop (P/N 042857) is installed on the valve at the factory. For more information, see "Injection Valve" on page 25.

Auxiliary Valve (Optional)

The auxiliary valve is a 2-position, electrically-activated Rheodyne valve. The valve is available in 6-port and 10-port models. For more information, see "Auxiliary Valve (Optional)" on page 26.

DS6 Heated Conductivity Cell

The flow-through conductivity cell measures the electrical conductance of analyte ions as they pass through the cell. A heat exchanger inside the cell regulates the temperature, which can be set to between 30 and 55 °C. For optimum performance, set the temperature to at least 7 °C above the ambient temperature and 5 °C above the column oven temperature. For more information, see "DS6 Heated Conductivity Cell" on page 10.

Suppressor

The suppressor reduces the eluent conductivity and enhances the conductivity of the sample ions, thereby increasing detection sensitivity. The following suppressors can be used with the Dionex Aquion RFIC:

- Thermo Scientific™ Dionex™ DRS™ Dynamically Regenerated Suppressor
- Thermo Scientific™ Dionex™ ERS™ 500 Electrolytically Regenerated Suppressor

For more information, see "Suppressor" on page 28.

Separator and Guard Columns

Both the separator and guard columns are packed with resin and perform the separation of the sample ions. The main function of the guard column is to trap contaminants and remove particulates that might damage the separator column.

Column Heater (Optional)

The column heater controls the temperature of the separator and guard columns. The temperature can be set to between 30 and 60 °C; however, it must be set to at least 5 °C above the ambient temperature. For more information, see "Column Heater (Optional)" on page 27.

Eluent Valve

The eluent valve controls the flow from the eluent reservoir. The eluent valve opens automatically when the pump is started and closes when the pump is turned off. For more information, see "Eluent Valve" on page 21.

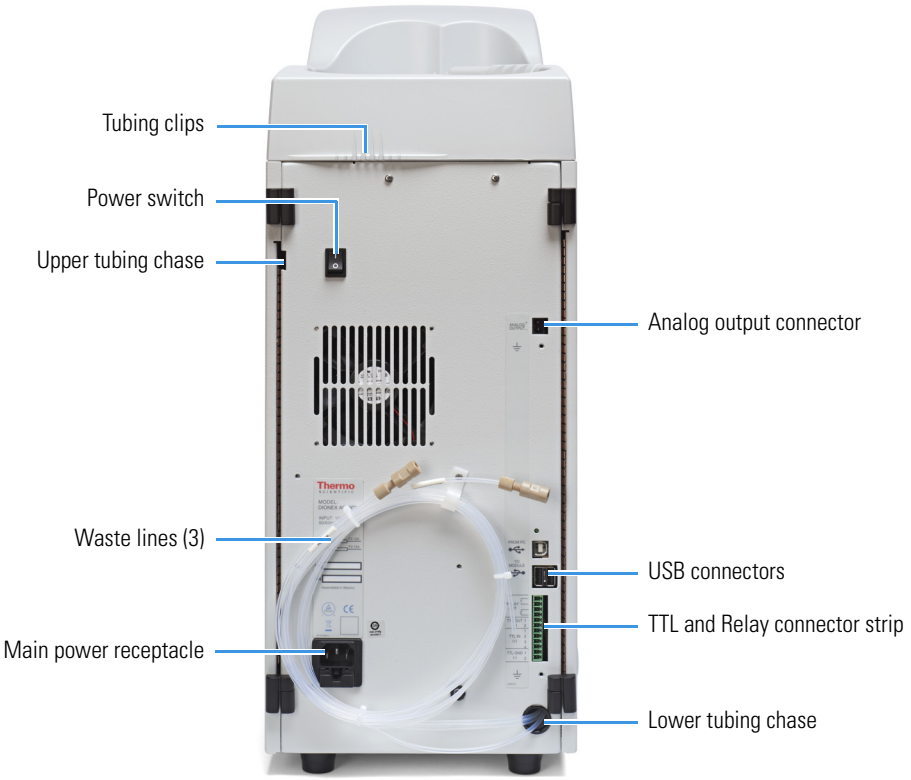
Tubing Chases

The upper tubing chase routes tubing from the top cover to the component panel. The lower tubing chase routes tubing from the component panel, through the interior of the system, to the rear panel.

Rear Panel

Figure 6 shows the Dionex Aquion RFIC rear panel.

Figure 6. Dionex Aquion RFIC rear panel



Analog Output Connector

The analog output connector outputs conductivity data (as a 0 to 1 V signal) to an integrator or recording device. For connection and setup information, refer to the Dionex Aquion RFIC installation instructions.

USB Connectors

The USB receptacle provides a connection to the Chromeleon computer. Two USB ports are available for connecting to other USB devices. For connection instructions, refer to the Dionex Aquion RFIC installation instructions.

TTL and Relay Connector

The TTL and Relay connector strip provides two TTL outputs, two relay outputs, and four TTL inputs. The outputs can be used to control functions in other TTL- or relay-controllable devices. The inputs can be used to switch the injection valve position, turn on the pump, perform an autozero command, and send an event mark to the analog output. For connection instructions, see "TTL and Relay Control" on page 131.

Tubing Chase

The lower tubing chase routes tubing from the rear panel to the component panel.

Tubing Clips

The tubing clips hold tubing routed from the top cover in place.

Power Switch

The power switch provides on/off control of power to the Dionex Aquion RFIC.

Main Power Receptacle

The power supply cord plugs into the AC power receptacle.

CAUTION The power supply cord is used as the main disconnect device. Verify that the socket-outlet is near the Dionex Aquion RFIC and is easily accessible.

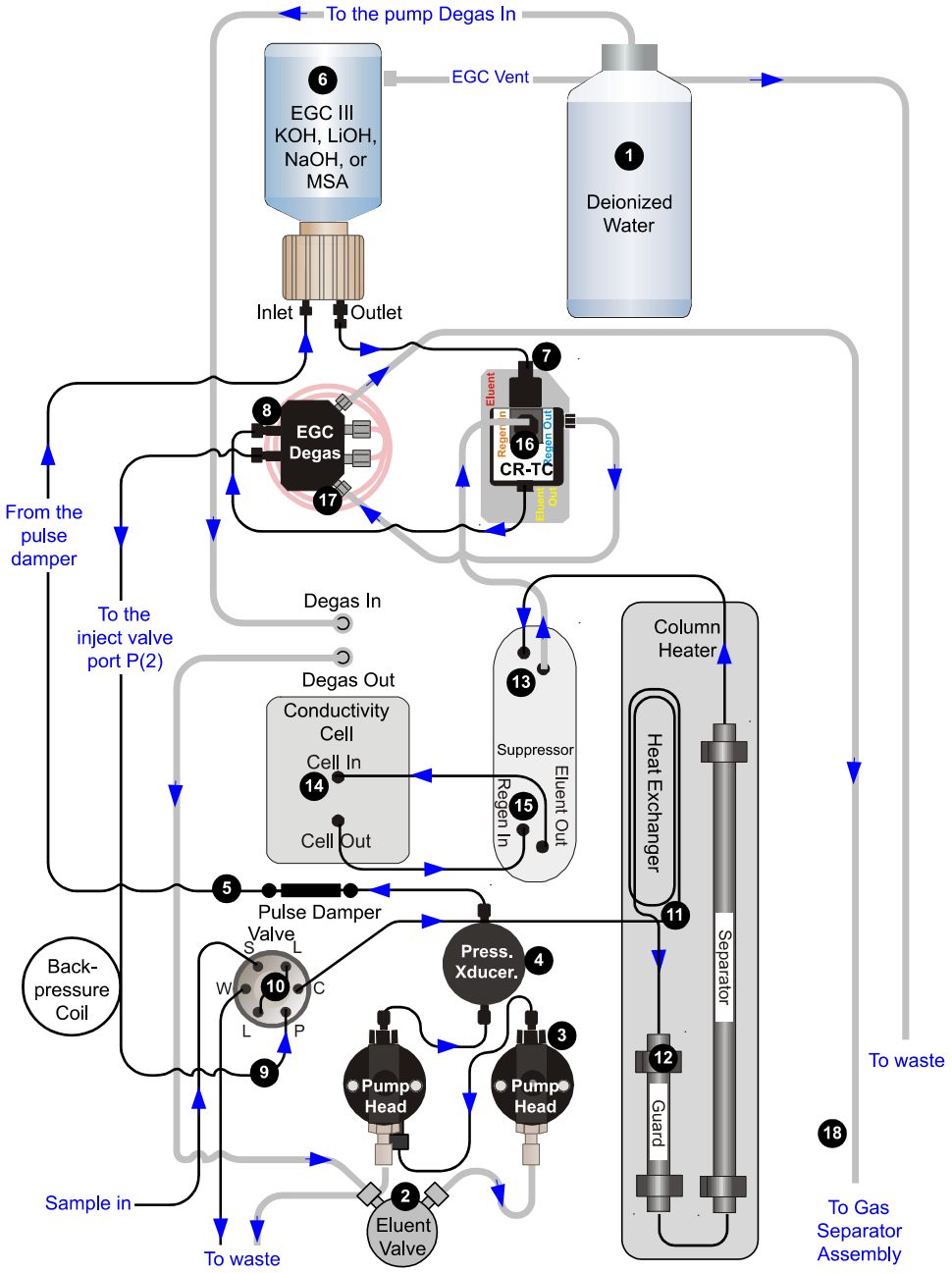
MISE EN GARDE Le cordon d'alimentation principal est utilisé comme dispositif principal de débranchement. Veillez à ce que la prise de base soit située/installée près du module et facilement accessible.

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

Flow Schematics

- Figure 7 illustrates the liquid flow path when the components required for producing KOH, LiOH, NaOH, or MSA eluent are installed. The required components include the corresponding type of Dionex EGC III Eluent Generator Cartridge and a Dionex CR-TC.
- Figure 8 illustrates the liquid flow path when the components required for producing carbonate eluent are installed. The required components include a Dionex EGC 500 K_2CO_3 Eluent Generator Cartridge and aThermo Scientific™ Dionex™ EGC 500 Carbonate Mixer.

Figure 7. Dionex Aquion RFIC flow schematic: KOH, LiOH, NaOH, or MSA eluent generation

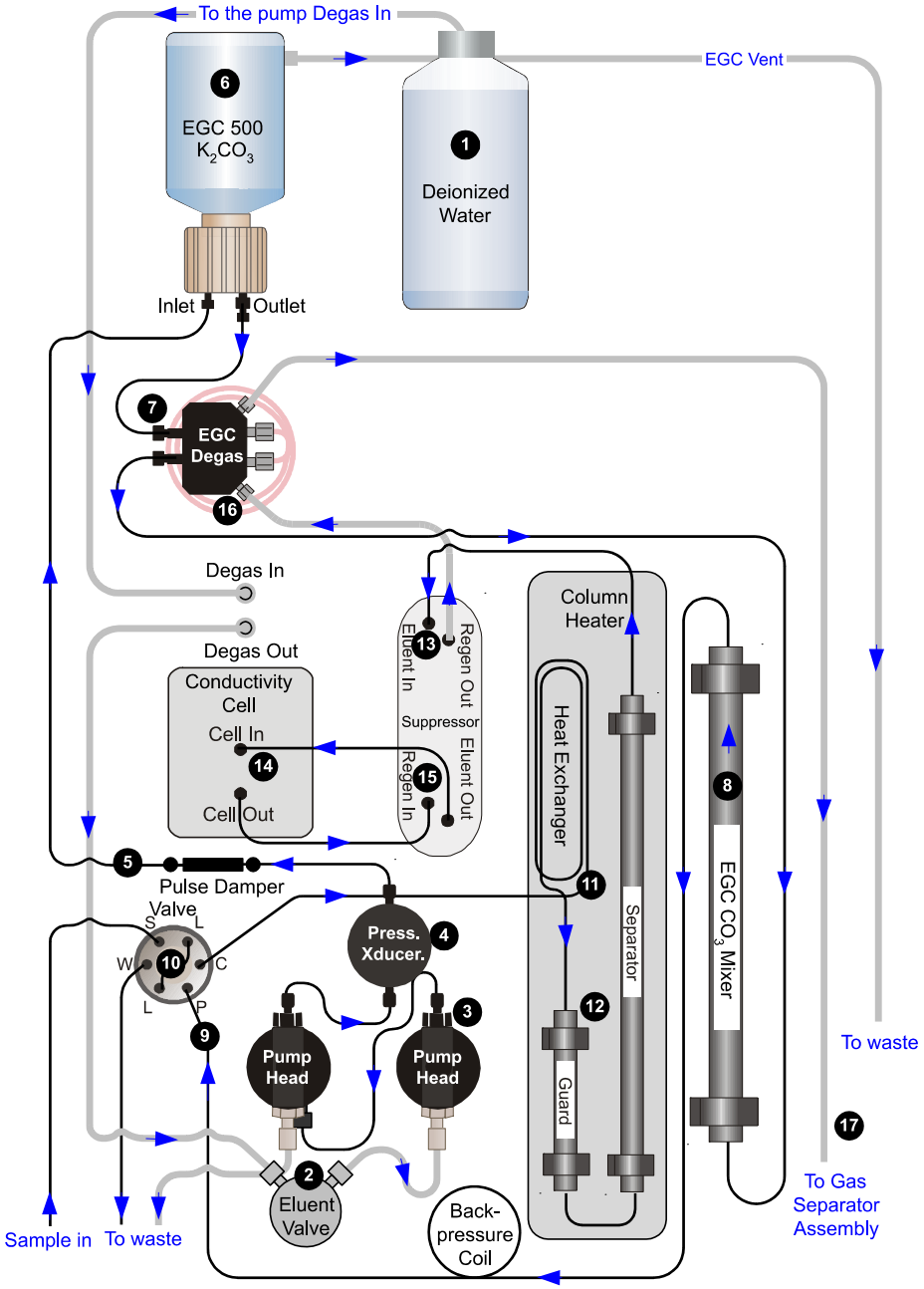


Flow Description for KOH, LiOH, NaOH, or MSA Eluent Generation

See Figure 7 for an illustration of the flow path described below.

- Deionized water from the reservoir ❶ flows first through the pump degas assembly, and then through the eluent valve ❷ to the pump ❸. The water is then pushed through the pressure transducer ❹, which measures the system pressure. From there, the water flows through a pulse damper ❺, which smooths minor pressure variations from the pump to minimize baseline noise.
- Water then flows into the eluent generator cartridge (Dionex EGC) ❻, which generates the programmed concentration of eluent. Eluent exits the cartridge and flows through the Dionex CR-TC ❼ (which traps ionic contaminants), through the Dionex EGC degas tubing assembly ❽, and on to the injection valve ❾.
- After sample is loaded into the sample loop ❿ and the injection valve is toggled to the Inject position, eluent passes through the sample loop.
- The eluent/sample mixture is pumped through the heat exchanger ⓫, which heats the mixture to the column heater temperature. The mixture then goes to the guard and separator columns ⓬ and through the suppressor ⓭.
- From the suppressor, the mixture flows through the conductivity cell ⓮, where the analytes are detected. A digital signal is sent to Chromeleon software. Analog output can be collected simultaneously.
- The mixture flows out of the conductivity cell and is recycled back into the suppressor ⓯, where it is the water source for the regenerant chamber.
- Regenerant waste from the suppressor is directed back to the Dionex CR-TC ⓰, and then to the Dionex EGC degas tubing ⓱, where any released hydrogen or oxygen gas is removed before it is sent to the gas separator assembly and then to waste ⓲.

Figure 8. Dionex Aquion RFIC flow schematic: carbonate eluent generation



Flow Description for Carbonate Eluent Generation

See Figure 8 for an illustration of the flow path described below.

- Deionized water from the reservoir ❶ flows first through the pump degas assembly and then through the eluent valve ❷ to the pump❸. The water is then pushed through the pressure transducer ❹, which measures the system pressure. From there, the water flows through a pulse damper ❺, which smooths minor pressure variations from the pump to minimize baseline noise.
- Water then flows into the eluent generator cartridge (Dionex EGC) ❻, which generates the programmed concentration of carbonate eluent. Eluent exits the cartridge and flows through the Dionex EGC degas tubing assembly ❼. Eluent then goes to the Dionex EGC 500 Carbonate Mixer ❽ (to ensure a homogeneous eluent concentration), and then on to the injection valve ❾.
- After sample is loaded into the sample loop ❿ and the injection valve is toggled to the Inject position, eluent passes through the sample loop.
- The eluent/sample mixture is pumped through the heat exchanger ⓫, which heats the mixture to the column heater temperature. The mixture then goes to the guard and separator columns ⓬ and through the suppressor ⓭.
- From the suppressor, the mixture flows through the conductivity cell ⓮, where the analytes are detected. A digital signal is sent to Chromeleon software. Analog output can be collected simultaneously.
- The mixture flows out of the conductivity cell and is recycled back into the suppressor ⓯, where it is the water source for the regenerant chamber.
- Regenerant waste from the suppressor is directed back to the Dionex EGC degas tubing ⓰, where any released hydrogen or oxygen gas is removed before it is sent to the gas separator assembly and then to waste ⓱.

Chromeleon Chromatography Data System

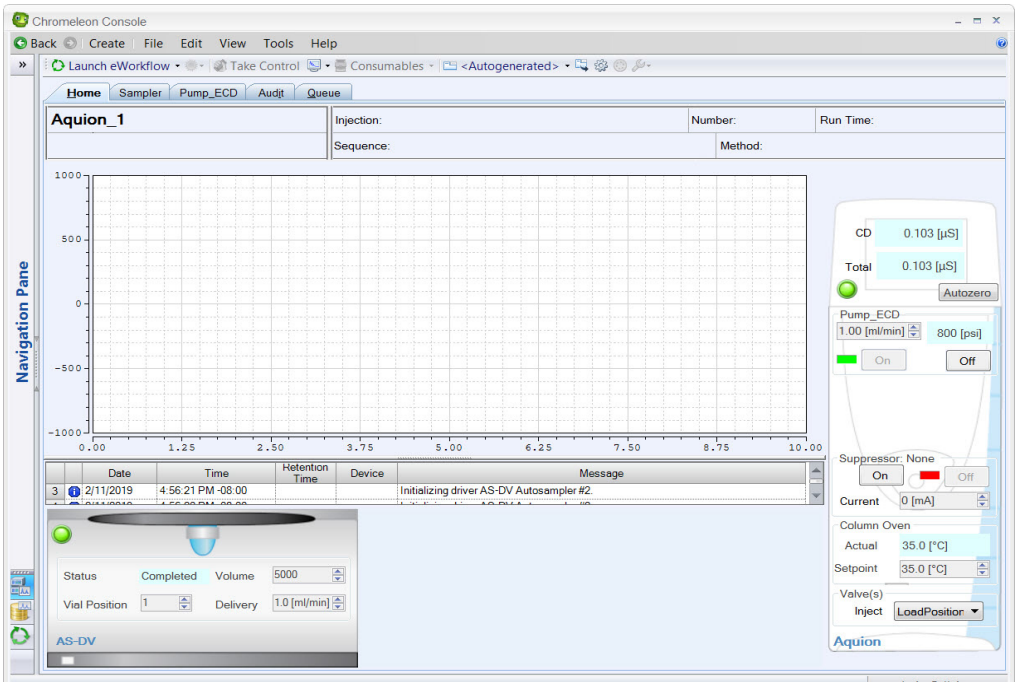
Chromeleon software is used to control the Dionex Aquion RFIC and to acquire and process data. There are two modes of software control:

- With *automated* control, you create a list of control commands to be executed in chronological order.
- With *direct* control, you use the controls on the Chromeleon ePanel Set (see Figure 9) to issue commands and enter operating parameters. Direct control commands and parameter settings are executed as soon as they are entered.

  The **Home** ePanel of the Chromeleon ePanel Set includes system status information, a signal plot, and controls for the most commonly used system functions. Click the tabs at the top of the ePanel to access detailed status and control functions for each system component (pump, detector, and so on).

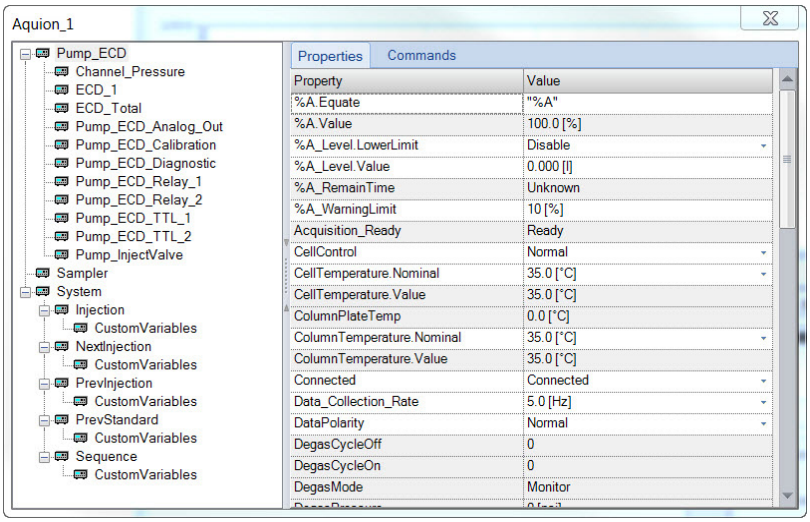
  For instructions on how to connect to the ePanel Set, see "Connecting to Chromeleon" on page 35.

Figure 9. Example Chromeleon ePanel Set



If the function to be performed is not available on the ePanel Set, click the **Command** icon on the Instrument toolbar above the ePanel Set (or press the **F8** key) to open the Chromeleon Command window (see Figure 10). From there, you can access all commands available for the system.

Figure 10. Chromeleon Command window



System Component Details

This section provides details about Dionex Aquion RFIC system components, including the vacuum degas assembly (optional), pump, eluent generator, injection valve, column heater (optional), suppressor, and conductivity cell.

Vacuum Degas Assembly (Optional)

The vacuum degas assembly provides online eluent degassing at a user-specified time and duration. The assembly, which must be installed in the Dionex Aquion RFIC at the factory, consists of:

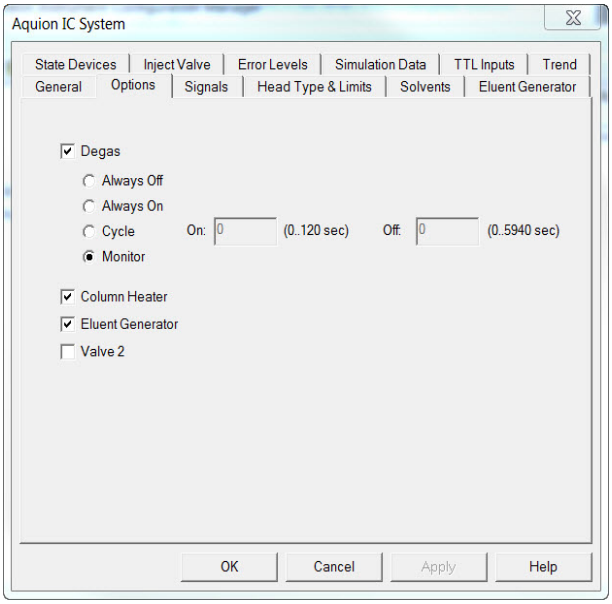
- A single-channel degas chamber (with degas membranes) with internal capacity of 17 mL
- A dual-stage diaphragm vacuum pump
- A solenoid valve
- An on-board vacuum sensor
- The electronics required to operate the vacuum pump
- Tubing, fittings, and other accessories

❖ To select the degas operating mode

By default, the Dionex Aquion RFIC monitors the degas pressure reading and turns the degas pump on and off as required. (This is the **Monitor** mode.) Follow the instructions here to select a different operating mode.

1. Open the Chromeleon Instrument Configuration Manager.
2. Double-click the Aquion IC System icon under the instrument.
3. In the Properties dialog box, click the **Options** tab (see Figure 11).

Figure 11. Properties dialog box: Options tab page



4. Select the preferred options.
   - **Always Off**: The degas pump is always off.
   - **Always On**: The degas pump is always on.

IMPORTANT Never select the **Always On** option for routine operation. The **Always On** option is intended for testing purposes only.

   - **Cycle**: The degas pump cycles on and off. In the **On** field, specify for how long the degas pump should run during a cycle. In the **Off** field, specify the time between cycles.
   - **Monitor**: (default mode) The Dionex Aquion RFIC monitors the degas pressure reading and turns the degas pump on and off as required.

Eluent Valve

The eluent valve (see Figure 12) controls the flow from the eluent reservoir. The valve opens automatically when the pump is started and closes when the pump is turned off.

You can also open and close the valve manually, using controls on the Chromeleon ePanel (see "Chromeleon Chromatography Data System" on page 18). This lets you perform service procedures on pump components without eluent leaks occurring.

Figure 12. Eluent valve

Pump

The Dionex Aquion RFIC pump is a microprocessor-based eluent delivery system. Its variable speed, dual-piston series design ensures pulse-free pumping for the most demanding applications.

Primary Pump Head

The primary pump head pumps eluent into the secondary pump head (see Figure 13). The check valves, which prevent reverse flow through the pump, are on the bottom (inlet) and top (outlet) of the primary pump head. The priming valve is on the front of the pump head.

To open the priming valve, turn the knob one-quarter to one-half turn counterclockwise. When the priming valve is open, liquid can flow into and out of the primary pump head via the port on the front of the valve.

Note The priming valve must be open when the pump is being primed with a syringe (see "Priming the Pump (Standard Procedure)" on page 90) or with isopropyl alcohol (see "Priming the Pump with Isopropyl Alcohol" on page 92).

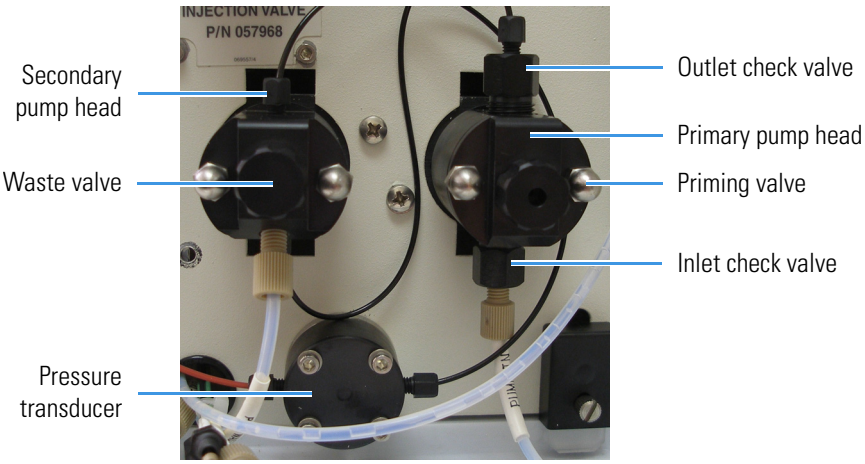
Secondary Pump Head

The secondary pump head delivers eluent to the remainder of the chromatography system (the injection valve, column, and detector). The waste valve is on the front of the secondary pump head (see Figure 13).

To open the waste valve, turn the knob one-quarter to one-half turn counterclockwise. When the waste valve is in the open position, all pump flow is directed to waste.

Note The waste valve must be open when the pump is being primed using the **Prime** button (see "Priming the Pump (Standard Procedure)" on page 90).

Figure 13. Secondary pump head



Pressure Transducer

Flow exiting the secondary pump head is directed to the pressure transducer (see Figure 13), which measures the system pressure.

Pressure readings are displayed on the Chromeleon ePanel. Monitor readings periodically to check that the pumping system is delivering smooth, accurate flow.

The system pressure should remain consistent, with no more than a 3% difference from one pressure reading to the next. High and low pressure limits can be used to stop the pump flow if a limit is exceeded. You can set the pressure limits from either the Chromeleon Instrument Configuration Manager or the ePanel. For instructions on what to do if a pressure limit is exceeded, see "Troubleshooting Error Messages" on page 51.

Pulse Damper

Flow output from the pressure transducer continues to the pulse damper, which smooths minor pressure variations. From there, flow is directed to the injection valve and then to the remainder of the chromatography system.

Piston Seal Wash

The pump includes a piston 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. To use this feature, an external wash solution must be connected to the system. The wash solution is either ASTM filtered, Type I (18 megohm-cm) deionized water or a combination of deionized water and 10% or 20% isopropyl alcohol. For connection instructions, refer to the Dionex Aquion RFIC installation instructions.

For continued protection of the pump, replace the piston rinse seals and O-rings in the pump housing every 6 months, or whenever you replace the main piston seals (see "Replacing a Pump Piston Seal and Piston Rinse Seal" on page 78).

Eluent Generator

The eluent generator produces high-purity eluents online, using only deionized water as the carrier. The eluent generator consists of an eluent generator cartridge (Dionex EGC) for eluent generation, as well as a high-pressure degas tubing assembly for removal of the electrolysis gases created during eluent generation.

Note The waste, gas separator tube (P/N 045460) should be connected to the system waste line during installation. For more information, refer to the Dionex Aquion RFIC installation instructions.

Several eluent generator cartridge types are available for use with the Dionex Aquion RFIC (see Table 3). Each cartridge contains 900 mL of the appropriate electrolyte concentrate solution for eluent generation. For more information, refer to the Dionex EGC manual.

Table 3. Dionex EGC cartridges for the Dionex Aquion RFIC

Eluent generator cartridge	P/N	Description
Dionex EGC III KOH	074532	Generates potassium hydroxide eluent for anion exchange separations
Dionex EGC III LiOH	074534	Generates lithium hydroxide eluent for anion exchange separations
Dionex EGC III NaOH	074533	Generates sodium hydroxide eluent for anion exchange separations
Dionex EGC III MSA	074535	Generates methanesulfonic acid eluent for cation exchange separations
Dionex EGC 500 K_2CO_3	088453	Generates potassium carbonate eluent for anion exchange separations; requires installation of a Dionex EGC 500 Carbonate Mixer

Select the concentration of eluent to be generated on the Chromeleon ePanel. The allowable eluent concentration depends on the flow rate, suppressor type, and cartridge type (see Table 4).

Table 4. Eluent concentration ranges

Eluent generator cartridge	Eluent concentration range
Dionex EGC III KOH	0.1 to 100 mM at 0.1 to 1.0 mL/min flow 0.1 to X mM at 1.0 to 3.0 mL/min flow where X = 100/flow in mL/min
Dionex EGC III LiOH	0.1 to 80 mM at 0.1 to £ 1.0 mL/min flow 0.1 to X mM at 1.0 to £ 3.0 mL/min flow where X = 80/flow in mL/min
Dionex EGC III NaOH	0.1 to 100 mM at 0.1 to 1.0 mL/min flow 0.1 to X mM at 1.0 to 3.0 mL/min flow where X = 100/flow in mL/min
Dionex EGC III MSA	0.1 to 100 mM at 0.1 to 1.0 mL/min flow 0.1 to X mM at 1.0 to 3.0 mL/min flow where X = 100/flow in mL/min
Dionex EGC 500 K_2CO_3	0.1 to 15 mM at 0.1 to 1.0 mL/min flow 0.1 to X mM at 1.0 to 2.0 mL/min flow where X = 15/flow in mL/min

Eluent Generator Cartridge (Dionex EGC) Holder

The Dionex EGC is installed in a cartridge holder mounted on the top cover of the Dionex Aquion RFIC (see Figure 4). The cartridge holder also houses a high-pressure degas tubing assembly. Tubing and fittings for plumbing the cartridge, degas assembly, and Dionex CR-TC are included with the holder. For more information, refer to the Dionex Aquion RFIC installation instructions.

Backpressure Coil (Optional)

The Dionex EGC 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 system backpressure is too low, Thermo Fisher Scientific recommends connecting a backpressure coil (P/N 053765) between the injection valve and the Dionex EGC **ELUENT OUT** port. For more information, refer to the Dionex Aquion RFIC installation instructions.

Continuously Regenerated Trap Column (Dionex CR-TC)

The Dionex CR-TC is a high-pressure electrolytically-regenerated trap column. The column is designed to remove anionic or cationic contaminants in the eluent or deionized water and to reduce drift during gradient separations. The following columns can be used with the Dionex Aquion RFIC:

- CR-ATC Continuously Regenerated Anion Trap Column (P/N 060477)
- CR-CTC II Continuously Regenerated Cation Trap Column (P/N 060262)

For more information, refer to the column manual.

Carbonate Mixer

To ensure a homogeneous eluent concentration, the carbonate eluent generated by the Dionex EGC 500 K_2CO_3 flows through a Dionex EGC 500 Carbonate Mixer before being delivered to the injection valve. The mixer is included in the following kits:

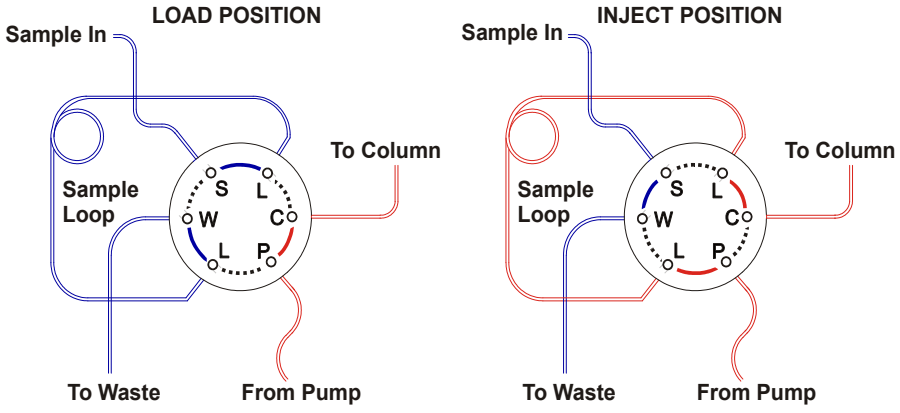
- Dionex EGC 500 Carbonate Mixer Kit, 2 mm (P/N 088467)
- Dionex EGC 500 Carbonate Mixer Kit, 4 mm (P/N 088468)

Injection Valve

The injection valve (P/N 057968) is a 6-port, electrically-activated valve. A 25-µL sample loop (P/N 042857) is installed on the valve at the factory.

The valve has two operating positions: Load and Inject (see Figure 14).

Figure 14. Injection valve flow schematics

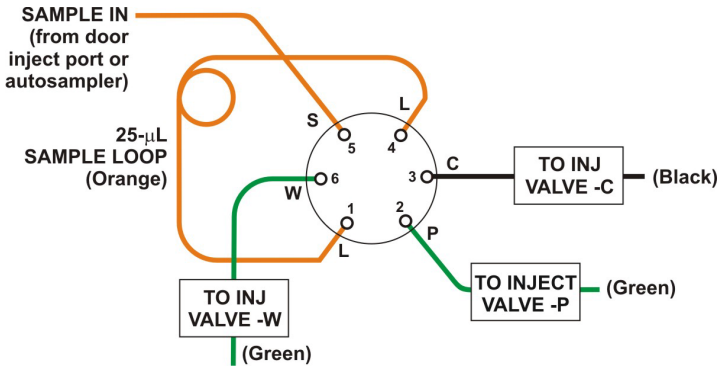


Eluent flows through the Load or Inject path, depending on the valve position.

- Load position: Sample is loaded into the sample loop, where it is held until injection. Eluent flows from the pump, through the valve, and to the column, bypassing the sample loop. Sample flows from the syringe or automated sampler line (if installed), through the valve, and into the sample loop. Excess sample flows out to waste.
- Inject position: Sample is swept to the column for analysis. Eluent flows from the pump, through the sample loop, and on to the column, carrying the contents of the sample loop with it. For more information, see "Loading and Injecting Samples" on page 41.

Figure 15 shows the injection valve connections. The injection valve is plumbed at the factory with all tubing and fittings for connection to the pump, injection port, column, and waste. A 25-µL PEEK™ (polyether ether ketone) sample loop (P/N 042857) is installed between ports **L (1)** and **L (4)**. If necessary, replace the pre-installed 25-µL loop with a loop that has a different sample injection volume. Thermo Fisher Scientific offers sample loops in various sizes.

Figure 15. Injection valve plumbing



Auxiliary Valve (Optional)

The auxiliary valve is a 2-position, electrically-activated, high-pressure Rheodyne valve. The PEEK valve is available in two models: a 6-port valve and a 10-port valve. The auxiliary valve must be installed on-site by Thermo Fisher Scientific field service personnel.

When installed, the valve enables a variety of sample preparation activities, including:

- Online filtration
- Matrix elimination (for example, the removal of high backgrounds of chloride or organic material)
- Concentrator-based techniques
- Conditional injections (large loop/small loop applications where the data system monitors sample concentration and reinjects the sample, using the smaller loop, if the concentration is too high)

- AutoNeutralization™
- Matrix diversion prior to MS (mass spectrometry) detection

Column Heater (Optional)

The column heater (see Figure 16) provides temperature control for the separator and guard columns.

Figure 16. Column heater

The heater temperature can be set to between 30 °C and 60 °C. The set temperature must be at least 5 °C above the ambient temperature. Setting the temperature to 0 °C turns off the column heater.

A thermistor mounted in the heater block monitors the temperature. If the temperature exceeds 65 °C, the column heater is shut off and an error message is displayed in the Chromeleon audit trail. For troubleshooting guidance, see "Column heater exceeds safe temperature" on page 51.

The column heater can be installed at the factory or installed on-site by Thermo Fisher Scientific field service personnel.

Suppressor

The suppressor reduces the eluent conductivity and enhances the conductivity of the sample ions, thereby increasing detection sensitivity. Table 5 lists the suppressors that can be used with the Dionex Aquion RFIC. For details about these suppressors (or guidelines for selecting a suppressor for an application), refer to the suppressor manuals.

Table 5. Thermo Scientific suppressors for the Dionex Aquion RFIC

Part number	Suppressor
088667	Dionex ADRS 600 Anion Dynamically Regenerated Suppressor (2 mm)*
088666	Dionex ADRS 600 Anion Dynamically Regenerated Suppressor (4 mm)*
088670	Dionex CDRS 600 Cation Dynamically Regenerated Suppressor (2 mm)*
088668	Dionex CDRS 600 Cation Dynamically Regenerated Suppressor (4 mm)*
085028	Dionex AERS 500 Carbonate Electrolytically Regenerated Suppressor (2 mm)
085029	Dionex AERS 500 Carbonate Electrolytically Regenerated Suppressor (4 mm)
*The Dionex DRS operates in the **Legacy** power mode, which uses constant current.	

DS6 Heated Conductivity Cell

The flow-through conductivity cell measures the electrical conductance of analyte ions as they pass through the cell. Two passivated 316 stainless steel electrodes are permanently sealed into the PEEK cell body. The cell design provides efficient sweep-out, low volume (1 µL), and low dispersion. Temperature control and compensation help verify good peak reproducibility and baseline stability.

Temperature Control

Temperature directly affects the conductivity of a solution. For example, laboratory heating and air conditioning systems can cause a regular slow cycling in the baseline. This, in turn, can affect the reproducibility of an analysis. The higher the conductivity, the more pronounced the effect.

In ion analysis, the effect of temperature variation is minimized by suppressing eluent conductivity. To further reduce the effect of temperature variation, a heater inside the cell regulates the temperature. The cell heater temperature can be set to between 30 °C and 55 °C. The set temperature must be at least 7 °C above the ambient temperature. Setting the cell temperature to 0 °C turns off the cell heater.

Temperature Compensation

Built-in preset temperature compensation of 1.7% per °C helps minimize changes in the baseline or in peak heights when the operating temperature is different from the temperature at which the cell was calibrated.

DS6 Heated Conductivity Cell Components

The **CELL IN** and **CELL OUT** fittings on the front cover of the cell are used to connect the cell to the suppressor (see Figure 5). The remaining cell components are mounted behind the component panel.

The cell must be installed at the factory or ordered separately and installed on-site by Thermo Fisher Scientific field service personnel.

3

Operation

This chapter describes routine operating and maintenance procedures for the Dionex Aquion RFIC.

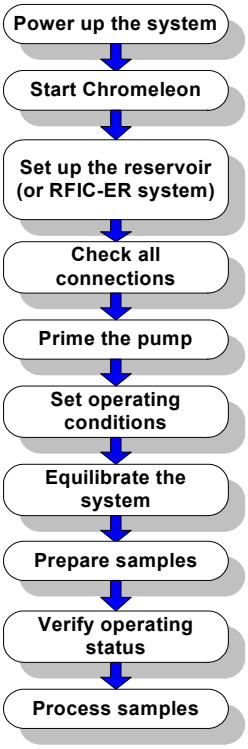
Note The instructions in this chapter assume that the initial setup of the Dionex Aquion RFIC (including configuring the system in a Chromeleon instrument) has been completed. If this is not the case, set up the system before proceeding. For more information, refer to the Dionex Aquion RFIC installation instructions.

Contents

Operation Overview

Figure 17 shows the basic steps for routine operation of the Dionex Aquion RFIC.

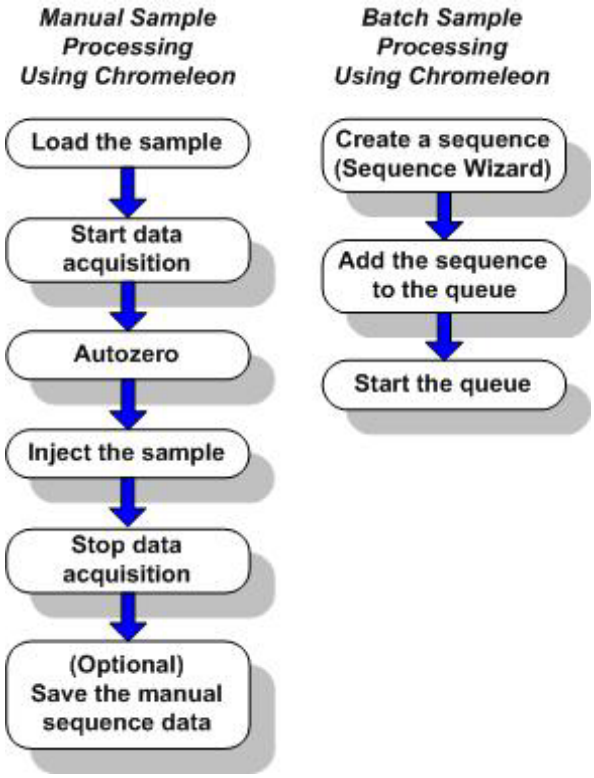
Figure 17. System operation overview



Sample Processing Overview

Samples can be run manually (one at a time) or else grouped and run automatically in batches. Figure 18 shows the typical steps for each type of sample processing.

Figure 18. Sample processing overview



Turning On the System Power

❖ To turn on the power

1. Press the main power switch on the Dionex Aquion RFIC rear panel (see Figure 19).
2. Turn on the power to the computer and the autosampler (if installed).

Figure 19. Dionex Aquion RFIC rear panel

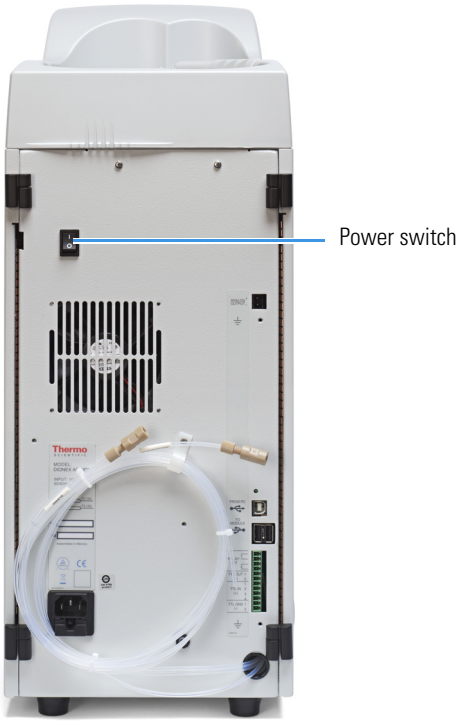


Table 6. Dionex Aquion RFIC power-up conditions

Feature	Power-up condition
Pump	Off
Injection valve	Load position
Cell	Reading current value
Suppressor	Off*
Cell heater	Set to the last value used. When the system is turned on for the first time, the default is 35 °C.
Column oven temperature (optional)	Set to the last value used. When the system is turned on for the first time, the default s 30 °C.
Eluent generator	Off*
Dionex CR-TC	Off
* When you start the suppressor or eluent generator, the value used last is restored.	

Connecting to Chromeleon

❖ To start the Chromeleon Instrument Controller Service

On the Windows taskbar, right-click the Chromeleon icon in the system tray and click **Start Chromeleon Instrument Controller**. The icon changes to to indicate that the Instrument Controller Service is starting. When the Instrument Controller Service is running (idle), the icon changes to gray .

–or–

If the Chromeleon icon is not on the taskbar, click **Start > All Programs > Thermo Chromeleon 7 > Services Manager** to open the Services Manager and click **Start Instrument Controller**.

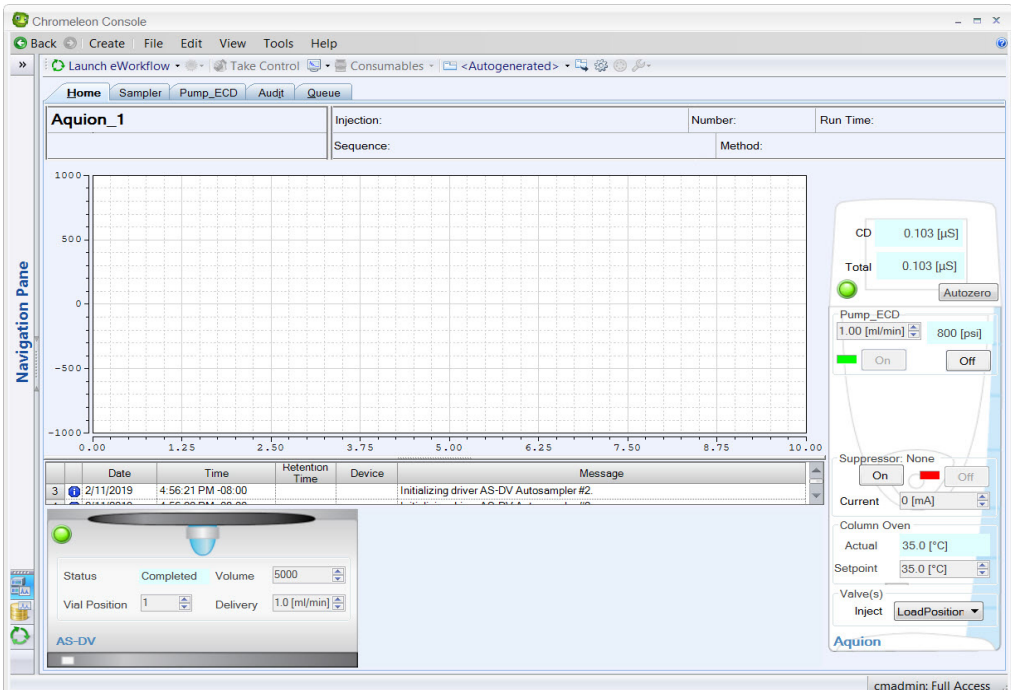
❖ To start the Chromeleon client

Click **Start > All Programs > Thermo Chromeleon 7 > Chromeleon 7**.

❖ To display the ePanel Set

1. In the Console, click the **Instruments** Category Bar.
2. Select the name of the instrument in which the Dionex Aquion RFIC is configured. Chromeleon will connect to the instrument and display the ePanel Set (see Figure 20).

Figure 20. Example Chromeleon ePanel Set



Setting Up the Eluent Reservoir

The Dionex Aquion RFIC does not require pressurized reservoirs. However, if eluent is manually degassed or is sensitive to contamination, Thermo Fisher Scientific recommends pressurizing the reservoir with helium or nitrogen.

The air regulator accessory (P/N 060054) required for pressurizing the eluent reservoir must be ordered separately. For more information, refer to the Dionex Aquion RFIC installation instructions.

❖ To filter the deionized water

Filtering removes small particulates in the deionized water that may contaminate the pump check valves and cause erratic flow rates or loss of prime.

1. Locate the end-line filter (P/N 045987) provided in the Dionex Aquion RFIC Ship Kit (P/N 064375).
2. Install the end-line filter on the end of the deionized water line, inside the reservoir.
3. Verify that the end of the filter extends to the bottom of the reservoir and that the filter is submerged in deionized water. This prevents air from being drawn through the lines.

❖ To fill the eluent reservoir

Fill the reservoir with ASTM filtered, Type I (18 megohm-cm) deionized water that meets the specifications in "Deionized Water Requirements for IC" on page x.

IMPORTANT After filling the reservoir, immediately set the eluent fill level in Chromeleon (see below).

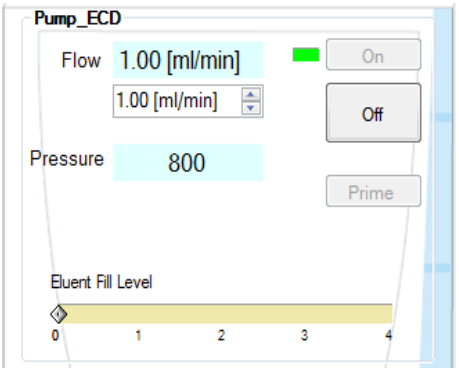
❖ To set the eluent level

1. On the Chromeleon ePanel Set, click the **Pump_ECD** tab.
2. Under **Pump_ECD**, drag the **Eluent Fill Level** slider to the location that corresponds to the current eluent level (see Figure 21).

During operation, Chromeleon determines the eluent usage by monitoring the flow rate and the length of time the pump is on. The eluent fill level volume is updated as the eluent is depleted. If the level falls below 200 mL, a warning message is displayed. The warning is repeated if the level falls to 100 mL and to 0 mL.

IMPORTANT To ensure that the **Eluent Fill Level** display is accurate, always enter the level immediately after filling the eluent reservoir. The Dionex Aquion RFIC does not automatically detect when the reservoir is filled, nor when it is empty.

Figure 21. Eluent Fill Level display in Chromeleon



❖ To connect the eluent reservoir

If it is not already connected, connect the **ELUENT BOTTLE OUT** line from the reservoir cap to the **ELUENT IN** line, which extends from the tubing chase on the top cover of the Dionex Aquion RFIC.

Checking All Connections

1. Make sure the eluent reservoir is filled.
2. Make sure the **ELUENT BOTTLE OUT** line from the reservoir cap is connected to the **ELUENT IN** line, which extends from the tubing chase on the top cover of the Dionex Aquion RFIC.
3. Make sure the Dionex EGC electrical cable (blue) is connected to the **EGC** connector.
4. Make sure the Dionex CR-TC electrical cable (black) is connected to the **CR-TC** connector.

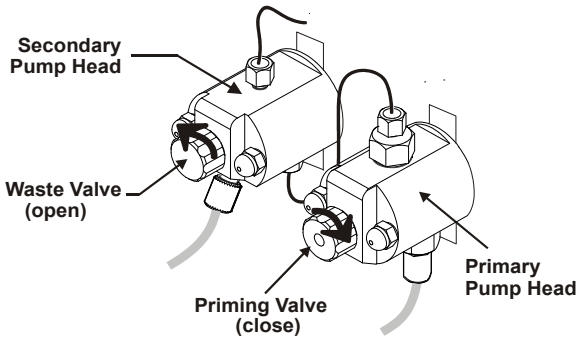
Priming the Pump

IMPORTANT If you changed the eluent—or if the eluent lines are dry—prime the eluent lines with a syringe (see page 90) before starting this pump priming procedure.

❖ To prime the pump

1. Verify that the priming valve on the primary pump head is closed (turned all the way clockwise) (see Figure 22).

Figure 22. Priming the pump



2. Open the waste valve on the secondary pump head by turning the knob one-quarter to one-half turn counterclockwise. (Opening the waste valve directs the eluent flow path to waste and eliminates backpressure.)
3. On the Chromeleon ePanel Set, click the **Pump_ECD** tab.
4. Under **Pump_ECD**, click the **Prime** button. The pump will begin pumping at approximately 3 mL/min.
5. Continue priming the pump until all air and previous eluent are purged and no air bubbles are exiting the waste line.
6. Under **Pump_ECD**, click the **Off** button to turn off the pump.
7. Close the waste valve. **Do not overtighten.** The pump is now ready for operation.

Setting System Operating Conditions

This section provides an overview of the steps required to start the system and select the initial system operating parameters. Actual operating parameters (including flow rate, cell heater temperature, and suppressor current) depend on the application you plan to run. For the required settings for your application, refer to the column manual.

Set or verify system operating parameters from the Chromeleon ePanel. Parameters can also be set automatically, by loading a Chromeleon sequence.

Note Clicking the **On** or **Off** button on the Chromeleon ePanel starts or stops the pump, suppressor, Dionex EGC, and Dionex CR-TC. Clicking **On** restores the flow rate, suppressor current, and eluent concentration settings that were in effect when the system was shut down.

❖ To set operating conditions

1. Verify that the pump is on and that the flow rate setting is correct.
2. Verify that the suppressor current is on and that the setting is correct.
3. Verify that the Dionex EGC is on and that the eluent concentration setting is correct.

4. Verify that the Dionex CR-TC is on.
5. Verify that the cell heater temperature is set to the correct value.
6. Verify that the column heater temperature is set to the correct value.

Equilibrating the System and Verifying Operational Status

This section provides an overview of the steps needed to equilibrate the system and verify operational readiness.

Note Equilibration time varies, and it may take some time to reach the expected values.

❖ To equilibrate the system and verify operational readiness

After setting operating conditions, allow the system to equilibrate. During equilibration, the Chromeleon ePanel displays the background conductivity (the conductivity of the eluent before sample injection) and the system backpressure.

1. Monitor the background conductivity to be sure that it is appropriate for your application.
2. Click **Autozero** on the ePanel to offset the detector background and zero the reading.
3. Monitor the system pressure to be sure that it is at the expected pressure for the installed column and is stable.
    - If the pressure is lower than expected, gas may be trapped in the system. To release the gas, remove the pump fitting on port **(P) 2** on the injection valve. Allow the air to escape, and then reconnect the fitting.
    - If the pressure fluctuates by more than about 0.13 MPa (20 psi), prime the pump (see "Priming the Pump (Standard Procedure)" on page 90). If this does not resolve the issue, see "Pump Difficult to Prime or Loses Prime" on page 62 for additional troubleshooting guidance.
    - If the pressure is higher than expected, there may be a restriction in the system plumbing. For troubleshooting guidance, see "Pump Difficult to Prime or Loses Prime" on page 62.
4. Verify that the baseline conductivity is at the expected reading for your application and is stable. In general, the reading should be <30 µS for a system set up for anion analyses and <2 µS for a system set up for cation analyses.
    - If the conductivity is too high, see "High Cell Output" on page 66 for troubleshooting guidance.
    - If there is baseline drift or excessive baseline "noise" (large fluctuations in readings), see "Baseline Noise or Drift" on page 67 for troubleshooting guidance.

5. Verify that the cell heater temperature is at the set point and is stable. The temperature is at equilibrium when the **Set Temperature** and **Current Temperature** readings are the same.
6. If a column heater is installed, verify that the temperature is at the set point and is stable. The temperature is at equilibrium when the **Set Temperature** and **Current Temperature** readings are the same.

The system is now ready for sample processing.

Preparing Samples

This section provides basic information about collecting, storing, and preparing samples for analysis.

Note You can begin preparing samples while the system is equilibrating.

Collecting and Storing Samples

Collect samples in high density polyethylene containers that have been thoroughly cleaned with deionized water. Do not clean containers with strong acids or detergents because these can leave traces of ions on the container walls. The ions may interfere with the analysis.

If samples will not be analyzed on the day they are collected, filter them through clean 0.45 µm filters immediately after collection; otherwise, bacteria in the samples may cause the ionic concentrations to change over time. Refrigerating the samples at 4° C (39° F) will reduce, but not eliminate, bacterial growth.

Analyze samples containing nitrite or sulfite as soon as possible. Nitrite oxidizes to nitrate, and sulfite to sulfate, thus increasing the measured concentrations of these ions in the sample. In general, samples that do not contain nitrite or sulfite can be refrigerated for at least one week with no significant changes in anion concentrations.

Pretreating Samples

Analyze rainwater, drinking water, and air particulate leach solutions directly with no sample preparation (other than filtering and possibly diluting).

Filter groundwater and wastewater samples through 0.45 µm filters before injection, unless samples were filtered after collection.

Before injection, pretreat samples that may contain high concentrations of interfering substances by putting them through Thermo Scientific™ Dionex™ OnGuard™ cartridges. For instructions, refer to the OnGuard cartridge manual.

Diluting Samples

Because the concentrations of ionic species in different samples can vary widely from sample to sample, no single dilution factor can be recommended for all samples of one type. In some cases (for example, many water samples), concentrations are so low that dilution is not necessary.

To dilute the sample, use either eluent or ASTM filtered, Type I (18 megohm-cm) deionized water that meets the specifications in "Deionized Water Requirements for IC" on page x. When using carbonate eluents, diluting with eluent minimizes the effect of the water dip at the beginning of the chromatogram. If you dilute the sample with eluent, also use eluent from the same lot to prepare the calibration standards. This is most important for fluoride and chloride, which elute near the water dip.

To improve the accuracy of early eluting peak determinations, such as fluoride, at concentrations below 50 ppb, dilute standards in eluent or spike the samples with concentrated eluent to minimize the water dip. For example, spike a 100 mL sample with 1.0 mL of a 100 X eluent concentrate.

Loading and Injecting Samples

There are two techniques for loading samples into the sample loop:

- With an autosampler
- With a syringe or vacuum syringe via the injection port on the Dionex Aquion RFIC front door (see Figure 2)

For autosampler injections, the injection port tubing must be disconnected from the Dionex Aquion RFIC injection valve and replaced by the autosampler outlet tubing. Other setup requirements vary, depending on the autosampler model.

Samples can be injected using either the standard injection valve or the optional auxiliary valve (see "Auxiliary Valve (Optional)" on page 26). The injection valve (or auxiliary valve) must be specified as the injection valve and linked to the autosampler in the Chromeleon instrument. For more information, refer to the Chromeleon Help or user's manual.

Setup for a Dionex AS-DV Autosampler

To use a Thermo Scientific™ Dionex™ AS-DV Autosampler, the Dionex Aquion RFIC injection valve (or auxiliary valve) must be specified as the injection valve and linked to the Dionex AS-DV in the Chromeleon instrument. For more information, refer to the Chromeleon Help or user's manual.

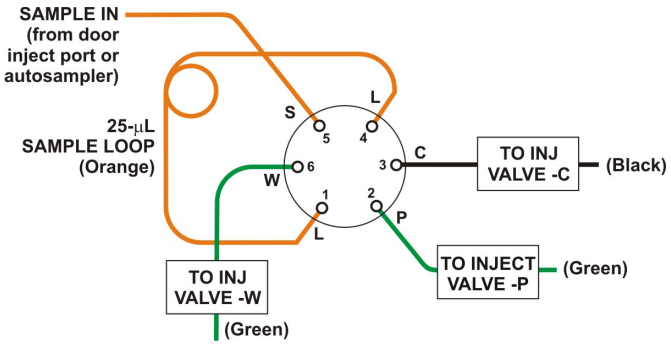
Setup for a Dionex AS-AP Autosampler

For setup information for a Thermo Scientific™ Dionex™ AS-SP Autosampler, refer to the autosampler manual.

❖ To load samples with a syringe

1. Verify that the injection port on the Dionex Aquion RFIC front door (see Figure 2) is connected to sample port **S (5)** on the injection valve (see Figure 23).

   Figure 23. Injection valve connections

2. Fill the 1-cc syringe (P/N 016388) provided in the Dionex Aquion RFIC Ship Kit (P/N 064375) with a calibration standard or sample.
3. Insert the syringe into the injection port on the Dionex Aquion RFIC front door (see Figure 2).
4. Verify that the injection valve is in the Load position.
5. Overfill the sample loop with several sample loop volumes. Excess sample will exit through the injection valve waste line.
6. Leave the syringe in the port and switch the injection valve to the Inject position (see "To inject samples" on page 43).

❖ To load samples with a vacuum syringe

1. Disconnect the waste line from port **W (6)** on the injection valve (see Figure 23) and replace it with a piece of PEEK or PTFE (polytetrafluoroethylene) tubing that is 25 to 30 cm (10 to 12 in) long.
2. Place the free end of the PEEK or PTFE line into the sample.
3. Verify that the injection valve is in the Load position.
4. Insert the 1-cc syringe (P/N 016388) provided in the Dionex Aquion RFIC Ship Kit (P/N 064375) into the injection port on the Dionex Aquion RFIC front door (see Figure 2) and pull out the plunger to draw the sample into the injection valve.
5. Switch the injection valve to the Inject position (see "To inject samples" on page 43).

❖ **To load samples with an autosampler**

1. Verify that the autosampler output line is connected to sample port **S (5)** on the Dionex Aquion RFIC injection valve.
2. Prepare and fill the sample vials and place them in the autosampler tray or cassette. For detailed instructions, refer to the autosampler manual.
3. The sample loading process depends on the autosampler model. In general, one of the following steps is required (for details, refer to the autosampler manual):
   - Include the commands for controlling sample loading in a Chromeleon method. For details, refer to the Chromeleon Help or user manual.
   - Enter the commands for loading the sample on the autosampler front panel.
4. Switch the injection valve to the Inject position (see "To inject samples" on page 43).

❖ **To inject samples**

After loading the sample in the sample loop, use one of the following methods to switch the injection valve to the Inject position.

- Manually: Click the **Inject** button on the Chromeleon ePanel (see "Example Chromeleon ePanel Set" on page 35).
- Automatically: Include an Inject command in a Chromeleon method. For details, refer to the Chromeleon Help or user manual.

Processing Samples

There are two options for processing samples:

- Run samples manually, one at a time (see "Manual Sample Processing" on page 43).
- Group samples and run them automatically, in batches (see "Automated (Batch) Sample Processing" on page 44).

Manual Sample Processing

To process samples manually, select operating parameters and commands from the Chromeleon ePanel. Commands are executed as soon as they are entered.

1. Complete the instructions in "Turning On the System Power" on page 34 through "Equilibrating the System and Verifying Operational Status" on page 39 to prepare the Dionex Aquion RFIC for operation and to prepare the sample for processing.
2. Load the sample, using a syringe, vacuum syringe, or autosampler (see"Loading and Injecting Samples" on page 41).
3. On the Chromeleon ePanel, click the **Autozero** button.

4. Inject the sample (see "To inject samples" on page 43). The signal plot is displayed on the ePanel.
5. Monitor the chromatogram. When sample data has been collected, click the **Monitor Baseline** button on the Instrument toolbar above the ePanel Set.

❖ To save data from a manual run

Data from manual processing is saved in the **manual** sequence under the instrument folder in the local data vault.

1. Select the **manual** folder and click **File > Save As**.
2. Enter a new name for the sequence.
3. Select the **Save raw data** check box.
4. Click **Save**.

Automated (Batch) Sample Processing

Note This section provides a brief overview of the steps required to perform sample analyses using Chromeleon. For detailed instructions, refer to the Chromeleon Help.

To process samples automatically, first add sample injections to a Chromeleon sequence. (A sequence determines how a group of injections will be analyzed and the order in which they will be run.) For each injection, a sequence typically includes the following elements:

- An *instrument method*—A predefined list of commands and parameters for controlling the system and acquiring sample data.
- The chromatographic data acquired.
- A *processing method*—A predefined set of instructions for evaluating the acquired data.
- Templates for displaying chromatographic data on the screen and for printing reports.

There are two ways to create a sequence in Chromeleon:

- eWorkflows provide predefined templates and rules for creating new sequences. If they have been defined for your laboratory, eWorkflows are the preferred method for creating a new sequence.
- The Sequence Wizard provides a series of dialog boxes that guide you through the process of creating a sequence.

After creating the sequence, you are ready to start batch processing.

1. Complete the instructions in "Turning On the System Power" on page 34 through "Equilibrating the System and Verifying Operational Status" on page 39 to prepare the Dionex Aquion RFIC for operation and to prepare the sample for processing.

2. If an autosampler is installed: Prepare and fill the sample vials, and then place them in the autosampler tray or cassette. For detailed instructions, refer to the autosampler manual.

   If an autosampler is *not* installed: Load the sample into the injection valve sample loop through the sample port on the Dionex Aquion RFIC front door (see "To load samples with a syringe" on page 42).

3. Load the sequence into a queue and start the run. Chromeleon performs a Ready Check to verify that the instrument is ready for operation and that the instrument methods specified in the sequence are error-free. If the Ready Check passes (and if another sequence is not currently running), the sequence is started.

4

Maintenance

This chapter describes routine maintenance procedures for the Dionex Aquion RFIC that users can perform. All other maintenance procedures must be performed by Thermo Fisher Scientific personnel.

Daily Maintenance

- Check the Dionex Aquion RFIC component panel (see Figure 5) for leaks or spills. Wipe up spills. Isolate and repair leaks (see "Liquid Leaks" on page 60). Rinse off any dried eluent with deionized water.
- Check the eluent reservoir. When necessary, refill the reservoir with ASTM filtered, Type I (18 megohm-cm) deionized water that meets the specifications listed in "Deionized Water Requirements for IC" on page x.
- Check the waste container and empty when needed.

Weekly Maintenance

- Check for crimps or discoloration in the fluid lines. Replace any pinched lines. Replace damaged lines.
- Check for evidence of liquid leaks in the junctions between the pump heads and the pump casting. If the piston seal wash tubing is not connected, check for evidence of moisture in the drain tubes at the rear of the pump heads. Normal friction and wear may gradually result in small liquid leaks around the piston seal. If unchecked, these leaks can gradually contaminate the piston housing, causing the pump to operate poorly. If leaks occur, replace the piston seals (see "Replacing a Pump Piston Seal and Piston Rinse Seal" on page 78).

- Check the end-line filter (P/N 045987) on the deionized water line for discoloration or bacterial buildup, and change if needed. When new, end-line filters are pure white. If the system is in continuous operation, change the end-line filter weekly (or whenever it becomes discolored). Replace the filter more often if bacterial buildup is visible or if the eluent does not contain solvent.

IMPORTANT It is especially important to replace end-line filters regularly when using aqueous eluents, which may contaminate the filter with bacteria or algae. The bacterial buildup may not be visible.

Semiannual Maintenance

- Replace the pump piston rinse seals and piston seals (see "Replacing a Pump Piston Seal and Piston Rinse Seal" on page 78).

Annual Maintenance

- Thermo Fisher Scientific recommends performing preventive maintenance of the Dionex Aquion RFIC annually, as well as before any scheduled Performance Qualification tests. The Dionex Aquion RFIC Preventive Maintenance Kit (P/N 057954) includes replacement parts and instructions.
- Rebuild the auxiliary valve, if installed (see "Rebuilding the Injection Valve or Auxiliary Valve" on page 74).
- If a Dionex AS-AP Autosampler is installed, perform the recommended annual preventive maintenance procedure. The Dionex AS-AP Preventive Maintenance Kit (P/N 075000) includes replacement parts and instructions.
- If a Dionex AS-DV Autosampler is installed, perform the recommended annual preventive maintenance procedure. The Dionex AS-DV Preventive Maintenance Kit (P/N 60-065335) includes replacement parts and instructions.

5

Troubleshooting

This chapter is a guide to troubleshooting issues that may arise during operation of the Dionex Aquion RFIC.

If you are unable to resolve a problem by following the instructions here, contact Technical Support for Dionex products. In the U.S. and Canada, call 1-800-532-4752. Outside the U.S. and Canada, call the nearest Thermo Fisher Scientific office.

Contents

Note An interactive troubleshooting guide is available in Chromeleon. To access the guide, click **Troubleshooting and Diagnostics** on the Instrument toolbar above the ePanel Set and select **Pump_ECD Device Troubleshooting**.

Error Messages

The instrument control firmware installed in the Dionex Aquion RFIC periodically checks the status of certain parameters. If a problem is detected, it is reported to Chromeleon and logged in the software audit trail. Each error message is preceded by an icon that identifies the seriousness of the underlying problem (see Table 7).

Table 7. Chromeleon audit trail severity levels

Severity level	Icon	Description
Warning		A message is displayed in the audit trail. If the system is not running, it can be started; if a run is in progress, the run is not interrupted. Nevertheless, you should always attempt to remedy the situation.
Error		A message is displayed in the audit trail or the Ready Check results, and the system attempts to correct the problem (sometimes by using an alternative parameter). If a run is in progress, the run is not interrupted. If the Ready Check is in progress, the queue is not started until the error is resolved.
Abort		A message is displayed in the audit trail and the running queue is aborted.

Table 8 lists the most frequently observed Dionex Aquion RFIC error message and their default severity levels. For troubleshooting guidance, refer to the page indicated in the table.

Table 8. Chromeleon audit trail error messages

Error message	Default severity level	See
Column heater exceeds safe temperature	Abort	page 51
Column heater open circuit	Abort	page 51
Column heater short circuit	Abort	page 52
CR-TC over current	Warning	page 52
CR-TC stopped for zero flow	Abort	page 52
EGC board not present	Warning	page 52
EGC calibration error	Abort	page 53
EGC disconnected error	Abort	page 53
EGC invalid concentration vs. flow rate	Warning	page 53
EGC invalid flow rate	Warning	page 54
EGC over current	Abort	page 54
EGC over voltage	Abort	page 54
Hardware not present	Error	page 55
Leak sensor wet	Warning	page 55
Load/Inject valve error	Abort	page 55
Option not installed	Error	page 56

Table 8. Chromeleon audit trail error messages, continued

Error message	Default severity level	See
Pump motor lost control	Warning	page 56
Pump over pressure	Abort	page 56
Pump pressure hardware error	Abort	page 56
Pump stopped due to lost USB communication error	Abort	page 57
Pump under pressure	Abort	page 57
Second valve error	Abort	page 57
Suppressor not connected	Warning	page 58
Suppressor over current	Abort	page 58
Suppressor over power	Abort	page 58
Suppressor over voltage	Abort	page 58
Suppressor stopped for zero flow rate	Warning	page 59

Troubleshooting Error Messages

Column heater exceeds safe temperature

This error occurs when the column heater temperature is higher than the maximum temperature allowed. This may occur, for example, if the Dionex Aquion RFIC is operating in an environment in which the temperature exceeds 40 °C (104 °F).

❖ To troubleshoot

For environmental specifications, see "Physical specifications" on page 129.

Column heater open circuit

This error usually indicates that the column heater is unplugged from the Dionex Aquion RFIC component panel.

❖ To troubleshoot

1. Verify that the column heater is plugged into the component panel (see Figure 5).
2. If the error persists, the column heater must be replaced. Contact Technical Support for Dionex products for assistance.

Column heater short circuit

This error indicates a short circuit of the thermistor input used to measure the column heater temperature.

❖ To troubleshoot

If the error persists, the column heater must be replaced. Contact Technical Support for Dionex products for assistance.

CR-TC over current

This error occurs when the current applied to the Dionex CR-TC exceeds the maximum current allowed.

❖ To troubleshoot

1. Verify that the Dionex CR-TC cable is securely plugged in to the **CR-TC** connector on the Dionex Aquion RFIC top cover (see Figure 4).
2. If the error persists, it indicates a possible malfunction in the Dionex CR-TC control electronics. Contact Technical Support for Dionex products for assistance.

Note Dionex Aquion RFIC electronics components cannot be serviced by the user.

CR-TC stopped for zero flow

This error occurs when the pump stops unexpectedly.

❖ To troubleshoot

Follow the troubleshooting steps in "No Flow" on page 63.

Note If this message appears when you turn off the pump flow while the Dionex CR-TC (and the Dionex EGC current) are on, it does not indicate a problem. In this situation, the Dionex CR-TC is turned off automatically to prevent it from being damaged.

EGC board not present

This error occurs when the Dionex Aquion RFIC receives a Dionex EGC-related command from Chromeleon but is unable to recognize the Dionex EGC controller board.

❖ To troubleshoot

Contact Technical Support for Dionex products for assistance.

Note Dionex Aquion RFIC electronics components cannot be serviced by the user.

EGC calibration error

This error occurs when the measured current during the Dionex EGC calibration procedure is outside the expected range. (Note that the calibration procedure must be performed by Thermo Fisher Scientific personnel.)

❖ To troubleshoot

1. Review the calibration procedure to verify that the Dionex Aquion RFIC was set up correctly.
2. Run the calibration again.

EGC disconnected error

This error occurs if the Dionex EGC is disconnected from the Dionex Aquion RFIC at the following times:

- When Chromeleon is attempting to send a Dionex EGC-related command to the system.
- When the Dionex EGC verification test is in progress. (Note that the verification test must be performed by Thermo Fisher Scientific personnel.)

❖ To troubleshoot

1. Verify that the Dionex EGC cable is securely connected to the **EGC** connector on the Dionex Aquion RFIC top cover (see Figure 4).
2. If the error message appears again, it may indicate a malfunction in the Dionex EGC control electronics. Contact Technical Support for Dionex products for assistance.

Note Dionex Aquion RFIC electronics components cannot be serviced by the user.

EGC invalid concentration vs. flow rate

This error occurs when the selected eluent concentration is too high for the current flow rate. The maximum eluent concentration for a particular application depends on the suppressor type, the Dionex EGC type, and the flow rate.

❖ To troubleshoot

1. Refer to the column manual for the recommended parameters for your application.
2. Reset the eluent concentration and/or the flow rate to the recommended values.

EGC invalid flow rate

This error occurs when the flow rate is set to a value that is not supported by the Dionex EGC.

❖ To troubleshoot

Set the flow rate to a value within the allowed range (see "Specifications" on page 125).

EGC over current

This error occurs when the current applied to the Dionex EGC exceeds the maximum allowable current. (Under these conditions, the Dionex EGC is turned off automatically to prevent damage.)

This error may also occur if liquid flow to the cartridge is interrupted.

❖ To troubleshoot

1. If there is no flow from the pump, follow the troubleshooting steps in "No Flow" on page 63.
2. If the error message appears again, it may indicate a malfunction in the Dionex EGC control electronics. Contact Technical Support for Dionex products for assistance.

Note Dionex Aquion RFIC electronics components cannot be serviced by the user.

EGC over voltage

This error occurs when the voltage applied to the Dionex EGC exceeds the maximum allowable voltage. (Under these conditions, the Dionex EGC is turned off automatically to prevent damage.)

This error may also occur when liquid flow to the Dionex EGC is interrupted.

❖ To troubleshoot

1. If there is no flow from the pump, follow the troubleshooting steps in "No Flow" on page 63.
2. If the error message appears again, it may indicate a malfunction in the Dionex EGC control electronics. Contact Technical Support for Dionex products for assistance.

Note Dionex Aquion RFIC electronics components cannot be serviced by the user.

Hardware not present

This error indicates a problem in the Dionex Aquion RFIC electronics.

❖ To troubleshoot

Contact Technical Support for Dionex products for assistance.

Note Dionex Aquion RFIC electronics components cannot be serviced by the user.

Leak sensor wet

This error occurs when liquid accumulates in the drip tray at the bottom of the Dionex Aquion RFIC component panel, where the leak sensor is located (see Figure 5).

❖ To troubleshoot

1. Locate the source of the leak by visually inspecting the tubing, fittings, and components on the component panel. For detailed troubleshooting of various types of leaks, see "Liquid Leaks" on page 60.
2. Tighten fittings, or replace tubing and fittings as required (see "Replacing Tubing and Fittings" on page 73).
3. Dry the drip tray and leak sensor thoroughly.

Note After eliminating the source of a leak, always dry the drip tray and the leak sensor thoroughly. If the leak sensor is not dry, it will remain activated and will continue to report a leak to Chromeleon.

Load/Inject valve error

This error occurs if the injection valve fails to switch position within 1 second of being toggled.

❖ To troubleshoot

1. If a sequence is running, click **Stop** on the Chromeleon ePanel to cancel the current injection and stop the sequence.
2. Try to toggle the valve from **LoadPosition** to **InjectPosition** by clicking the down arrow next to **Inject** on the **Home** ePanel.
3. Turn off the Dionex Aquion RFIC power briefly, and then restart the system.
4. If the problem persists, repeat Step 2.
5. If the problem persists, contact Technical Support for Dionex products for assistance.

Option not installed

This error occurs if a command is issued to control an option that has not been installed (or if the option has been installed, but has not been configured in Chromeleon).

❖ **To troubleshoot**

1. Verify that the option is installed.
2. In the Chromeleon Instrument Configuration Manager, configure the option in the same instrument as the Dionex Aquion RFIC.

Pump motor lost control

This error indicates a problem in the pump controller electronics.

❖ **To troubleshoot**

Contact Technical Support for Dionex products for assistance.

Note Dionex Aquion RFIC electronics components cannot be serviced by the user.

Pump over pressure

If the system pressure exceeds the set limit for at least 0.5 second, this error occurs and the pump stops.

❖ **To troubleshoot**

1. Check for blockages in the liquid lines by working backward from the cell to the pump (see "Flow Schematics" on page 13).
2. Verify that the flow rate is set to the correct value.
3. Verify that the high pressure limit is set to the correct value. If necessary, reset the pressure limit in either the Chromeleon Instrument Configuration Manager or the instrument method.
4. Restart the pump.

Pump pressure hardware error

This error indicates a problem in the pump controller electronics.

❖ **To troubleshoot**

Contact Technical Support for Dionex products for assistance.

Note Dionex Aquion RFIC electronics components cannot be serviced by the user.

Pump stopped due to lost USB communication error

This error occurs when the Dionex Aquion RFIC is unable to communicate with Chromeleon.

❖ **To troubleshoot**

Verify that the USB cable is connected correctly from the Dionex Aquion RFIC rear panel to the computer on which Chromeleon is installed. For details, refer to the Dionex Aquion RFIC installation instructions.

Pump under pressure

If the system pressure falls below the low pressure limit, this error occurs and the pump stops.

❖ **To troubleshoot**

1. Verify that the eluent reservoir is filled with ASTM filtered, Type I (18 megohm-cm) deionized water that meets the specifications listed in "Deionized Water Requirements for IC" on page x.
2. Check for liquid leaks (see"Liquid Leaks" on page 60).
3. Verify that the waste valve is closed (see Figure 13).
4. Prime the pump (see "Priming the Pump (Standard Procedure)" on page 90).
5. Restart the pump.

Second valve error

This error occurs if the auxiliary valve fails to switch position within 1 second of being toggled.

❖ **To troubleshoot**

1. If a sequence is running, click **Stop** on the Chromeleon ePanel to cancel the current injection and stop the sequence.
2. Try to toggle the auxiliary valve from position A to position B by clicking the down arrow beside the **Valve 2** button on the Chromeleon ePanel.
3. Turn off the Dionex Aquion RFIC power briefly, and then restart the system.
4. If the problem persists, repeat Step 2.
5. If the problem persists, contact Technical Support for Dionex products for assistance.

Suppressor not connected

This error occurs if you turn on the suppressor but the Dionex Aquion RFIC cannot establish a connection with it.

❖ To troubleshoot

1. Check the suppressor cable connection (see "Replacing the Suppressor" on page 85).
2. If the error persists, it may indicate a problem in the suppressor controller electronics. Contact Technical Support for Dionex products for assistance.

Note Dionex Aquion RFIC electronics components cannot be serviced by the user.

Suppressor over current

This error indicates that the suppressor is depleted or dirty.

❖ To troubleshoot

1. Follow the instructions in the suppressor manual to regenerate the suppressor.
2. Follow the instructions in the suppressor manual to clean the suppressor.
3. If the error persists, it may indicate a malfunction in the suppressor controller electronics. Contact Technical Support for Dionex products for assistance.

Note Dionex Aquion RFIC electronics components cannot be serviced by the user.

Suppressor over power

This error occurs when, to maintain the selected current, the Dionex Aquion RFIC is required to apply a higher voltage than the suppressor can support.

❖ To troubleshoot

1. Reduce the flow rate.
2. Follow the instructions in the suppressor manual to rehydrate the suppressor.
3. If the error persists, replace the suppressor (see "Replacing the Suppressor" on page 85).

Suppressor over voltage

This error occurs if you turn on the suppressor and the system cannot establish a connection with the suppressor.

❖ To troubleshoot

1. Check the suppressor cable connection (see "Replacing the Suppressor" on page 85).
2. If the error persists, replace the suppressor (see "Replacing the Suppressor" on page 85).

Suppressor stopped for zero flow rate

This error occurs if the pump flow stops unexpectedly while the suppressor is on.

❖ **To troubleshoot**

Follow the troubleshooting steps in "No Flow" on page 63.

Note If this message appears when you turn off the pump flow while the suppressor is on, it does not indicate a problem. In this situation, the suppressor is turned off automatically to prevent it from being damaged.

Troubleshooting System Component Symptoms

Table 9 lists symptoms related to problems with system components that may occur during operation of the Dionex Aquion RFIC.

Table 9. System component symptoms

Symptom category	Symptom	See
Leaks	Liquid Leaks	page 60
Pump	Pump Difficult to Prime or Loses Prime	page 62
	Pump Does Not Start	page 63
Pressure	No Flow	page 63
	Erratic Flow and/or Pressure Reading	page 64
	Excessive System Backpressure	page 64
Ghosting	Peak Ghosting	page 65
Timing	Insufficient Time Between Sample Injections	page 65
	Nonreproducible Peak Height or Retention Time	page 65
	Abnormal Retention Time or Selectivity	page 66
Cell	No Cell Response	page 66
	High Cell Output	page 66
Baseline noise or drift	Baseline Noise or Drift	page 67
Hardware	Hardware Not Present	page 68
Sensor	Leak Sensor Wet	page 68
Degas assembly	Vacuum Degas Assembly Does Not Run	page 68

Liquid Leaks

Note After eliminating the source of a leak, always dry the drip tray and the leak sensor thoroughly. If the leak sensor is not dry, it will remain activated and will continue to report a leak to Chromeleon.

❖ To troubleshoot

1. Locate the source of the leak by visually inspecting the tubing, fittings, and components. To check for smaller leaks, use a paper towel or KIMWIPE™ to dab fittings.
2. Make sure liquid lines are not crimped or otherwise blocked. Make sure waste lines are not elevated at any point after they exit the system. If a line is blocked, replace it (see "Replacing Tubing and Fittings" on page 73).
3. See the sections below for specific troubleshooting information for various components.

Source of leak	Solution
Fitting or broken liquid line	Tighten the fitting, or replace tubing and fittings as required (see "Replacing Tubing and Fittings" on page 73).
Pump check valve	1. Verify that the check valves are firmly seated in the pump head. If necessary, tighten them carefully with an open-end wrench just until the leak stops. 2. If the leak persists, replace the check valve (see "Cleaning and Replacing the Pump Check Valves" on page 76).
Seal wash port	Replace the piston seal (see "Replacing a Pump Piston Seal and Piston Rinse Seal" on page 78).
Pump piston seal	1. Replace the piston seal (see "Replacing a Pump Piston Seal and Piston Rinse Seal" on page 78). 2. If the leak persists, replace the piston (see "Replacing a Pump Piston" on page 83).
Pump head	Carefully tighten the pump head mounting nuts just until the leak stops. **Do not overtighten!**
Pressure transducer	1. Verify that the liquid line connections to the pressure transducer are tight. For tightening requirements, refer to *Installation of Dionex Liquid Line Fittings* (Document No. 031432). 2. If the leak persists, contact Technical Support for Dionex products for assistance. **Note** Dionex Aquion RFIC electronics components cannot be serviced by the user.

Source of leak	Solution
Pump head waste valve	1. Verify that the waste valve is closed. To close the valve, turn the knob clockwise and tighten finger-tight. **Do not overtighten! Overtightening may damage the valve and the pump head.** 2. If the leak persists, replace the waste valve O-ring (see "Replacing the Waste Valve or Priming Valve O-Ring" on page 83).
Suppressor	Refer to the suppressor manual for troubleshooting guidance.
Injection valve or auxiliary valve	1. Verify that the liquid line connections to the transducer are tight. For tightening requirements, refer to *Installation of Dionex Liquid Line Fittings* (Document No. 031432). 2. If the leak is from behind the valve stator, the rotor seal may be scratched. Rebuild the valve (see "Rebuilding the Injection Valve or Auxiliary Valve" on page 74).
Conductivity cell	1. Check for blockage in the waste line; trapped particles can plug the lines and cause a restriction and/or leak. If necessary, clear the waste lines by reversing the direction of flow. 2. Verify that the plumbing downstream from the cell is clear; a blockage may overpressurize the cell, causing a leak. 3. If the leak persists, contact Technical Support for Dionex products for assistance.

Pump Difficult to Prime or Loses Prime

Excessive pressure fluctuations (more than 3% difference from one pressure reading to the next) indicate that the pump is out of prime.

Possible cause	Solution
Empty eluent reservoir and/or no eluent connected	1. Verify that the reservoir is filled with ASTM filtered, Type I (18 megohm-cm) deionized water (for specifications, see "Deionized Water Requirements for IC" on page x). 2. Verify that all connections are secure.
Eluent improperly or insufficiently degassed	If the optional vacuum degas assembly is installed: Check the degas settings in the Properties dialog box (see "Vacuum Degas Assembly Does Not Run" on page 68). If the vacuum degas assembly is *not* installed: Manually degas the eluent.
End-line filter dirty or clogged	New end-line filters (P/N 045987) are pure white. If the system is in continuous operation, change the end-line filter weekly (or whenever it becomes discolored). Replace the filter more often if bacterial buildup is visible or if the eluent does not contain solvent. **IMPORTANT** It is especially important to replace end-line filters regularly when using aqueous eluents, which may contaminate the filter with bacteria or algae. The bacterial buildup may not be visible.
Blockage in inlet tubing	Check for kinked or clogged tubing, which may be causing the pump to be "starved" for eluent. If necessary, replace the tubing and fittings (see "Replacing Tubing and Fittings" on page 73).
Dirty pump check valve	Clean or replace the check valve (see "Cleaning and Replacing the Pump Check Valves" on page 76).
Liquid leaks at junction between pump head and pump casting	1. Using the open-end wrench (P/N 014605) provided in the Dionex Aquion RFIC Ship Kit (P/N 064375), tighten the two acorn nuts that attach the pump head to the pump housing (see Figure 28). Tighten the nuts evenly (12 in-lb torque). 2. If the leak persists, replace the piston seal (see "Replacing a Pump Piston Seal and Piston Rinse Seal" on page 78).

Possible cause	Solution
Liquid leaks from seal wash port	Replace the piston seal (see "Replacing a Pump Piston Seal and Piston Rinse Seal" on page 78).
Scratched pump piston	Inspect the pump pistons. If a piston is scratched, replace it (see "Replacing a Pump Piston" on page 83).

Pump Does Not Start

Possible cause	Solution
No power (**Power** LED not lighted)	1. Verify that the power cord is plugged in. 2. Replace the main power fuses, if necessary (see "Replacing the Dionex EGC" on page 93).
No communication between Dionex Aquion RFIC and Chromeleon	Verify that the USB cable is connected correctly. For connection and setup information, refer to the Dionex Aquion RFIC installation instructions.
Pump turned off	Turn on the pump from the Chromeleon ePanel.
Flow rate set to 0	Set the flow rate from the Chromeleon ePanel.

No Flow

Possible cause	Solution
Pump waste or priming valve open	Close the valve by turning the valve knob clockwise until finger-tight (see Figure 35). **Do not overtighten! Overtightening may damage the valve and the pump head.**
Flow rate set to 0	Set the flow rate from the Chromeleon ePanel.
Eluent valve closed	Turn on the pump from the Chromeleon ePanel. The eluent valve opens automatically when the pump is started (and closes when the pump is turned off).
Pump not primed	Prime the pump (see "Priming the Pump (Standard Procedure)" on page 90).
Broken pump piston	Replace the piston (see "Replacing a Pump Piston" on page 83).
Eluent generator degas tubing assembly ruptured	Replace the Dionex EGC (see "Replacing the Dionex EGC" on page 93).

Erratic Flow and/or Pressure Reading

Possible cause	Solution
Pump not primed	Prime the pump (see "Priming the Pump (Standard Procedure)" on page 90).
Damaged piston seal	Replace the piston seal (see "Replacing a Pump Piston Seal and Piston Rinse Seal" on page 78).
Dirty pump check valve	Clean or replace the check valve (see "Cleaning and Replacing the Pump Check Valves" on page 76).
Leaking liquid line or fitting	Check for small leaks in the liquid lines and fittings. Tighten leaking fittings, or replace tubing and fittings as required (see "Replacing Tubing and Fittings" on page 73).

Excessive System Backpressure

Possible cause	Solution
Restriction in system plumbing	Check all liquid lines for crimping or blockage. Make sure the ferrule fittings are not overtightened onto tubing. For details, refer to *Installation of Dionex Liquid Line Fittings* (Document No. 031432). If you have trouble isolating the restriction, see "Isolating a Restriction in the Liquid Lines" on page 72.
Plugged or damaged fitting	To isolate the faulty fitting, loosen each fitting until the pressure returns to normal. Repair or replace the fitting (see "Replacing Tubing and Fittings" on page 73).
Flow rate through columns too high	Set the correct flow rate for your application.
Clogged column bed supports	Refer to the column manual for troubleshooting guidance.
Contaminated columns	Clean the columns as instructed in the column manual or replace the guard column.
Plugged injection valve or auxiliary valve passages	Rebuild the valve (see "Rebuilding the Injection Valve or Auxiliary Valve" on page 74).

Peak Ghosting

"Ghosting" is the appearance of extraneous peaks in a chromatogram. These may be late-eluting peaks from a previous injection, or they may be the result of an operating issue (for example, contaminated eluent or a malfunctioning valve). These peaks may co-elute with peaks of interest, resulting in nonreproducible peak heights and/or areas.

Possible cause	Solution
Insufficient time between sample injections	Wait until the previous sample has been completely eluted before making another injection.
Insufficient flush between samples	Flush the sample loop with at least 10 loop volumes of deionized water or sample between injections.
Incorrect or contaminated standards	Remake standards.
Incorrect or contaminated eluent	1. Remake the eluent. 2. Verify that the correct eluent concentration is selected. 3. Install an end-line filter (P/N 045987) on the end of the deionized water line, or replace the existing filter (see "To filter the deionized water" on page 36).
Malfunctioning injection valve or auxiliary valve	1. Rebuild the valve (see "Rebuilding the Injection Valve or Auxiliary Valve" on page 74). 2. If the valve leak persists, contact Technical Support for Dionex products for assistance.

Nonreproducible Peak Height or Retention Time

Possible cause	Solution
Column overloading	Dilute the sample (see "Diluting Samples" on page 41).
Liquid leak	Locate and eliminate any leaks (see "Liquid Leaks" on page 60).
Incomplete or imprecise filling of sample loop	1. Fill the sample loop until excess sample exits the waste line. 2. Inspect the 1-cc syringe (P/N 016388) for damage. If necessary, replace the syringe.
Pump not primed properly	Prime the pump (see "Priming the Pump (Standard Procedure)" on page 90).

Abnormal Retention Time or Selectivity

Possible cause	Solution
Incorrect eluent	Verify that the correct eluent concentration is selected.
Contaminated or degraded sample	Take appropriate precautions when preparing and storing samples (see "Preparing Samples" on page 40).
Contaminated column	1. Clean the column as instructed in the column manual. 2. If the problem persists, replace the column.

No Cell Response

Possible cause	Solution
Cell incorrectly installed	Verify that the cell front cover is flush against the component panel. If necessary, tighten the two mounting screws. (This ensures an electrical connection between the cell and the connector inside the Dionex Aquion RFIC.)
No flow from pump	This condition has several possible causes; for more information, see "Pump Does Not Start" on page 63 and "No Flow" on page 63.

High Cell Output

Possible cause	Solution
Background not suppressed by suppressor	Verify that the suppressor is turned on and that the current is set to the correct value. For additional troubleshooting guidance, refer to the suppressor manual.
Sample concentration too high	Dilute the sample (see "Diluting Samples" on page 41).
Wrong eluent	Check the column manual to verify that you are using the correct eluent for your application.
Background conductivity not offset from conductivity reading	Before making an injection: Allow the background conductivity to equilibrate, and then click **Autozero** on the Chromeleon ePanel.

Baseline Noise or Drift

Possible cause	Solution
Flow system leak; erratic baseline	Check for leaks in all fittings and liquid lines. Tighten or, if necessary, replace all liquid line connections (see "Replacing Tubing and Fittings" on page 73).
Trapped gases	Loosen the lines to and from the cell, and then retighten them. Next, loosen and retighten the fittings to and from the suppressor eluent ports.
Pump not properly primed	Prime the pump (see "Priming the Pump (Standard Procedure)" on page 90).
Incorrect eluent	Check the Dionex EGC concentration setting.
Inadequate system backpressure	A system backpressure of at least 14 MPa (2000 psi) is required to ensure removal of electrolysis gas from the eluent produced by the Dionex EGC. If the backpressure is too low, install backpressure tubing (P/N 053765) between port **P (2)** on the injection valve and the Dionex EGC **ELUENT OUT** port. For details, refer to the Dionex Aquion RFIC installation instructions.
Rapid changes in ambient temperature	1. Verify that the ambient temperature is between 4 and 40 °C (40 and 104 °F). 2. Make sure air conditioning and heating vents are directed away from the Dionex Aquion RFIC, and that the front door of the system is closed.
Insufficient system equilibration after changes to operating parameters (especially apparent when operating at high sensitivities)	Allow a longer system equilibration time (up to 2 hours) before starting operation.
Incorrect suppressor operating conditions	Refer to the suppressor manual for troubleshooting guidance.
Cell above or below temperature	Contact Technical Support for Dionex products for assistance.
Damaged piston seal	Replace the piston seal (see "Replacing a Pump Piston Seal and Piston Rinse Seal" on page 78).

Hardware Not Present

This error indicates a problem in the Dionex Aquion RFIC electronics.

❖ **To troubleshoot**

Contact Technical Support for Dionex products for assistance.

Note Dionex Aquion RFIC electronics components cannot be serviced by the user.

Leak Sensor Wet

This error occurs when liquid accumulates in the drip tray at the bottom of the Dionex Aquion RFIC component panel, where the leak sensor is located (see Figure 5).

❖ **To troubleshoot**

1. Locate the source of the leak by visually inspecting the tubing, fittings, and components on the component panel. For detailed troubleshooting of various types of leaks, see "Liquid Leaks" on page 60.
2. Tighten fittings, or replace tubing and fittings as required (see "Replacing Tubing and Fittings" on page 73).
3. Dry the drip tray and leak sensor thoroughly.

Note After eliminating the source of a leak, always dry the drip tray and the leak sensor thoroughly. If the leak sensor is not dry, it will remain activated and will continue to report a leak to Chromeleon.

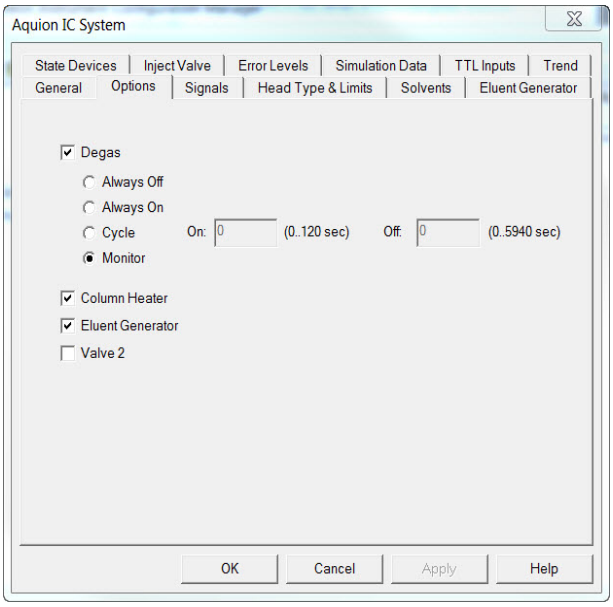
Vacuum Degas Assembly Does Not Run

This error occurs if the optional vacuum degas assembly was installed in the Dionex Aquion RFIC but was not configured in Chromeleon.

❖ **To troubleshoot**

1. Open the Chromeleon Instrument Configuration Manager.
2. Double-click the Aquion IC System icon under the instrument.
3. In the Properties dialog box, click the **Options** tab.
4. Verify that the **Degas** check box is selected (see Figure 24).

Figure 24. Properties dialog box: Options tab page



5. Under **Degas**, verify that the **Always Off** option is *not* selected. If necessary, clear the option and select one of the following settings:

   - **Cycle** (set the **On** cycle to 30 seconds; set the **Off** cycle to 600 seconds)
   - **Monitor**

6. If the **Degas** options are correct, test the assembly by selecting the **Always On** option. The pump should turn on immediately. If it does not, the vacuum degas assembly may need to be replaced. Contact Technical Support for Dionex products for assistance.

IMPORTANT Never select the **Always On** option for routine operation. The **Always On** option should be selected only when testing the vacuum degas assembly.

Service

This chapter describes Dionex Aquion RFIC service and repair procedures that users may perform. All procedures not included here, including electronics-related repair procedures, must be performed by Thermo Fisher Scientific personnel. For assistance, contact Technical Support for Dionex products. In the U.S. and Canada, call 1-800-532-4752. Outside the U.S. and Canada, call the nearest Thermo Fisher Scientific office.

Before replacing any part, verify the cause of the problem by referring to the troubleshooting information in Chapter 5.

IMPORTANT Substituting non-Dionex/Thermo Fisher Scientific parts may impair system performance, thereby voiding the product warranty. Refer to the warranty statement in the Dionex Terms and Conditions for more information.

CAUTION Before servicing the instrument, allow any heated components to cool.

MISE EN GARDE Permettre aux composants chauffés de refroidir avant tout intervention.

VORSICHT Warten Sie erhitzte Komponenten erst nachdem diese sich abgekühlt haben.

Contents

Isolating a Restriction in the Liquid Lines

A restriction in the liquid plumbing causes excessive system backpressure.

❖ **To isolate a restriction**

1. Begin pumping eluent through the system (including the columns).
2. Follow the flow schematic (see Figure 7 or Figure 8) to work backward through the system, beginning at the suppressor **Regen Out** port. One at a time, loosen each fitting and observe the pressure. The connection at which the pressure drops abnormally indicates the point of restriction.

IMPORTANT The numbers on the flow schematic indicate the order in which liquid flows through the system components.

If the restriction has caused such high pressure that the system cannot be operated, you must work forward through the flow schematic, adding parts one at a time until an abnormal pressure increase (and hence, the restriction) is found.

3. If the restriction is in the tubing or fitting, remove the restriction by back flushing or by replacing the tubing or fitting (see "Replacing Tubing and Fittings" on page 73).

Replacing Tubing and Fittings

The Dionex Aquion RFIC is plumbed with the tubing and tubing assemblies listed below.

Tubing size and type	Color	Used for...
0.125-mm (0.005-in) ID PEEK (P/N 044221)	Red	Connection from pump pulse damper to pressure transducer
0.25-mm (0.010-in) ID PEEK (P/N 042690)	Black	Connections between other system components
0.50-mm (0.020-in) ID PEEK (P/N 042855)	Orange	Connection from injection port to injection valve
0.75-mm (0.030-in) ID PEEK (P/N 044777)	Green	Connection from injection valve to waste
1.58-mm (0.062-in) ID PTFE (P/N 014157)	Clear	Connection from pump to degas or eluent reservoir; pump waste
25-µL sample loop (P/N 042857)	Orange	Connection between injection valve ports **L (1)** and **L (4)**

- 10-32 fittings (P/N 043275) and ferrules (P/N 043276) are used for most tubing connections. For tightening requirements, refer to *Installation of Dionex Liquid Line Fittings* (Document No. 031432).
- 1/8-in fittings (P/N 052267) and ferrules (P/N 048949) are used for connections to the suppressor **REGEN OUT** port and the eluent reservoir.

Rebuilding the Injection Valve or Auxiliary Valve

Thermo Fisher Scientific recommends rebuilding the injection valve (and the auxiliary valve, if installed) annually. The following kits are available:

- Rebuild Kit for 6-Port Valve (P/N 075973)
- Rebuild Kit for 10-Port Valve (P/N AAA-061759)

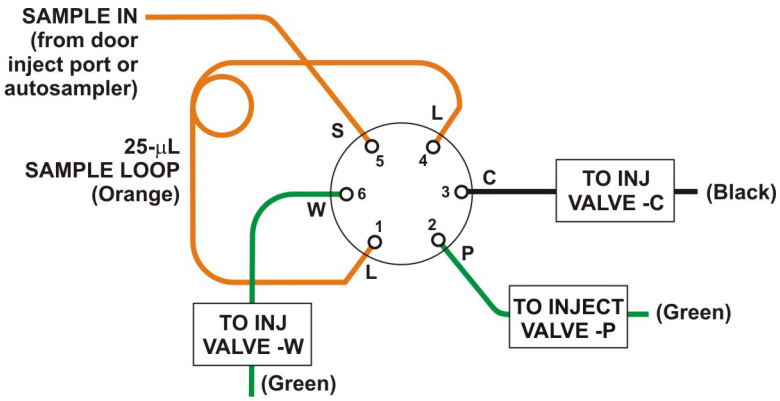
Each kit contains all required replacement parts.

Tip If preferred, you can replace the auxiliary valve "pod," instead of rebuilding the valve. Replacing the pod is easier and faster than rebuilding the valve. For instructions, see page 75.

❖ To rebuild the injection valve or auxiliary valve

1. Turn off the pump from the Chromeleon ePanel.
2. Open the Dionex Aquion RFIC front door.
3. Disconnect each liquid line connected to the valve.
4. Follow the instructions provided in the Injection Valve Rebuild Kit to replace the rotor seal and stator face.
5. Reconnect all liquid lines to the injection valve (see Figure 25) or auxiliary valve.

Figure 25. Injection valve plumbing



6. Close the front door.
7. Turn on the pump.

Replacing the Auxiliary Valve Pod

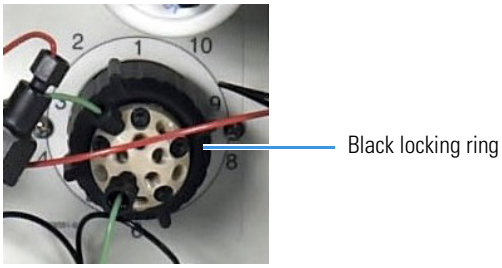
The "pod" is the mechanical part of the auxiliary valve. Replacing the pod is easier and faster than rebuilding the valve (see page 74).

Note If the auxiliary valve electronics require service, contact Thermo Fisher Scientific. Electronics-related repair procedures must be performed by Thermo Fisher Scientific personnel.

❖ To replace the auxiliary valve pod

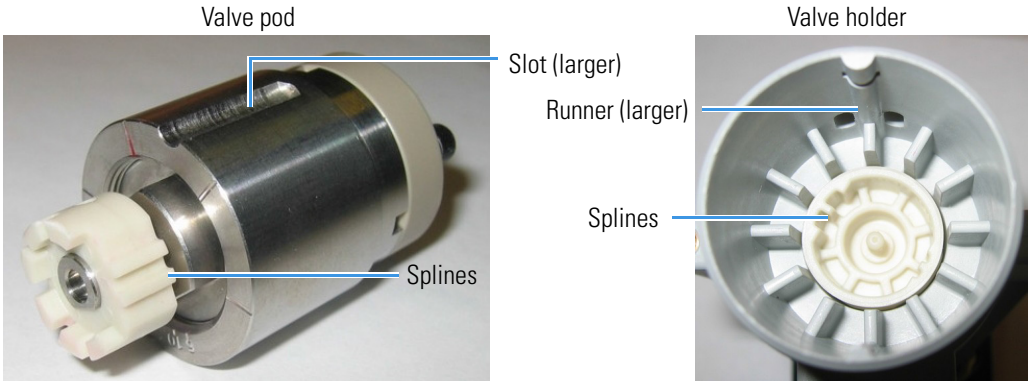
1. Turn off the pump flow from the Chromeleon ePanel.
2. Open the Dionex Aquion RFIC front door.
3. Disconnect each liquid line connected to the auxiliary valve.
4. Unscrew the black locking ring on the front of the valve (see Figure 26) and remove the ring.

   Figure 26. Auxiliary valve locking ring

5. Grasp the front of the valve pod and pull firmly to remove it from the Dionex Aquion RFIC.
6. Check that the new pod (6-port, P/N 061947; 10-port, P/N 061948) has the correct number of ports for the valve being serviced.
7. Align the slots in the new pod with the runner in the valve holder on the Dionex Aquion RFIC (see Figure 27). Valve pods are keyed to fit in one way only (one slot is narrower than the other). Verify that the slots are aligned with their matching runners.

Figure 27. Auxiliary valve pod and pod holder



8. Also verify that the two splines on the pod are aligned with the matching splines inside the valve holder (see Figure 27). If necessary, twist the end of the pod to adjust the position of the splines.
9. Push the pod into the holder until it clicks into place.
10. Replace the black locking ring on the valve.
11. Reconnect all liquid lines to the valve.
12. Turn on the pump flow. Check for leaks from the valve and tighten fittings as required (see "Liquid Leaks" on page 60).
13. Close the front door.

Cleaning and Replacing the Pump Check Valves

A dirty check valve causes erratic flow rates and pressures. In addition, it may cause the pump to lose prime and/or be difficult to reprime. If possible, replace check valves that are dirty. If new check valves are not available, follow the instructions below to clean the valves.

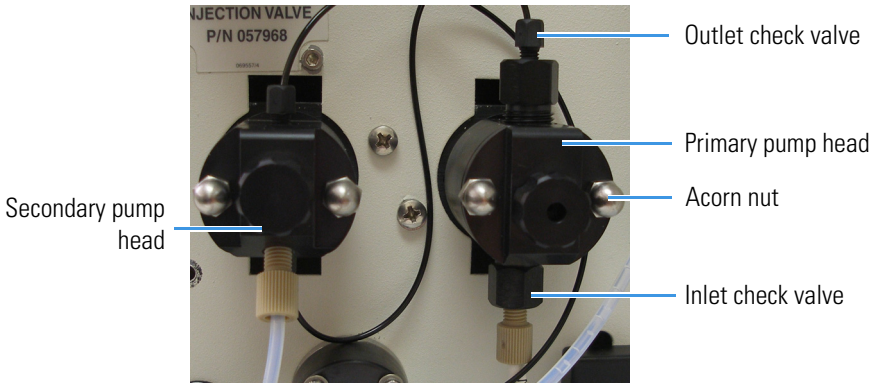
❖ To replace the check valves

1. Turn off the pump from the Chromeleon ePanel.
2. Turn off the Dionex Aquion RFIC main power switch.
3. To prevent contamination of pump parts, put on standard disposable laboratory rubber gloves (powder-free, particle-free, and oil-free) before disassembling the pump head.

> **Note** Never disassemble the pump head with bare hands. Even minute particles of dust or dirt on the check valves or piston can contaminate the inside of the pump head and result in poor pump performance.

4. Disconnect the tube fittings from the inlet and outlet check valve assemblies on the primary pump head (see Figure 28).

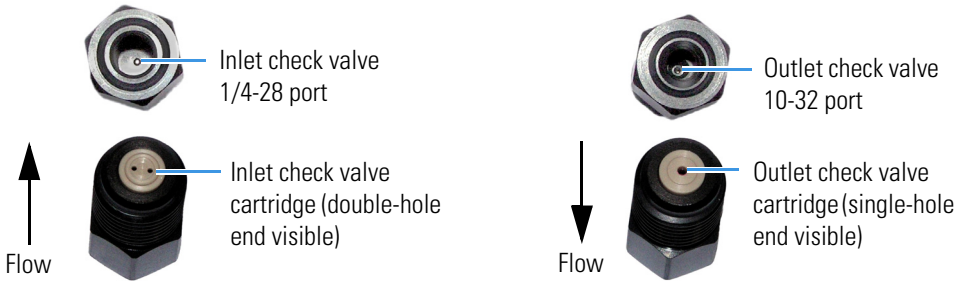
Figure 28. Pump components



5. Using a 1/2-inch wrench, loosen both check valve assemblies. Remove the check valve assemblies from the pump head.

Note The *inlet* check valve assembly housing has a 1/4-28 port. The *outlet* check valve assembly housing has a 10-32 (smaller) port (see Figure 29).

Figure 29. Inlet and outlet check valve assemblies



6. If you are installing new cartridges (P/N 045994) in the existing check valve housings:
   - When placing the cartridge in the *inlet* check valve housing, be sure the double-hole end of the cartridge is visible (see Figure 29). If it is not, remove the cartridge from the housing and install it correctly.
   - When placing the cartridge in the *outlet* housing, be sure the single-hole end is visible (see Figure 29). If it is not, remove the cartridge from the housing and install it correctly.

IMPORTANT If you do not orient the check valve cartridges correctly, the pump will not operate properly (and may be damaged). Liquid must enter the check valve through the large single hole and exit through the small double holes.

7. Install the inlet check valve assembly (P/N 045722) on the *bottom* of the primary pump head.
8. Install the outlet check valve assembly (P/N 045721) on the *top* of the primary pump head.

9. Tighten the check valves finger-tight, and then use a wrench to tighten an additional one-quarter to one-half turn.

   IMPORTANT Overtightening may damage the pump head and check valve housing and crush the check valve seats.

10. Reconnect the liquid lines.
11. Close the front door.
12. Turn on the Dionex Aquion RFIC main power switch.
13. Prime the pump (see "Priming the Pump (Standard Procedure)" on page 90).
14. When the system is at operating pressure, check for leaks from the check valves. Tighten a check valve a *little more* only if it leaks.

❖ To clean the check valves

1. Carefully remove the check valve cartridges from the valve housings.
2. Place the check valve housings and cartridges in a beaker with methanol. Sonicate or agitate the parts for several minutes.
3. Rinse each check valve housing and cartridge thoroughly with ASTM filtered, Type I (18 megohm-cm) deionized water that meets the specifications listed in "Deionized Water Requirements for IC" on page x.
4. To reinstall the check valves and complete the procedure, see Step 6 through Step 14 above.

Replacing a Pump Piston Seal and Piston Rinse Seal

A damaged seal allows leakage past the piston, as well as leakage from the piston seal wash housing. As a result, the pump may be difficult to prime, flow rates may be unstable, and there may be baseline noise.

❖ To prepare the pump for seal replacement

1. Rinse the pump flow path with ASTM filtered, Type I (18 megohm-cm) deionized water that meets the specifications listed in "Deionized Water Requirements for IC" on page x. Direct the flow to waste by opening the waste valve on the secondary pump head (see Figure 35). (To open the waste valve, turn the knob one-quarter to one-half turn counterclockwise.)
2. After rinsing, close the waste valve.
3. Turn off the pump from the Chromeleon ePanel.

❖ To remove the pump head and piston

1. Turn off the Dionex Aquion RFIC main power switch.
2. To prevent contamination of pump parts, put on standard disposable laboratory rubber gloves (powder-free, particle-free, and oil-free) before disassembling the pump head.

Note Never disassemble the pump head with bare hands. Even minute particles of dust or dirt on the check valves or piston can contaminate the inside of the pump head and result in poor pump performance.

3. Disconnect all tubing connections to the pump head.
4. Locate the open-end wrench (P/N 014605) provided in the Dionex Aquion RFIC Ship Kit (P/N 064375). Use the wrench to remove the two acorn nuts from the pump head (see Figure 28).
5. Slowly pull the head, allowing it to separate from the housing. Carefully disengage the head from the piston by pulling the head straight off and away from its mounting studs.

CAUTION Lateral motion while disengaging the pump head from the piston may break the piston.

MISE EN GARDE Un mouvement latéral pendant la séparation de la tête et du piston peut casser le piston.

VORSICHT Vermeiden Sie Seitwärtsbewegungen, wenn Sie den Kopf vom Kolben lösen. Andernfalls kann der Kolben brechen.

6. Place the head (front end down) on a clean work surface. Lift off the spacer to expose the piston seal (for the primary pump head, see Figure 30; for the secondary pump head, see Figure 31).
7. Hold the shaft of the piston (near the base), tilt the piston slightly, and pull the piston away from the pump. The piston does not come off as part of the pump head assembly because it is captured by a magnetic retention system.

Figure 30. Primary pump head components

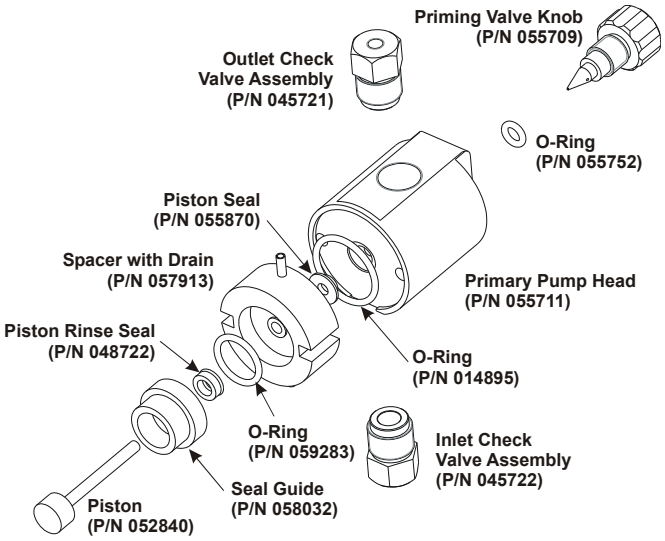
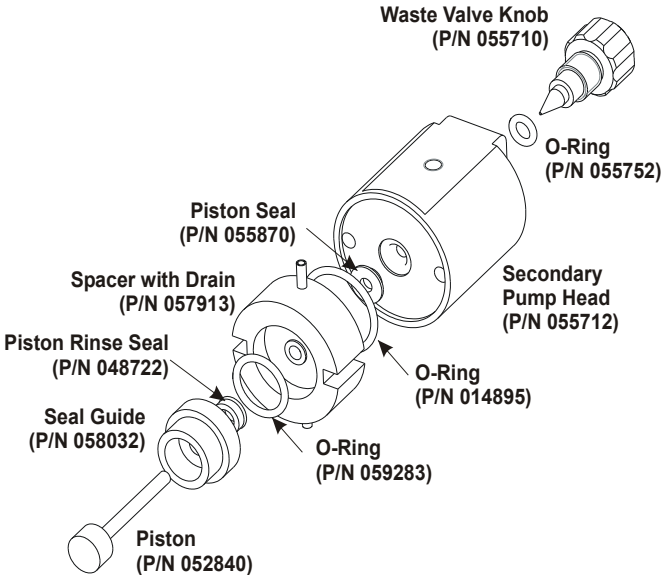


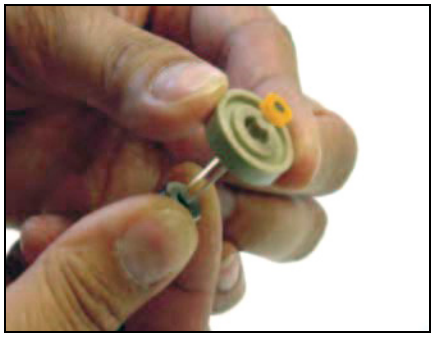
Figure 31. Secondary pump head components



❖ To install the new piston rinse seal

1. Remove the seal guide from the spacer to expose the piston rinse seal and O-ring. Remove the O-ring.
2. Remove the old piston rinse seal from the seal guide:
   a. Hold the seal guide with the flat side facing up.
   b. To dislodge the piston rinse seal, gently insert the shaft of the piston through the small hole in the center of the seal guide (see Figure 32).

Figure 32. Removing the piston rinse seal from the seal guide



c. Pull the seal off the end of the piston shaft and remove the piston from the seal guide.

3. Hold the new piston rinse seal (P/N 048722) with the grooved side facing up.
4. Using your fingertip, gently press the piston rinse seal into the seal guide until the edge of the seal is below the surface of the seal guide.

IMPORTANT The piston rinse seal is made of soft plastic. Do not press on the seal with anything hard or sharp, including your fingernail. If the seal is nicked or gouged, it will not seal properly and may result in leaks.

5. Place the new O-ring (P/N 059283) into the groove in the seal guide.
6. Remove the O-ring from the groove in the flat side of the spacer and replace it with the new O-ring (P/N 014895).
7. In one hand, hold the seal guide with the O-ring and piston rinse seal facing up (to prevent the O-ring from falling out). In your other hand, hold the spacer with the cavity facing down.
8. Gently press the seal guide into the cavity in the spacer until it is fully seated.

❖ To remove the piston seal from the pump head

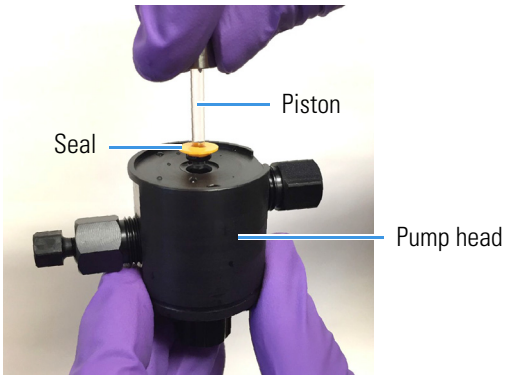
1. For the *primary* pump head: Install a 10-32 fitting plug (P/N 042772) in the outlet check valve. Tighten the plug.

   For the *secondary* pump head: Install a 10-32 fitting plug (P/N 042772) in both the inlet and outlet ports. Tighten the plugs.
2. Close the priming valve.
3. Using a squirt bottle or a plastic syringe, fill the head cavity with deionized water through the piston opening (see Figure 33). Use ASTM filtered, Type I (18 megohm-cm) deionized water that meets the specifications listed in "Deionized Water Requirements for IC" on page x.

Figure 33. Filling the pump head cavity with deionized water

4. Reinsert the piston into the seal, and then push the piston into the head (see Figure 34). This should hydraulically unseat the seal, causing it to pop out of the head. When this occurs, remove the piston and pull off the seal.
5. If the seal does *not* pop out of the head, follow these steps:
   a. Verify that the 10-32 fitting plugs in the inlet and outlet holes are tightened enough to prevent any leaks from the pump head.
   b. Fill the piston cavity with water and check for bubbles.
   c. If there are no bubbles, repeat Step 4.

Figure 34. Removing the piston seal from the pump head



6. Remove the 10-32 fitting plug(s).

❖ To install the new piston seal

1. Open the priming valve knob (primary pump head) or waste valve knob (secondary pump head) by turning the knob one-quarter to one-half turn counterclockwise.
2. Push the piston through the spacer and then through the new seal. Insert the piston and seal into the pump head until the seal makes contact with the bottom of the counterbore.

Note If necessary, lubricate the seal with a small amount of 0.2 micron filtered isopropyl alcohol to facilitate insertion.

3. To seat the seal, push down on the spacer until it is flush with the head. A clicking sound indicates that the seal is correctly seated.
4. Close the priming valve knob or waste valve knob.

❖ **To reinstall the pump head and piston**

Thermo Fisher Scientific recommends reinstalling the pump head and piston as a single assembly. This allows the piston to center itself onto the magnetic follower.

1. Hold the assembled spacer and seal guide with the drain tubes aligned vertically and press the spacer into the head until it is flush with the indented surface of the head.
2. Insert the piston so that 6 mm (1/4 inch) of the shaft is exposed. This ensures that the magnet in the follower picks up the piston. (The follower is the cylinder that holds the piston in place as it moves in and out of the pump head assembly.)
3. Reinstall the head and piston assembly. Use a wrench to tighten the nuts evenly (12 in-lb torque).

❖ **To complete the procedure**

1. Reconnect all liquid lines to the pump head.
2. Turn on the Dionex Aquion RFIC main power switch.
3. Prime the pump (see "Priming the Pump (Standard Procedure)" on page 90).

Replacing a Pump Piston

Continued leaking of the piston seal after installation of a new seal (assuming the pump head is tight) indicates a dirty, scratched, or broken piston.

Follow the instructions in "Replacing a Pump Piston Seal and Piston Rinse Seal" on page 78 to install a new piston (P/N 052840) and piston seal (P/N 055870).

Replacing the Waste Valve or Priming Valve O-Ring

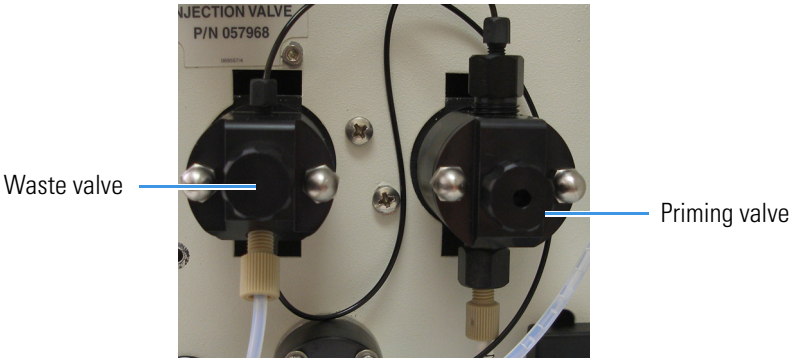
A damaged O-ring causes leakage around the base of the waste valve knob (on the primary pump head) or priming valve knob (on the secondary pump head).

❖ **To replace the waste valve or priming valve O-ring**

1. Turn off the pump from the Chromeleon ePanel.
2. Turn off the Dionex Aquion RFIC main power switch.

3. To remove the waste valve or priming valve from the pump head: Turn the valve knob (see Figure 35) counterclockwise until it is loose, and then pull the knob straight out of the cavity in the pump head.

Figure 35. Pump waste valve and priming valve

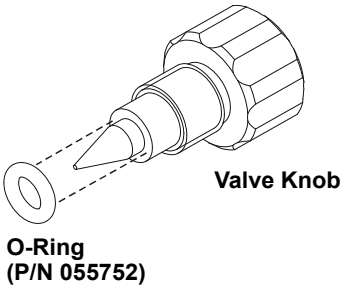


4. If the O-ring is removed with the valve knob in Step 3, pull the O-ring off the end of the knob (see Figure 36).

   If the O-ring is *not* removed with the valve knob, carefully insert a thin object (for example, the bent end of a paper clip) into the cavity in the pump head and pull out the O-ring.

IMPORTANT **Do not scratch the cavity.** Scratches in the cavity will cause leaks around the base of the knob while the pump is being primed.

Figure 36. Removing the waste valve or priming valve O-ring



5. Slide a new O-ring (P/N 055752) over the end of the valve.
6. To reinstall the valve, turn the knob clockwise and tighten finger-tight.

Note It is normal to encounter resistance after several rotations of the knob, as the O-ring is being pushed into the cavity of the pump head.

7. Turn on the Dionex Aquion RFIC main power switch.
8. Prime the pump (see "Priming the Pump (Standard Procedure)" on page 90).

Replacing the Suppressor

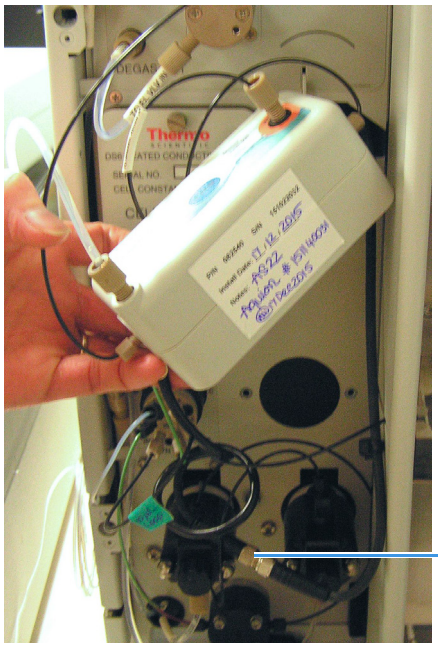
Refer to the suppressor manual for guidance on when to replace a suppressor.

Refer to the suppressor manual and suppressor installation check list for instructions on how to prepare a new suppressor before initial use. All new suppressors require hydration or other preparation steps before initial use.

❖ To replace the suppressor

1. Turn off the pump from the Chromeleon ePanel.
2. Open the Dionex Aquion RFIC front door.
3. Disconnect the two eluent lines and two regenerant lines from the suppressor.
4. Remove the suppressor from the system:
   a. Slide the suppressor up to detach it from the mounting tabs on the component panel and begin pulling it toward you.
   b. Continue pulling the suppressor out until the connector on the cable inside the system is outside the component panel (see Figure 37).

Figure 37. Removing the suppressor

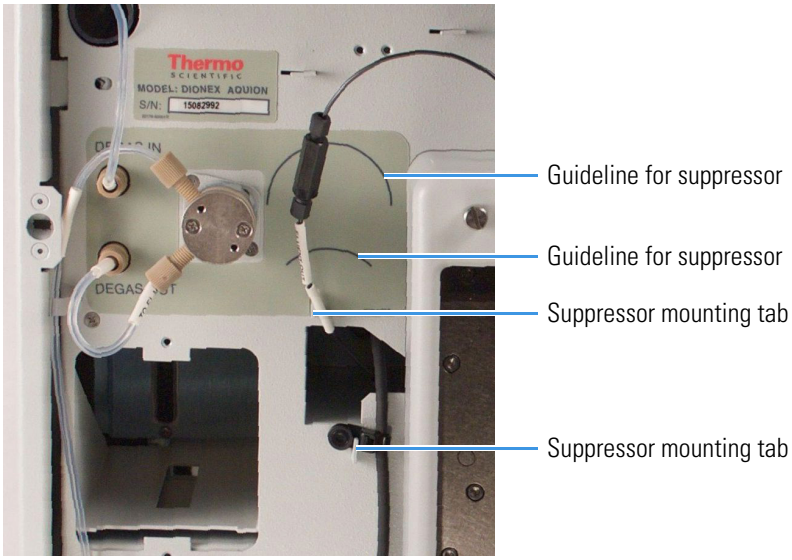


5. To disconnect the suppressor cable, turn the ring on the cable connector and pull the two connectors apart.
6. To connect the cable from the new suppressor to the cable inside the system, align the pins on the two connectors and push them together.
7. Orient the suppressor with the **REGEN OUT** fitting on top and the cables to the right.

8. Push the cables into the opening in the component panel.
9. Mount the new suppressor on the component panel:
   a. Align the top of the suppressor with the appropriate installation guidelines on the component panel (see Figure 38).
   b. Align the slots on the rear of the suppressor with the mounting tabs on the panel (see Figure 38).
   c. Press the suppressor onto the tabs and then slide it down until it locks into place. Pull slightly on the center of the suppressor to verify that it is securely fastened.

Note Some suppressors require more force to secure them onto the tabs.

Figure 38. Suppressor guidelines and mounting tabs on component panel



10. Connect the two eluent lines and two regenerant lines to the new suppressor.
11. Close the front door.

Replacing the Eluent Valve

❖ **To replace the eluent valve**

1. Turn off the Dionex Aquion RFIC main power switch.
2. Open the Dionex Aquion RFIC front door.
3. To prevent an eluent leak during the valve replacement procedure:

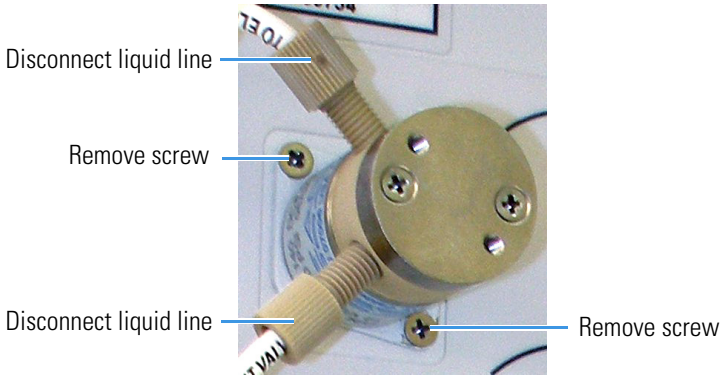
   Disconnect the eluent line from the reservoir cap before proceeding.

   –or–

Plug the line on the left side of the eluent valve with a coupler (P/N 039056) and a plug (P/N 037628) after you disconnect the liquid line from the valve in Step 4.

4. Disconnect the two liquid lines connected to the eluent valve (see Figure 39).

Figure 39. Eluent valve

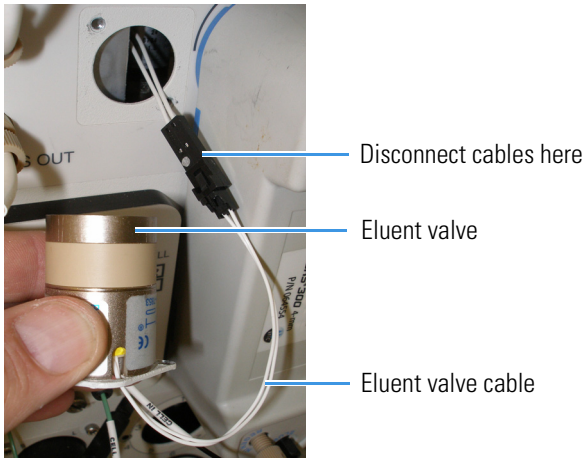


5. Unscrew and remove the two screws that attach the valve to the component panel (see Figure 39). **Save the screws.**

6. Pull the valve straight off the component panel and begin pulling the attached cable out of the opening in the panel. (This cable is connected to a matching cable inside the Dionex Aquion RFIC.)

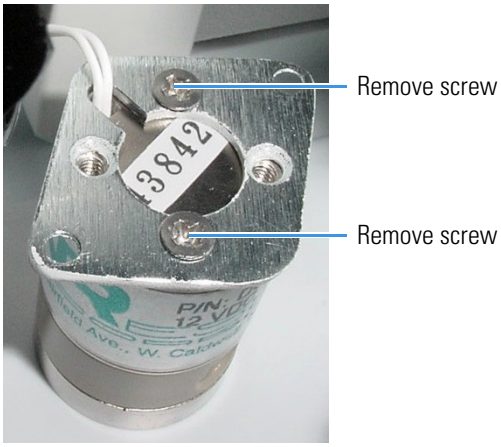
7. When the connectors for the two cables are outside the panel, disconnect the cables from each other (see Figure 40).

Figure 40. Eluent valve cable



8. Remove the mounting plate on the old valve by unscrewing and removing the two screws shown in Figure 41. **Save the screws.**

Figure 41. Removing the eluent valve mounting plate



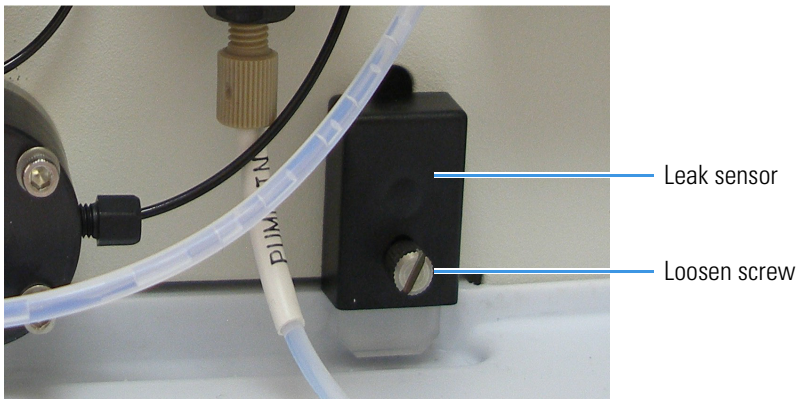
9. Thread the cable from the new eluent valve (P/N 057945) through the mounting plate.
10. Attach the mounting plate to the new valve, using the screws removed in Step 8.
11. Connect the cable from the new valve to the Dionex Aquion RFIC cable. Feed the cables back inside the Dionex Aquion RFIC.
12. Hold the new valve with the ports facing up and align the valve with the component panel. Attach it with the two screws removed in Step 5.
13. Reconnect the liquid lines.
14. Turn on the Dionex Aquion RFIC main power switch.
15. Prime the pump (see "Priming the Pump (Standard Procedure)" on page 90).

Replacing the Leak Sensor

❖ To replace the leak sensor

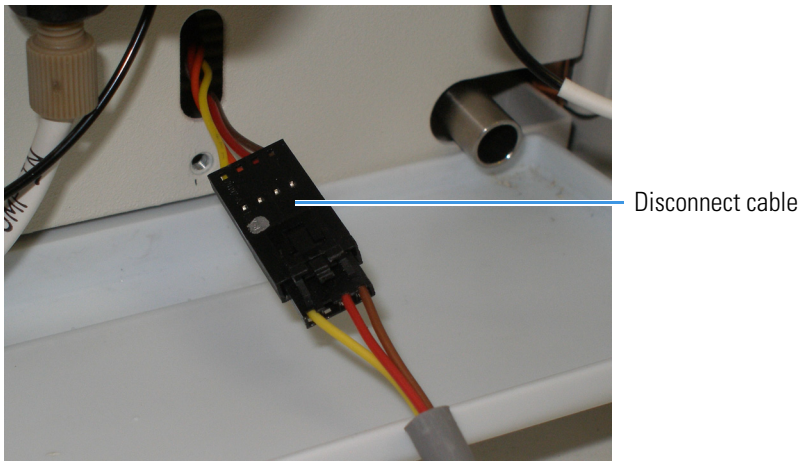
1. Turn off the Dionex Aquion RFIC main power switch.
2. Open the Dionex Aquion RFIC front door.
3. Loosen the screw on the front of the leak sensor (see Figure 42). The screw should remain attached to the sensor.

Figure 42. Leak sensor



4. Remove the leak sensor from the component panel and begin pulling the attached cable out of the opening in the panel. (This cable is attached to a matching cable inside the Dionex Aquion RFIC.)
5. When the connectors for the two cables are outside the panel, disconnect the cables from each other (see Figure 43).

Figure 43. Leak sensor cable



6. Connect the cable from the new leak sensor (P/N 058053) to the connector on the other cable.
7. Feed the cables back inside the Dionex Aquion RFIC.
8. Align the leak sensor with the component panel opening and finger-tighten the screw on the front of the sensor.
9. Verify that the leak sensor does not touch the bottom of the drip tray at the bottom of the component panel.
10. Close the front door.
11. Turn on the Dionex Aquion RFIC main power switch.

Priming the Pump (Standard Procedure)

The standard priming procedure consists of two parts:

- Priming the eluent lines with a syringe (see page 90). Perform this procedure at initial installation, after changing eluents, or when eluent lines are empty.
- Priming the pump heads with the **Prime** button in Chromeleon (see page 91). Perform this procedure after priming the eluent lines.

Note If the standard priming procedure is unsuccessful, follow the instructions in "Priming the Pump with Isopropyl Alcohol" on page 92.

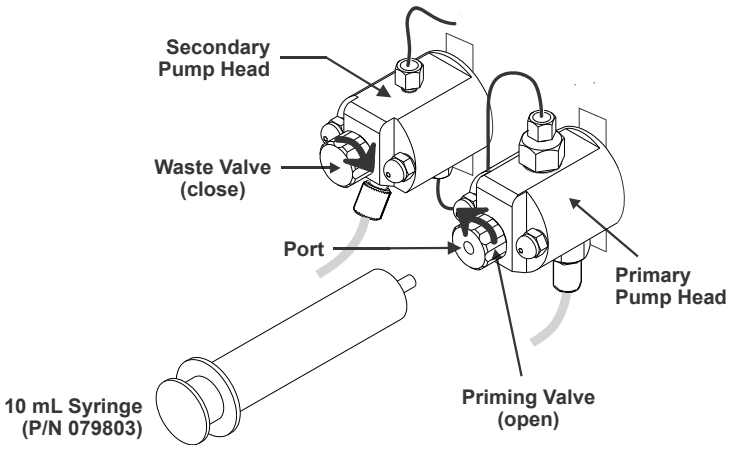
❖ To prepare the system

1. Before proceeding, verify that these tasks have been completed:
   - The eluent reservoir is filled.
   - The reservoir cap is installed and hand-tightened.
   - The liquid line from the pump to the reservoir cap is connected.
   - All waste lines are directed to a waste container.

❖ To prime the eluent lines

1. Turn off the pump.
2. Connect a 10 mL syringe (P/N 079803) to the priming valve port on the primary pump head (see Figure 44).

   Figure 44. Priming the eluent lines



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

4. 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.)

   Note If the vacuum degas assembly is installed (see "Vacuum Degas Assembly (Optional)" on page 19), draw out an additional 20 mL of eluent.

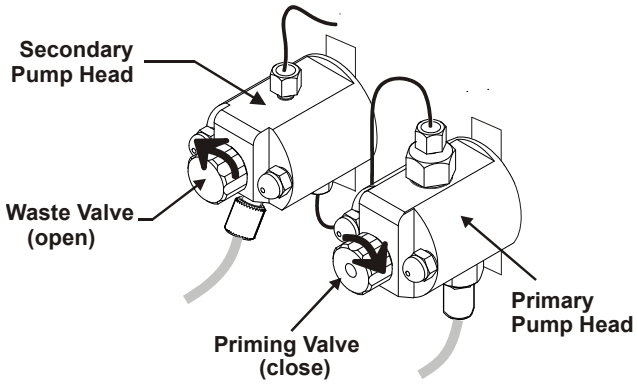
5. After priming the lines thoroughly, close the priming valve. **Do not overtighten the valve.**

❖ To prime the pump heads

Before priming the pump heads, the eluent lines must be primed (see page 90).

1. Verify that the priming valve on the primary pump head is closed (see Figure 45).

   Figure 45. Priming the pump heads



2. Open the waste valve on the secondary pump head by turning the knob one-quarter to one-half turn counterclockwise (see Figure 45). (Opening the valve directs the eluent flow path to waste and eliminates backpressure.)
3. On the Chromeleon ePanel Set, click the **Pump_ECD** tab.
4. Under **Pump_ECD**, click the **Prime** button.
5. When Chromeleon displays a message reminding you that the waste valve is open, click **OK**. The pump will begin pumping at about 3 mL/min.
6. Monitor the pump waste line for air bubbles. When no air bubbles are visible in the waste line, close the waste valve. **Do not overtighten the waste valve.**

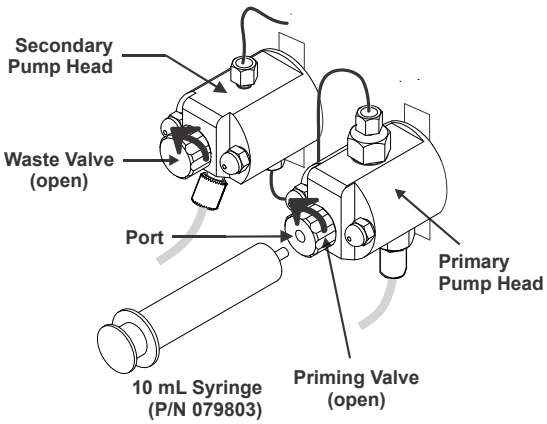
Priming the Pump with Isopropyl Alcohol

Note Prime the pump heads with isopropyl alcohol only if the standard priming procedure (see page 90) is unsuccessful.

❖ To prime the pump with isopropyl alcohol

1. Connect a 10 mL syringe (P/N 079803) filled with 0.2 micron filtered isopropyl alcohol (IPA) to the port in the primary pump head (see Figure 46).

   Figure 46. Priming the pump heads with IPA

2. Open the waste valve on the secondary pump head by turning the knob one-quarter to one-half turn counterclockwise. (Opening the valve directs the eluent flow path to waste and eliminates backpressure.)
3. On the Chromeleon ePanel Set, click the **Pump_ECD** tab.
4. Under **Pump_ECD**, click the **On** button.
5. Open the priming valve on the primary pump head by turning it one-quarter to one-half turn counterclockwise.
6. Use the syringe to slowly push IPA through the pump.

   Note Do not push any air trapped in the syringe through the pump. Check the waste line from the secondary pump head to verify that there are no air bubbles.

7. Close the priming valve. **Do not overtighten the valve.**
8. Disconnect the syringe from the priming valve.
9. Let the pump run for several minutes to purge IPA from the pump heads.
10. Under **Pump_ECD**, click the **Prime** button to flush the heads with eluent.

    IMPORTANT Isopropyl alcohol may damage some columns. Thoroughly rinse the alcohol from the pump as described in Step 9 and Step 10.

11. Close the waste valve. **Do not overtighten the valve.**
12. Select the flow rate required for the application.
13. Under **Pump_ECD**, click the **Off** button.

Replacing the Dionex EGC

CAUTION The Dionex EGC 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 Le Dionex EGC 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 Dionex EGC 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 Kartusche eine Schutzbrille und Handschuhe.

The procedure for replacing a Dionex EGC varies, depending on the type of cartridge:

- To replace a KOH, LiOH, NaOH, or MSA cartridge, go to page 93.
- To replace a K_2CO_3 cartridge, go to page 100.

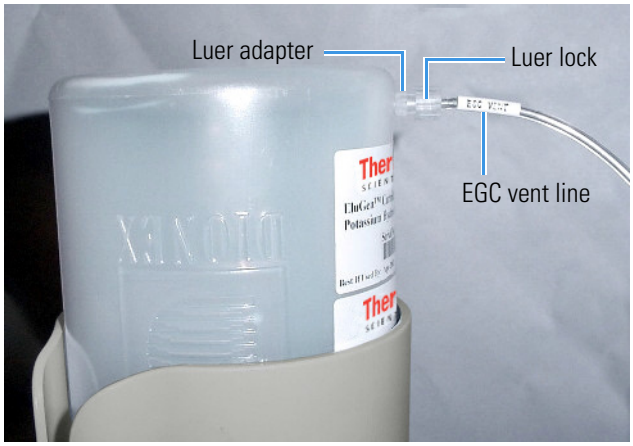
Replacing a KOH, LiOH, NaOH, or MSA Cartridge

❖ To remove the old Dionex EGC (KOH, LiOH, NaOH, or MSA)

1. Turn off the pump from the Chromeleon ePanel.
2. Disconnect the Dionex EGC electrical cable from the **EGC** connector on the Dionex Aquion RFIC top cover (see Figure 4).
3. Disconnect the Dionex CR-TC electrical cable from the **CR-TC** connector on the top cover.
4. Remove the Dionex EGC **VENT** line (see Figure 47) from the cartridge by unscrewing the luer lock from the luer adapter.

Tip If necessary, use a wrench to hold the luer adapter in place while unscrewing the vent line.

Figure 47. Dionex EGC vent line and luer fitting



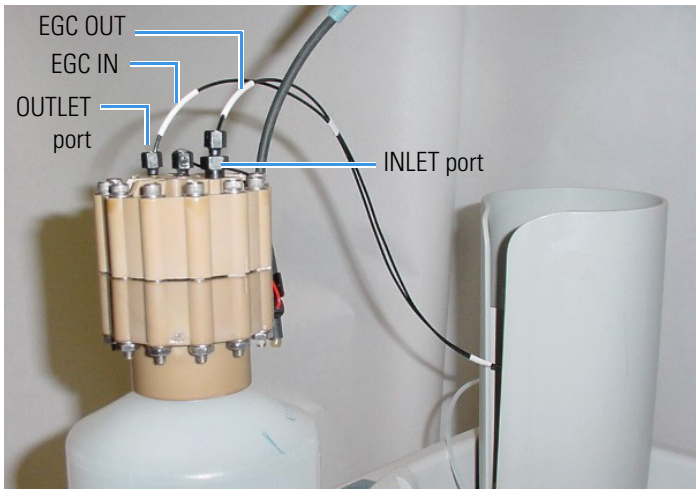
5. Install the luer cap (P/N 053981) provided with the Dionex EGC onto the luer adapter. This prevents leaks from the vent opening when you turn over the cartridge (see Step 7).
6. Lift the Dionex EGC straight up and out of the cartridge holder.
7. Turn the Dionex EGC upside down and set it in the cartridge service area on top of the Dionex Aquion RFIC (see Figure 48 and Figure 49).

Figure 48. Dionex EGC service area

Figure 49. Dionex EGC in the service area

8. Disconnect the **EGC IN** and **EGC OUT** lines from the **INLET** and **OUTLET** ports on the Dionex EGC (see Figure 50).

Figure 50. Disconnecting the Dionex EGC inlet and outlet lines

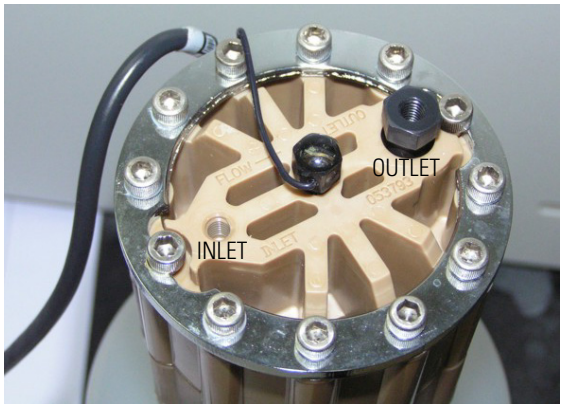


9. Follow the instructions in the Dionex EGC manual to prepare an expended cartridge for disposal or to store a partially used cartridge for later use.

❖ To install the new Dionex EGC (KOH, LiOH, NaOH, or MSA)

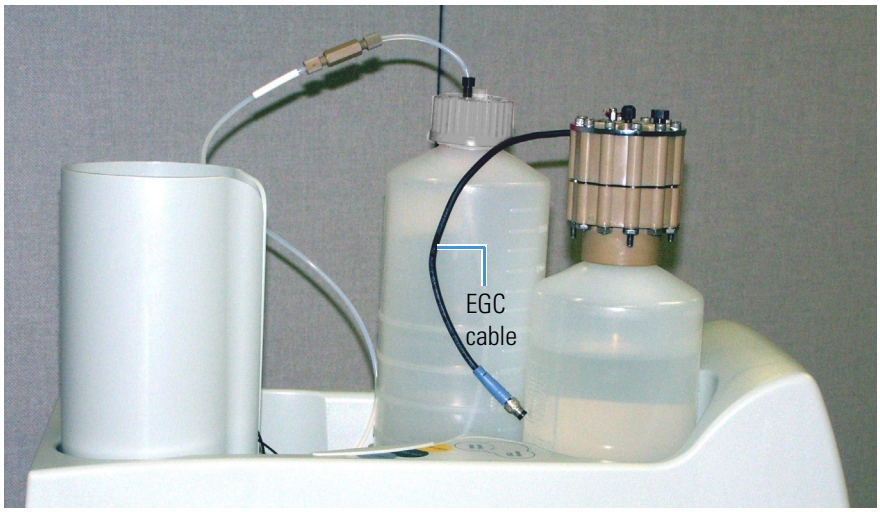
1. Remove the new Dionex EGC from the shipping box.
2. Orient the Dionex EGC with the fittings facing up and remove the plugs from the **INLET** and **OUTLET** ports (see Figure 51).

Figure 51. Dionex EGC inlet and outlet port lines



3. Set the Dionex EGC in the service area on top of the Dionex Aquion RFIC. Orient the cartridge with the electrical cable toward the Dionex EGC holder (see Figure 52).

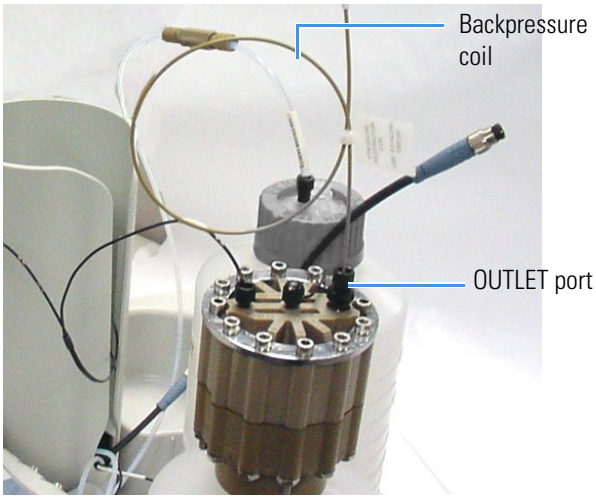
Figure 52. Dionex EGC in the service area



4. Connect the **EGC IN** line to the **INLET** port on the Dionex EGC.
5. Locate the yellow 0.5 mL/min, 7 MPa (1000 psi) backpressure coil (P/N 053765) in the Dionex Aquion RFIC Ship Kit (P/N 064375).
6. Connect one end of the backpressure coil to the **OUTLET** port on the Dionex EGC (see Figure 53). Leave the other end of the coil unconnected.

Note This backpressure coil connection is temporary; it is used only during the Dionex EGC conditioning procedure (see page 99).

Figure 53. Dionex EGC outlet connection for conditioning procedure



7. Turn the Dionex EGC over (fittings facing down). **Shake the 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 Dionex EGC 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 Le Dionex EGC 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 Dionex EGC 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 Kartusche eine Schutzbrille und Handschuhe.

8. Slide the Dionex EGC **straight down** into the holder until it stops. Make sure the electrical cable and backpressure coil remain outside the holder.

Note To avoid crimping the lines inside the holder, do not twist the cartridge when sliding it into the holder. The lines are designed to coil neatly inside the holder.

9. Remove the plug from the **EGC** connector on the Dionex Aquion RFIC top cover.
10. Orient the blue 4-pin electrical cable connector for the Dionex EGC as shown in Figure 54. Push the cable connector onto the **EGC** connector on the Dionex Aquion RFIC top cover. Twist the ring on the cable connector finger-tight to secure it.

Figure 54. Connecting the Dionex EGC electrical cable

11. Remove the plug from the Dionex EGC vent opening and connect the cartridge **VENT** line.

CAUTION Failure to remove the vent plug before beginning operation with the Dionex EGC will allow an excessive buildup of electrolysis gas, which can result in an explosion.

MISE EN GARDE Si vous ne retirez pas le bouchon d'évent avant de commencer à utiliser le Dionex EGC, vous risquez une accumulation excessive de gaz d'électrolyse, pouvant entraîner une explosion.

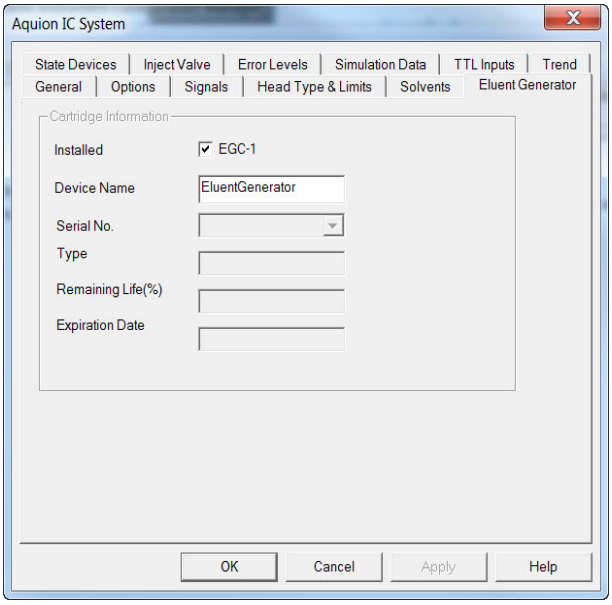
VORSICHT Wenn der Entlüftungsstopfen nicht entfernt wird, bevor der Dionex EGC in Betrieb genommen wird, kann sich übermäßiges Elektrolysegas bilden, was zu einer Explosion führen kann.

❖ To record the Dionex EGC (KOH, LiOH, NaOH, or MSA) serial number in Chromeleon

The serial number is printed on the Dionex EGC label.

1. Open the Instrument Configuration Manager.
2. Double-click the Aquion IC System icon under the instrument.
3. In the Properties dialog box, click the **Eluent Generator** tab (see Figure 55).

Figure 55. Properties dialog box: Eluent Generator tab page



4. Select the **EGC-1** check box.
5. Enter the serial number of the Dionex EGC.
6. Verify that the cartridge **Type** is **OH**. If it is not, check that you entered the serial number correctly.
7. Click **OK**.

❖ To condition the Dionex EGC (KOH, LiOH, NaOH, or MSA)

Always condition a new Dionex EGC for 30 minutes before initial use. This requires directing the backpressure coil connected to the cartridge outlet to waste, and then generating 50 mM of eluent at 1.00 mL/min for 30 minutes.

1. Set a temporary waste container (for example, a beaker) on top of the Dionex Aquion RFIC.
2. Direct the yellow backpressure coil from the Dionex EGC **OUTLET** port to the waste container.
3. Select these operating conditions on the Chromeleon ePanel:
   a. Set the pump flow rate to 1.00 mL/min.
   b. Set the Dionex EGC concentration to 50 mM.

c. Verify that the suppressor and Dionex CR-TC are off.

IMPORTANT To avoid damaging the suppressor and Dionex CR-TC, always turn them off before conditioning the Dionex EGC. Although the pump flow remains on during the conditioning procedure, no flow will reach either the suppressor or Dionex CR-TC.

4. Verify that the eluent reservoir is filled with ASTM filtered, Type I (18 megohm-cm) deionized water that meets the specifications listed in "Deionized Water Requirements for IC" on page x.
5. Turn on the pump.
6. Run at the selected settings (1.00 mL/min at 50 mM) for 30 minutes.
7. Turn off the pump.
8. Disconnect the Dionex EGC electrical cable from the **EGC** connector.
9. Remove the temporary backpressure tubing from the waste container and remove the waste container.
10. Lift the Dionex EGC out of the holder, turn it over, and set it in the service area.
11. Disconnect the backpressure coil from the Dionex EGC **OUTLET** port.
12. Connect the **EGC OUT** line from the holder to the Dionex EGC **OUTLET** port.
13. Turn over the Dionex EGC (fittings facing down) and check for bubbles. If necessary, shake and tap the cartridge to remove bubbles.
14. Reinstall the Dionex EGC in the holder.
15. Reconnect the Dionex EGC electrical cable.
16. Reconnect the Dionex CR-TC electrical cable.

The new Dionex EGC is ready for routine operation.

Replacing a Carbonate Cartridge

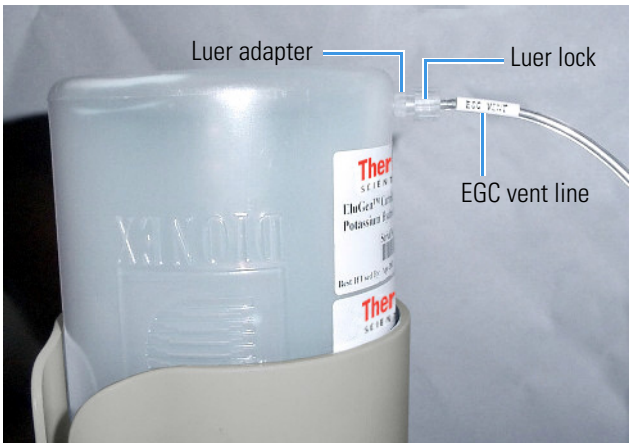
❖ To remove the old Dionex K_2CO_3 EGC

1. Turn off the pump from the Chromeleon ePanel.
2. Disconnect the Dionex EGC electrical cable from the **EGC** connector on the Dionex Aquion RFIC top cover (see Figure 4).
3. Disconnect the Dionex CR-TC electrical cable from the **CR-TC** connector on the top cover.

4. Remove the Dionex EGC **VENT** line (see Figure 56) from the cartridge by unscrewing the luer lock from the luer adapter.

> **Tip** If necessary, use a wrench to hold the luer adapter in place while unscrewing the vent line.

Figure 56. Dionex EGC vent line and luer fitting



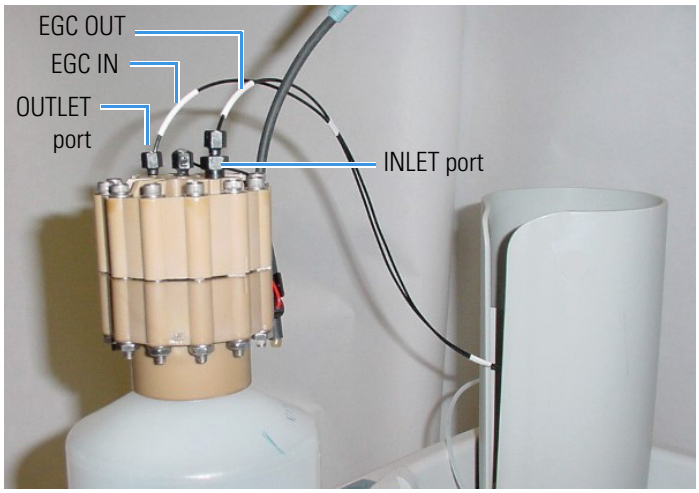
5. Install the luer cap (P/N 053981) provided with the Dionex EGC onto the luer adapter. This prevents leaks from the vent opening when you turn over the cartridge (see Step 7).
6. Lift the Dionex EGC straight up and out of the cartridge holder.
7. Turn the Dionex EGC upside down and set it in the cartridge service area on top of the Dionex Aquion RFIC (see Figure 57 and Figure 58).

Figure 57. Dionex EGC service area

Figure 58. Dionex EGC in the service area

8. Disconnect the **EGC IN** and **EGC OUT** lines from the **INLET** and **OUTLET** ports on the Dionex EGC (see Figure 59).

Figure 59. Disconnecting the Dionex EGC inlet and outlet port lines

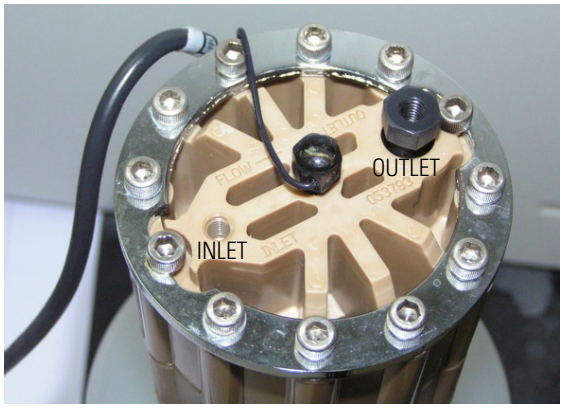


9. Follow the instructions in the Dionex EGC manual to prepare an expended cartridge for disposal or to store a partially used cartridge for later use.

❖ To install the new Dionex K_2CO_3 EGC

1. Remove the new Dionex EGC from the shipping box.
2. Orient the Dionex EGC with the fittings facing up and remove the plugs from the **INLET** and **OUTLET** ports (see Figure 60).

Figure 60. Dionex EGC inlet and outlet port lines



3. Set the Dionex EGC in the service area on top of the Dionex Aquion RFIC. Orient the cartridge with the electrical cable toward the Dionex EGC holder (see Figure 61).

Figure 61. Dionex EGC in the service area

4. Connect the **EGC IN** line to the **INLET** port on the Dionex EGC.
5. Connect the **EGC OUT** line to the **OUTLET** port on the Dionex EGC.
6. Turn the Dionex EGC over (fittings facing down). **Shake the 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 Dionex EGC 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 Le Dionex EGC 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 Dionex EGC 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 Kartusche eine Schutzbrille und Handschuhe.

7. Slide the Dionex EGC **straight down** into the holder until it stops. Make sure the electrical cable remains outside the holder (see Figure 62).

Note To avoid crimping the lines inside the holder, do not twist the Dionex EGC when sliding it into the holder. The lines are designed to coil neatly inside the holder.

Figure 62. Dionex EGC installed in the holder

8. Remove the plug from the **EGC** connector on the Dionex Aquion RFIC top cover.
9. Orient the blue 4-pin electrical cable connector for the Dionex EGC as shown in Figure 63. Push the cable connector onto the **EGC** connector on the top cover. Twist the ring on the cable connector finger-tight to secure it.

Figure 63. Connecting the Dionex EGC electrical cable

10. Remove the plug from the Dionex EGC vent opening and connect the cartridge **VENT** line.

CAUTION Failure to remove the vent plug before beginning operation with the Dionex EGC will allow an excessive buildup of electrolysis gas, which can result in an explosion.

MISE EN GARDE Si vous ne retirez pas le bouchon d'évent avant de commencer à utiliser le Dionex EGC, vous risquez une accumulation excessive de gaz d'électrolyse, pouvant entraîner une explosion.

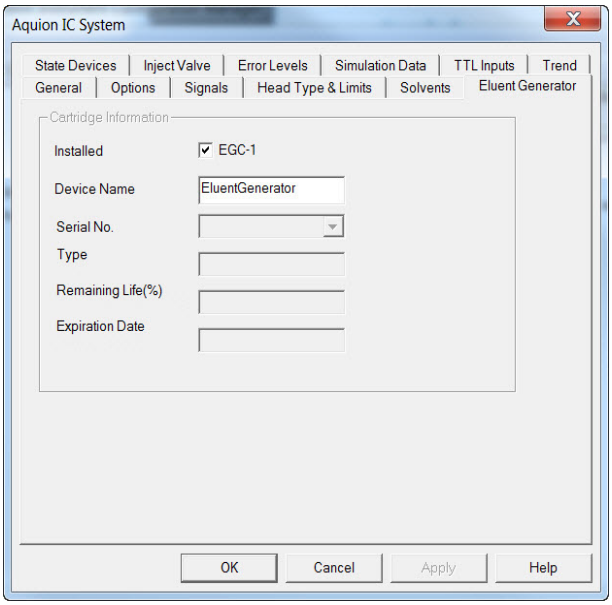
VORSICHT Wenn der Entlüftungsstopfen nicht entfernt wird, bevor der Dionex EGC in Betrieb genommen wird, kann sich übermäßiges Elektrolysegas bilden, was zu einer Explosion führen kann.

❖ To record the Dionex K_2CO_3 EGC serial number in Chromeleon

The serial number is printed on the Dionex EGC label.

1. Open the Instrument Configuration Manager.
2. Double-click the Aquion IC System icon under the instrument.
3. In the Properties dialog box, click the **Eluent Generator** tab (see Figure 64).

Figure 64. Properties dialog box: Eluent Generator tab page



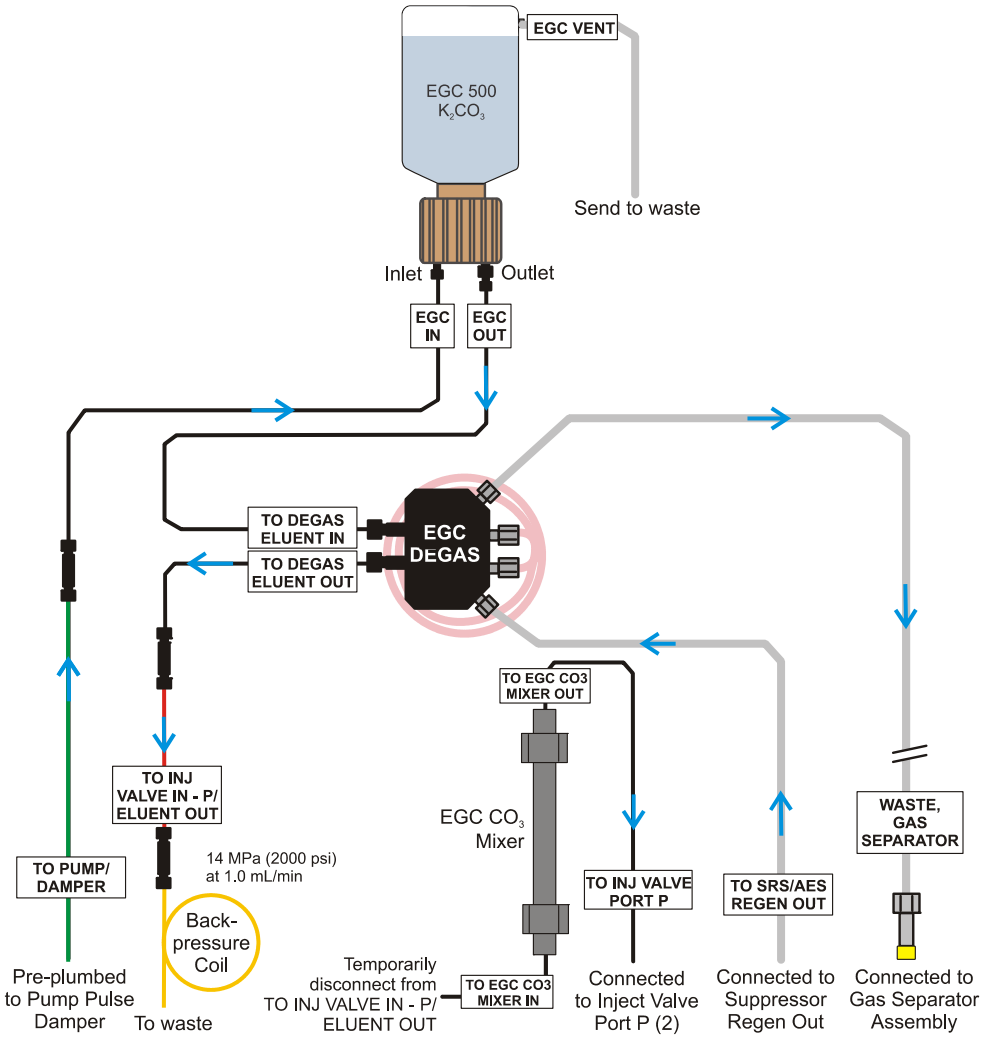
4. Select the **EGC-1** check box.
5. Enter the serial number of the Dionex EGC.

6. Verify that the cartridge type is **Carb**. If it is not, make sure you entered the cartridge serial number correctly.
7. Click **OK**.

❖ To plumb the Dionex K_2CO_3 EGC for conditioning

Figure 65 illustrates the liquid flow path through the Dionex K_2CO_3 EGC during the conditioning procedure with carbonate eluent.

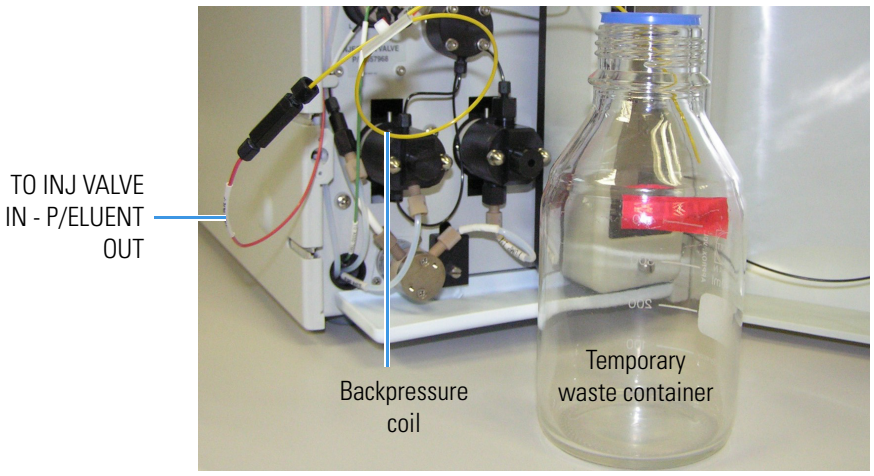
Figure 65. Dionex K_2CO_3 EGC plumbing for conditioning



1. Disconnect the **TO INJ VALVE IN - P/ELUENT OUT** line from the inlet of the Dionex EGC 500 Carbonate Mixer (P/N 088467 for Carbonate Mixer Kit, 2 mm; P/N 088468 for Carbonate Mixer Kit, 4 mm).
2. Locate the yellow 0.5 mL/min, 7 MPa (1000 psi) backpressure coil (P/N 053765) and a 10-32 to 10-32 coupler (P/N 042627) in the Dionex Aquion RFIC Ship Kit (P/N 064375).

3. Use the coupler to connect the **TO INJ VALVE IN - P/ELUENT OUT** line to one end of the backpressure coil (see Figure 66).
4. Direct the free end of the backpressure coil to a temporary waste container.

Figure 66. Plumbing connections for the Dionex K_2CO_3 EGC conditioning procedure



❖ To condition the Dionex K_2CO_3 EGC

Always condition a new Dionex EGC for 30 minutes before initial use.

1. Verify that the eluent reservoir is filled with ASTM filtered, Type I (18 megohm-cm) deionized water that meets the specifications listed in "Deionized Water Requirements for IC" on page x.
2. Verify that the suppressor is off.

> **IMPORTANT** **To avoid damaging the suppressor**, always turn it off before conditioning the Dionex EGC. Although the pump flow remains on during the conditioning procedure, no flow will reach the suppressor.

3. Select these operating conditions on the Chromeleon ePanel:
   a. Set the pump flow rate to 1.00 mL/min.
   b. Turn on the pump.
   c. Set the eluent concentration to 9 mM.
   d. Turn on the Dionex EGC current.
4. Run at the selected settings (1.00 mL/min at 9 mM) for 30 minutes.
5. Turn off the Dionex EGC current.
6. Turn off the pump.
7. Remove the backpressure coil.

8. Reconnect the **TO INJ VALVE IN - P/ELUENT OUT** line to the mixer inlet.

The new Dionex EGC is ready for routine operation.

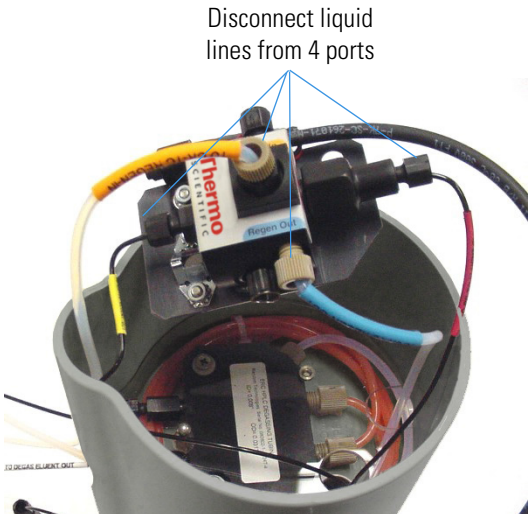
Replacing the Dionex CR-TC

For guidance on when to replace the Dionex CR-TC, refer to the column manual.

❖ To remove the old Dionex CR-TC

1. Turn off the pump from the Chromeleon ePanel.
2. Complete the following tasks (for instructions, see "To remove the old Dionex EGC (KOH, LiOH, NaOH, or MSA)," Step 2 through Step 8):
   - Disconnect the Dionex EGC and Dionex CR-TC electrical cables.
   - Cap the Dionex EGC vent opening.
   - Remove the Dionex EGC from the holder.
   - Disconnect the inlet and outlet tubing.
3. Disconnect the line labeled **TO INJ VALVE IN - P/ELUENT OUT** from port **P (2)** on the injection valve.
4. Disconnect the line labeled **SRS/AES REGEN OUT** from the **REGEN OUT** port on the suppressor.
5. Lift up the Dionex EGC holder and tilt it so as to view the bottom of the holder. While maintaining the holder at this angle, brace it against the rear corner of the Dionex Aquion RFIC.
6. Grasp the top of the Dionex CR-TC and lift up to disconnect it from the holder.
7. Disconnect the liquid lines from the four ports on the Dionex CR-TC (see Figure 67).

Figure 67. Disconnecting the Dionex CR-TC liquid lines

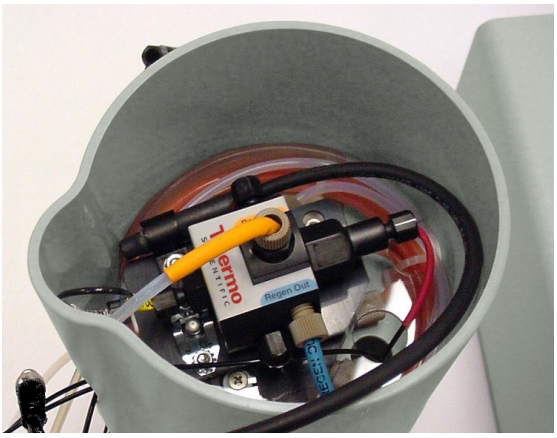


8. Remove the Dionex CR-TC from the holder.

❖ To install the new Dionex CR-TC

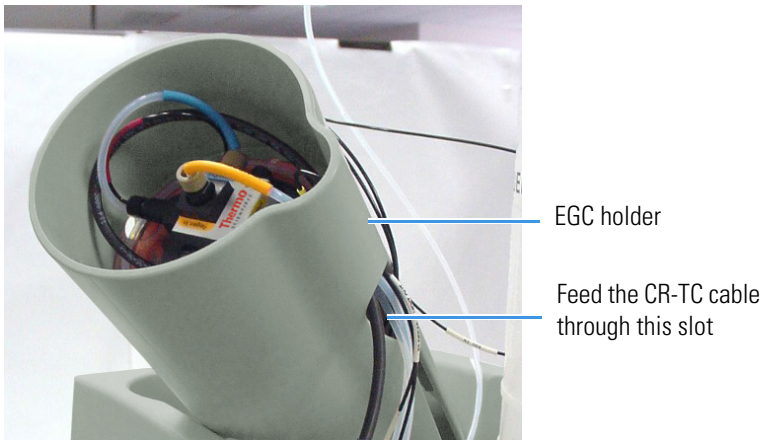
1. Remove the plugs from the ports on the new column (Dionex CR-ATC, P/N 060477; Dionex CR-CTC II, P/N 060262).
2. Connect the liquid lines previously connected to the old Dionex CR-TC to the corresponding ports on the new Dionex CR-TC.
3. After checking that none of the liquid lines are caught under the Dionex CR-TC, begin pushing the column onto the metal stud inside the Dionex EGC holder. Continue pushing down until the Dionex CR-TC snaps into place (see Figure 68).

Figure 68. Dionex CR-TC installed in Dionex EGC holder



4. Feed the Dionex CR-TC electrical cable through the slot on the side of the Dionex EGC holder (see Figure 69).

Figure 69. Feeding the Dionex CR-TC electrical cable into the Dionex EGC holder



5. Turn the Dionex EGC holder right-side up.
6. Reconnect the **EGC IN** and **EGC OUT** lines to the Dionex EGC **INLET** port and **OUTLET** port, respectively.
7. Turn over the Dionex EGC (fittings facing down). Check for bubbles in the eluent generation chamber. If necessary, shake and tap the cartridge to remove bubbles.
8. Reinstall the Dionex EGC in the holder.
9. Remove the cap on the luer adapter by twisting. **Save the cap.**
10. Twist the luer lock and **EGC VENT** line into the luer adapter.

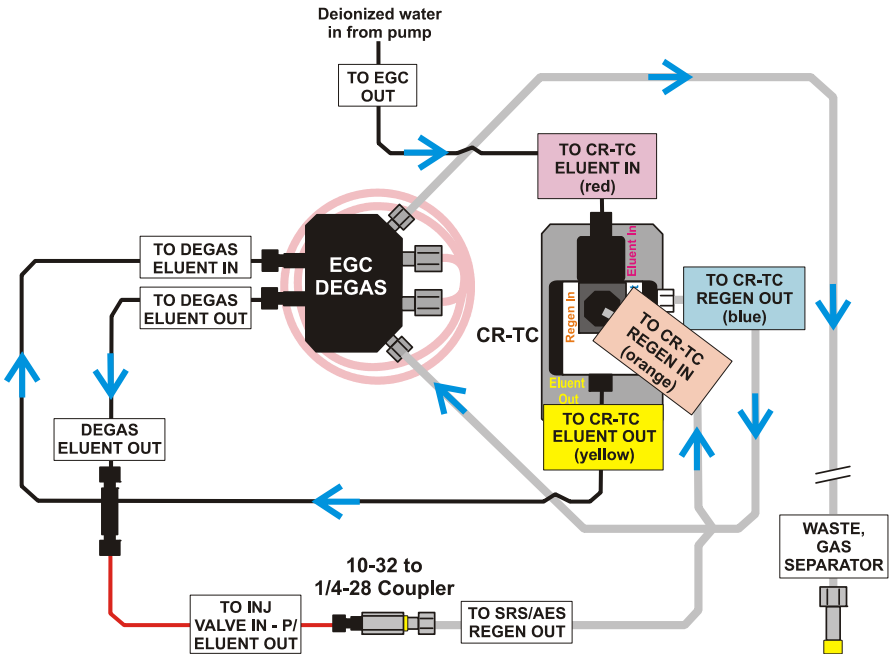
Note Do not connect the Dionex EGC electrical cable until after hydrating the Dionex CR-TC.

❖ To hydrate the new Dionex CR-TC

Always hydrate a new Dionex CR-TC before initial operation. During the hydration procedure, ASTM filtered, Type 1 (18 megohm-cm) deionized water is pumped through the Dionex CR-TC for 10 minutes (bypassing the guard column, separator column, and suppressor).

Figure 70 illustrates the liquid flow path through the Dionex CR-TC during the hydration procedure.

Figure 70. Dionex CR-TC plumbing for hydration



1. Locate the 10-32 to 1/4-28 coupler (P/N 042806) provided in the Dionex Aquion RFIC Ship Kit (P/N 064375).
2. Use the coupler to connect the line labeled **TO INJ VALVE IN - P/ELUENT OUT** and the line labeled **SRS/AES REGEN OUT**.
3. Verify that the current to the suppressor is turned off.

> **IMPORTANT** **To avoid damaging the suppressor**, always turn it off before hydrating the Dionex CR-TC. Although the pump flow remains on during the hydration procedure, no flow will reach the suppressor.

4. Turn on the pump and set the flow to the rate recommended for your application.
5. Pump ASTM filtered, Type 1 (18 megohm-cm) deionized water that meets the specifications listed in "Deionized Water Requirements for IC" on page x through the Dionex CR-TC for at least 10 minutes.
6. Turn off the pump.

❖ To complete the Dionex CR-TC installation

1. Disconnect the 10-32 to 1/4-28 coupler.
2. Reconnect the **TO INJ VALVE IN - P/ELUENT OUT** line to port **(P) 2** on the injection valve.
3. Reconnect the **TO SRS/AES REGEN OUT** line to the **REGEN OUT** port on the suppressor.

4. Reconnect the Dionex CR-TC and Dionex EGC electrical cables.

The new Dionex CR-TC is ready for routine operation.

Replacing the Dionex EGC 500 Carbonate Mixer

During initial system installation, the carbonate mixer is attached directly to the inside of the front door (with double-sided tape) or mounted in two 3/4-in U style mounting clips. For details, refer to the Dionex Aquion RFIC installation instructions.

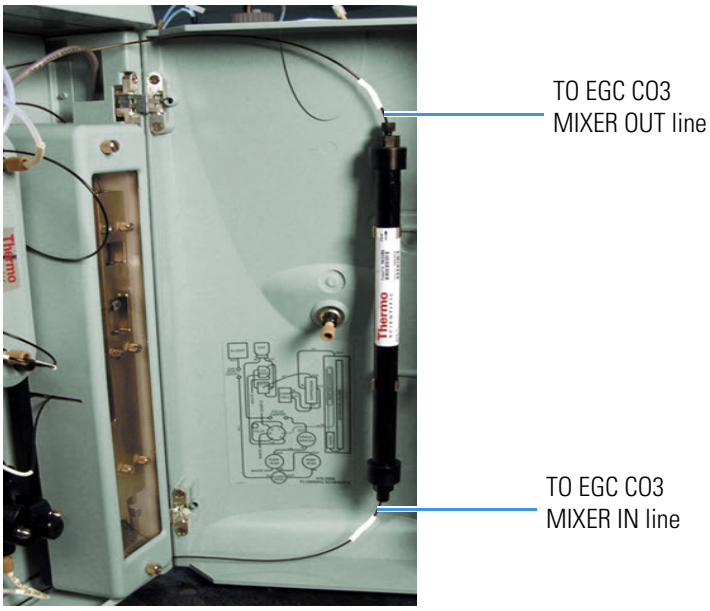
❖ To remove the old carbonate mixer

1. Turn off the pump from the Chromeleon ePanel.
2. Open the Dionex Aquion RFIC front door.
3. Disconnect the inlet and outlet lines (labeled **TO EGC CO3 MIXER IN** and **TO EGC CO3 MIXER OUT**) from the old mixer.
4. Remove the mixer from the system. Do not remove the double-sided tape or mounting clips from the door.

❖ To install the new carbonate mixer

1. Remove the new Dionex EGC 500 Carbonate Mixer (P/N 088467 for Carbonate Mixer Kit, 2 mm; P/N 088468 for Carbonate Mixer Kit, 4 mm) from the shipping box.
2. Orient the mixer with the outlet pointing upward and push it onto the double-sided tape or into the mounting clips (see Figure 71). This orientation ensures thorough mixing of the eluent.
3. Connect the **TO EGC CO3 MIXER IN** line to the mixer inlet.
4. Connect the **TO EGC CO3 MIXER OUT** line to the mixer outlet.

Figure 71. Dionex EGC 500 Carbonate Mixer installed

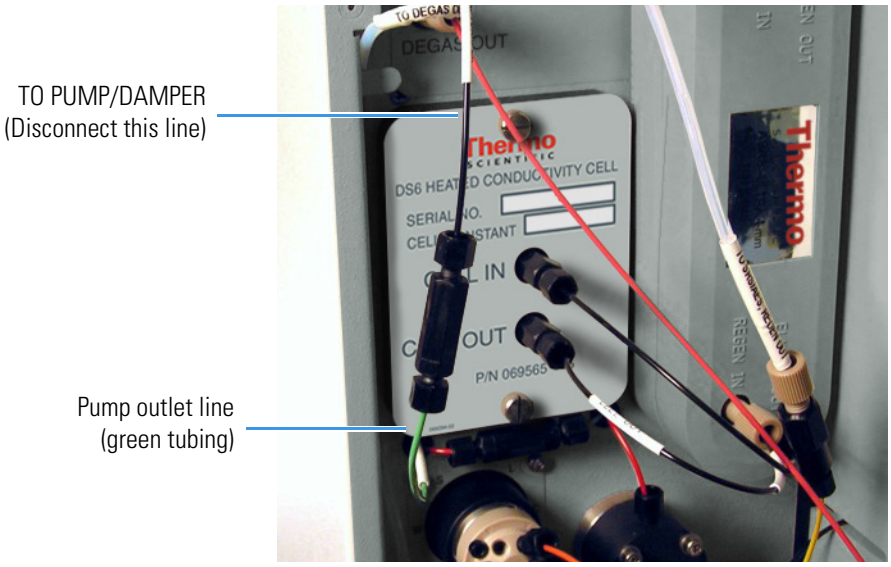


❖ To hydrate the new carbonate mixer

Follow the steps below to hydrate a new carbonate mixer with deionized water.

1. Verify that the Dionex EGC current is off.
2. Disconnect the Dionex EGC inlet line (labeled **TO PUMP/DAMPER**) from the coupler that connects it to the green pump outlet line (see Figure 72).

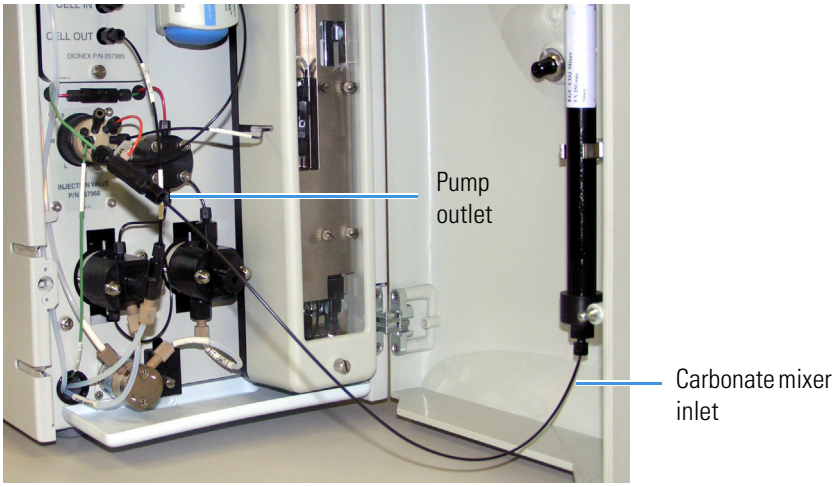
   Figure 72. Disconnecting the Dionex EGC inlet and pump outlet



3. Disconnect the **TO EGC CO3 MIXER IN** line from the **TO INJ VALVE IN - P/ELUENT OUT** line.

4. Connect the pump outlet to the carbonate mixer inlet (see Figure 73).

Figure 73. Pump outlet connected to carbonate mixer inlet for mixer hydration



5. Disconnect the carbonate mixer outlet line (labeled **TO INJ VALVE PORT P**) from port **P (2)** on the injection valve.
6. Direct the carbonate mixer outlet line to a temporary waste container (for example, a beaker).
7. Set the pump flow rate to 5.00 mL/min.
8. Verify that the suppressor is off.

IMPORTANT **To avoid damaging the suppressor**, always turn it off before hydrating the carbonate mixer. Although the pump flow remains on during the hydration procedure, no flow will reach the suppressor.

9. Turn on the pump.
10. Begin running at the selected settings. When you observe a consistent flow of eluent exiting the carbonate mixer outlet, turn off the Dionex EGC current and the pump.

    For reference:

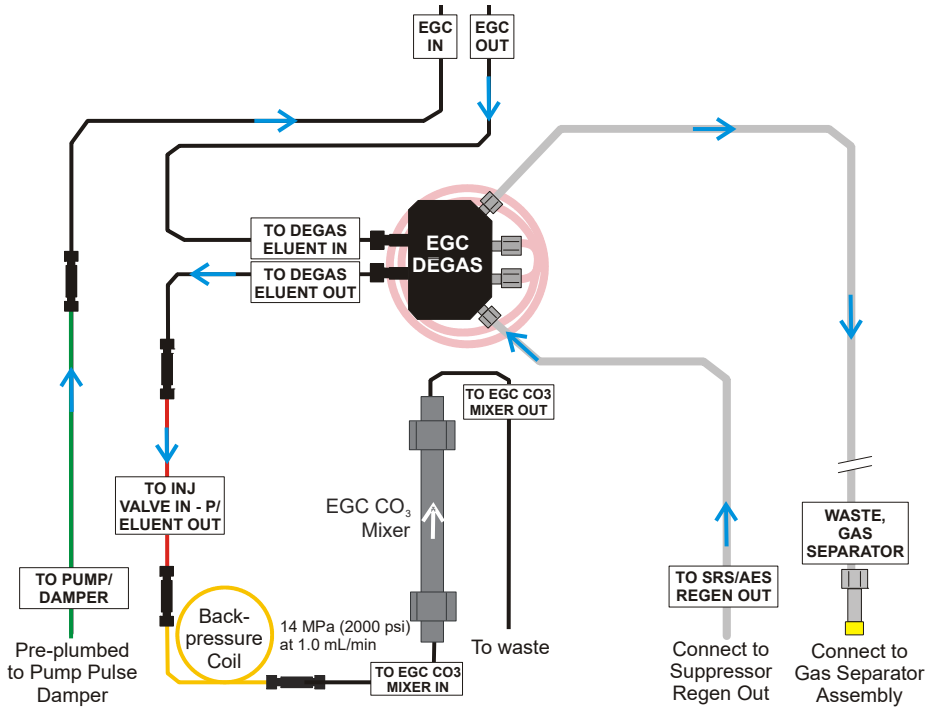
    - The carbonate mixer for 2-mm columns has a void volume of about 5 mL. At a flow rate of 1.0 mL/min, it takes about 5 minutes to fill the mixer.
    - The carbonate mixer for 4-mm columns has a void volume of about 16 mL. At a flow rate of 1.0 mL/min, it takes about 16 minutes to fill the mixer.

11. Turn off the pump.

❖ To fill the carbonate mixer with eluent

Before initial use, follow the steps in this section to fill the new carbonate mixer with carbonate eluent. Figure 74 illustrates the liquid flow path through the eluent generator components during this procedure.

Figure 74. Plumbing for initial filling of the carbonate mixer with carbonate eluent



1. Locate the yellow 0.5 mL/min, 7 MPa (1000 psi) backpressure coil (P/N 053765) and a 10-32 to 10-32 coupler (P/N 042627) provided in the Dionex Aquion RFIC Ship Kit (P/N 064375).
2. Use the coupler to connect the **TO INJ VALVE IN - P/ELUENT OUT** line to one end of the backpressure coil (see Figure 66).
3. Connect the free end of the backpressure coil to the coupler on the mixer inlet.

> **Note** This backpressure coil connection is temporary; it is used only during the initial filling of the mixer with carbonate eluent.

4. Direct the mixer outlet to a temporary waste container (for example, a beaker).
5. Verify that the suppressor is off.

> **IMPORTANT** **To avoid damaging the suppressor**, always turn it off before filling the mixer. Although the pump flow remains on during filling, no flow will reach the suppressor.

6. On the Chromeleon ePanel, set the pump flow rate to the rate required for the application.
7. Turn on the pump.
8. 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.
9. Turn on the Dionex EGC current.
10. Begin running at the selected settings until a consistent flow of eluent exits the mixer outlet.
11. Turn off the Dionex EGC current.
12. Turn off the pump.
13. Remove the backpressure coil from the **TO INJ VALVE IN - P/ELUENT OUT** line and the mixer inlet.

Note Retain the coupler on the mixer inlet.

14. Reconnect the **TO INJ VALVE IN - P/ELUENT OUT** line to the coupler on the mixer inlet.
15. Reconnect the mixer outlet line to port **P (2)** on the injection valve.

Replacing the Dionex EGC Holder and Degas Assembly

❖ **To remove the Dionex EGC from the system**

1. Turn off the Dionex Aquion RFIC main power switch.
2. Disconnect the following Dionex EGC holder liquid lines:
   - The line labeled **TO INJ VALVE IN - P/ELUENT OUT** from port **P (2)** on the injection valve.
   - (If a Dionex CR-TC is installed) The line labeled **TO SRS/AES REGEN OUT** from the **REGEN OUT** port on the suppressor.
   - The line labeled **TO PUMP/DAMPER** from the pump damper.
   - The line labeled **WASTE-GAS SEPARATOR** from the gas separator waste tube assembly installed on the waste container.
3. Disconnect the Dionex EGC and Dionex CR-TC electrical cables from the connectors on the Dionex Aquion RFIC top cover (see Figure 4).

CAUTION The Dionex EGC 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.

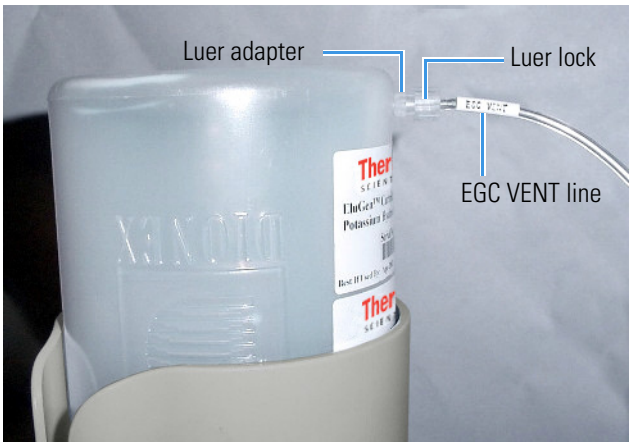
MISE EN GARDE Le Dionex EGC contient un de ce qui suit: une base corrosive (KOH, LiOH, ou NaOH), un acide corrosif (MSA), ou une solution concentrée de K_2CO_3. Porter des lunettes et des gants protectives en manipulant la cartouche.

VORSICHT Die Dionex EGC 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 Kartusche eine Schutzbrille und Handschuhe.

4. Remove the **EGC VENT** line (see Figure 75) from the Dionex EGC by unscrewing the luer lock from the luer adapter.

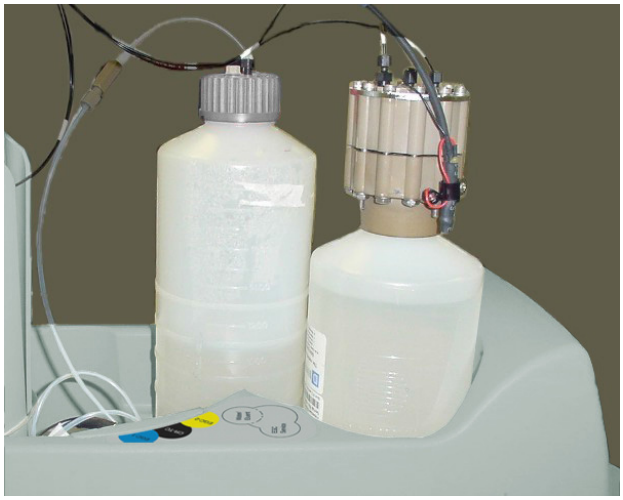
   Tip If necessary, use a wrench to hold the luer adapter in place while unscrewing the vent line.

   Figure 75. Dionex EGC vent line and luer fitting

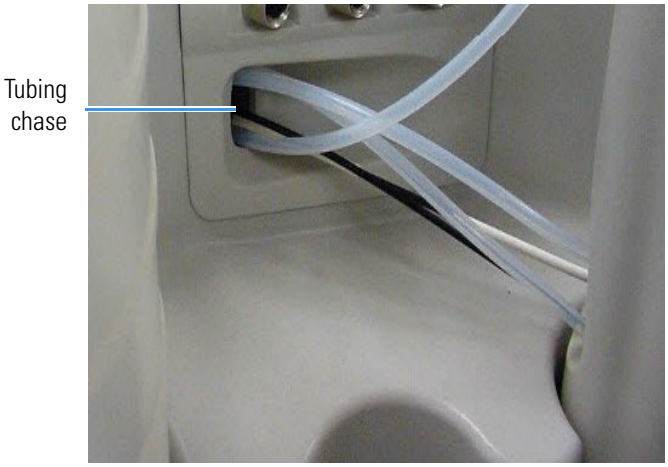
5. Install the luer cap (P/N 053981) provided with the Dionex EGC onto the luer adapter. This prevents leaks from the vent opening when you turn over the cartridge (see Step 7).
6. Lift the cartridge straight up and out of the Dionex EGC holder.
7. Turn the cartridge upside down and set it in the cartridge service area on top of the Dionex Aquion RFIC (see Figure 76).

Figure 76. Dionex EGC in service area



8. Disconnect the **EGC IN** and **EGC OUT** lines from the **INLET** and **OUTLET** ports on the cartridge.
9. Lift the Dionex EGC holder out of the top cover and pull the liquid lines through the tubing chase (see Figure 77) to remove them from the system.

Figure 77. Top cover tubing chase



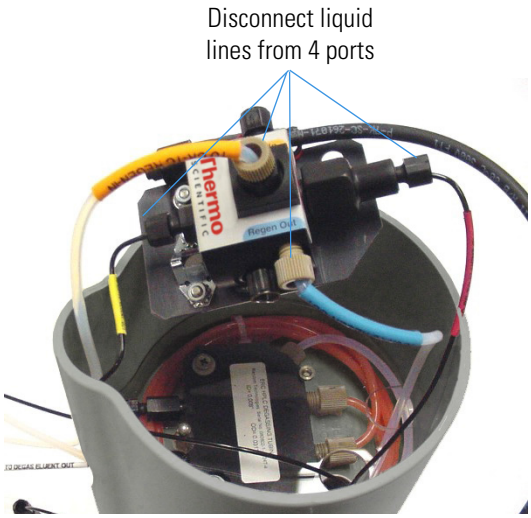
If a Dionex CR-TC is installed, go on to "To remove the Dionex CR-TC and reinstall it in the new Dionex EGC holder" on page 118.

If a Dionex CR-TC is *not* installed, go on to "To install the new Dionex EGC holder without a Dionex CR-TC" on page 121.

❖ To remove the Dionex CR-TC and reinstall it in the new Dionex EGC holder

1. Turn the Dionex EGC holder upside down to view the Dionex CR-TC.
2. Grasp the top of the Dionex CR-TC and lift up to disconnect it from the holder.
3. Disconnect the liquid lines from the four ports on the Dionex CR-TC (see Figure 78).

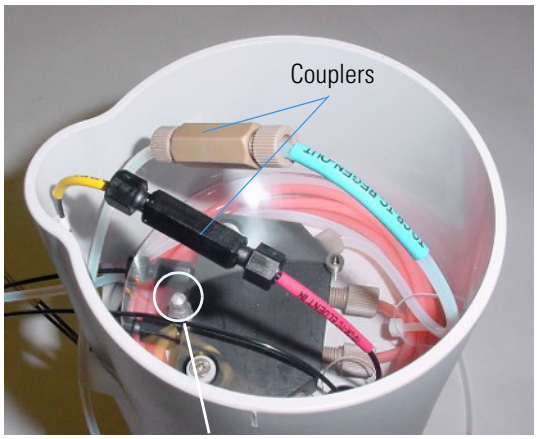
Figure 78. Disconnecting the Dionex CR-TC liquid lines



4. Remove the new Dionex EGC holder (P/N 058069) from the shipping box.
5. Turn the holder upside down (see Figure 79) and connect the liquid lines to the Dionex CR-TC.

Tip 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 79. Dionex EGC holder (upside down)

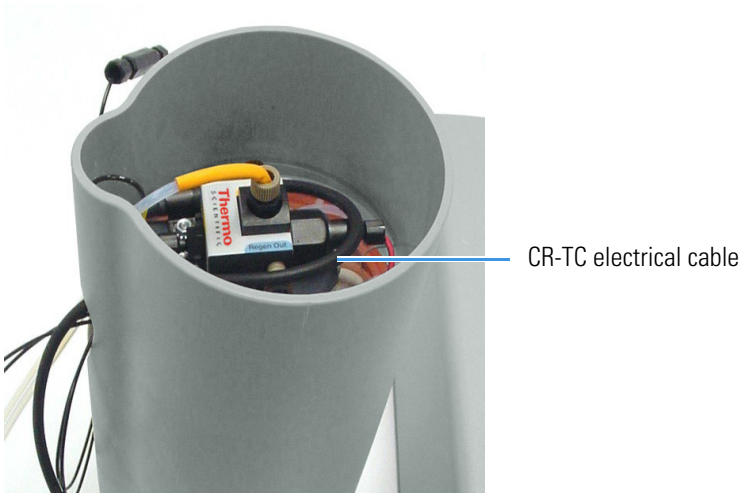


6. After checking that none of the lines are caught under the Dionex CR-TC, begin pushing the column onto the metal stud inside the Dionex EGC holder. Continue pushing down until the Dionex CR-TC snaps into place (see Figure 80).

Figure 80. Dionex CR-TC installed in Dionex EGC holder

7. Feed the Dionex CR-TC electrical cable through the slot on the side of the Dionex EGC holder (see Figure 81).

Figure 81. Dionex CR-TC electrical cable



8. Turn the Dionex EGC holder right-side up and set it on top of the Dionex Aquion RFIC.
9. Direct the **WASTE, GAS SEPARATOR** line from the top of the Dionex Aquion RFIC 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 assembly installed on the waste container.
10. Feed the following liquid lines from the bottom of the Dionex EGC holder, through the tubing chase, to the Dionex Aquion RFIC component panel:
    - **TO SRS/AES REGEN OUT**
    - **TO INJ VALVE IN - P/ELUENT OUT**
    - **TO PUMP/DAMPER**

11. Connect each liquid line to the appropriate location:
    a. Connect the **TO SRS/AES REGEN OUT** line to the **REGEN OUT** port on the suppressor.
    b. Connect the **TO INJ VALVE IN - P/ELUENT OUT** line to port **P (2)** on the injection valve.
    c. Connect the **TO PUMP/DAMPER** line to the pulse damper.

Go on to "To reinstall the Dionex EGC" on page 121.

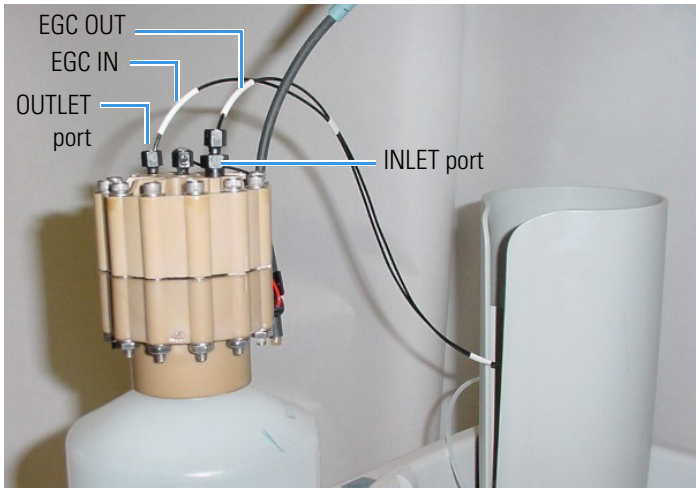
❖ To install the new Dionex EGC holder without a Dionex CR-TC

1. Remove the new Dionex EGC holder (P/N 058069) from the shipping box.
1. Set the Dionex EGC holder in place on top of the Dionex Aquion RFIC.
2. Feed the following liquid lines through the tubing chase to the Dionex Aquion RFIC component panel:
    - **TO SRS/AES REGEN OUT**
    - **TO INJ VALVE IN - P/ELUENT OUT**
    - **TO PUMP/DAMPER**
3. Connect each liquid line to the appropriate location:
    a. Connect the **TO SRS/AES REGEN OUT** line to the **REGEN OUT** port on the suppressor.
    b. Connect the **TO INJ VALVE IN - P/ELUENT OUT** line to port **P (2)** on the injection valve.
    c. Connect the **TO PUMP/DAMPER** line to the pulse damper.
4. Direct the **WASTE, GAS SEPARATOR** line from the top of the Dionex Aquion RFIC to the rear panel. Snap the line onto one of the tubing clips on the rear panel, and then connect the line to the gas separator waste tube assembly installed on the waste container.

❖ To reinstall the Dionex EGC

1. Pull the coiled black **EGC IN** and **EGC OUT** lines from inside the Dionex EGC holder.
2. Disconnect the **EGC IN** line from the coupler that connects it to the **EGC OUT** line.
3. Connect the **EGC IN** line to the Dionex EGC **INLET** port (see Figure 82).

Figure 82. Dionex EGC inlet and outlet port connections



4. Remove the coupler, and then connect the **EGC OUT** line to the Dionex EGC **OUTLET** port.
5. Turn over the Dionex EGC (fittings facing down) and check for any bubbles in the eluent generation chamber. If necessary, shake and tap the cartridge to remove bubbles.
6. Reinstall the Dionex EGC in the holder.
7. Reconnect the Dionex EGC electrical cable and Dionex CR-TC cable (if installed).
8. Remove the cap from the luer adapter on the Dionex EGC vent opening and reconnect the **EGC VENT** line.

Changing the Main Power Fuses

❖ **To change the fuses**

1. Turn off the Dionex Aquion RFIC main power switch.

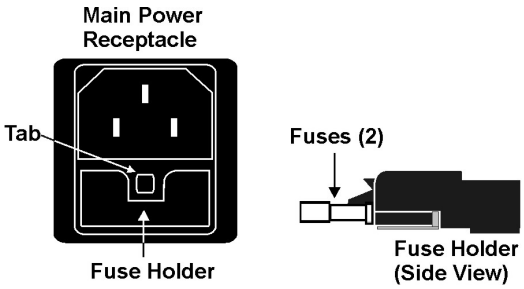
DANGER HIGH VOLTAGE—Disconnect the main power cord from its source and also from the rear panel of the Dionex Aquion RFIC.

DANGER HAUTE TENSION—Débranchez le cordon d'alimentation principal de sa source et du panneau arrière du Dionex Aquion RFIC.

ACHTUNG HOCHSPANNUNG—Ziehen Sie das Netzkabel aus der Steckdose und der Netzbuchse auf der Rückseite des Dionex Aquion RFIC.

2. The fuse holder is part of the main power receptacle on the Dionex Aquion RFIC rear panel (see Figure 83). To remove the fuse holder, squeeze the tab on the top of the holder to release it and pull the holder straight out of its compartment.

Figure 83. Main power fuse holder



3. Replace the two fuses in the holder with new IEC 127 fast-blow fuses rated 3.15 amps (P/N 954745). Thermo Fisher Scientific recommends always replacing both fuses.
4. Reinsert the fuse holder into its compartment and push in until the tab clicks in place.
5. Reconnect the main power cord and turn on the power.

A

Specifications

Front panel	
Power LED	On when power is present; off when power is not present
Inject valve LEDs	Indicates the injection valve position
Alarm LED	Indicates an alarm state
Status LEDs	Indicates the system status

Analytical pump and fluidics	
Type	Serial dual-reciprocating pistons, microprocessor-controlled constant stroke, variable speed
Construction	Chemically inert, metal-free PEEK pump heads and flow paths compatible with aqueous eluents of pH 0 to 14 and reversed-phase solvents
Pump operating pressure	0 to 35 MPa (0 to 5000 psi)
Flow rate range	0.00 to 5.00 mL/min (in 0.01 mL/min increments) without changing pump heads **Note:** When a Dionex EGC is installed, the flow rate range is 0.10 to 3.00 mL/min.
Flow precision	<0.1%, typically
Flow accuracy	<0.1%, typically
Pressure ripple	<1% at 13.8 MPa (2000 psi) and 1.0 mL/min
Eluent on/off valve	Standard feature
Piston seal wash	Dual-pump head; wash can be continuous when connected to rinse solution supply
Pressure alarm limits	Upper limit of 0 to 35 MPa (0 to 5000 psi) in increments of one unit (MPa or psi); lower limit can be set to up to one unit (MPa or psi) lower than the upper limit

Analytical pump and fluidics	
Vacuum degas	(Optional feature) Automatic control
Eluent reservoirs	Polypropylene
Eluent reservoir pressure	None required; optional regulator assembly available
Injection valve	6-port, 2-position Rheodyne valve with PEEK wetted components; electrically-activated
Auxiliary valve	6-port or 10-port, 2-position Rheodyne valve with PEEK wetted components; electrically-activated
Leak detection	Built-in optical sensor

Eluent generation	
Eluent types	KOH, LiOH, NaOH, MSA, K_2CO_3
Eluent concentration range	0.1 to 100 mM; dependent on flow rate, suppressor type, and Dionex EGC type (see Table 4)
Concentration increments	0.01 mM
Flow rate range	0.10 to 3.00 mL/min
Maximum operating pressure	21 MPa (3000 psi)
Maximum solvent concentration	Anions: 25% methanol Cations: None
Gradient profile	One-step linear
Number of cartridges supported	One

Conductivity detector electronics	
Type	Microprocessor-controlled digital signal processor
Cell drive	8 kHz square wave
Detector linearity	1% up to 1 mS
Resolution	0.00238 nS/cm
Full-scale output ranges	Digital signal range: 0 to 15,000 µS Analog signal range: 0 to 15,000 µS
Electronic noise	±0.1 nS/cm when background conductivity is 0 to 150 µS/cm ±2 nS/cm when background conductivity is 151 to 3200 µS/cm
Filter	Rise times from 0 to 10 s; user-selectable
Temperature compensation	Fixed at 1.7% per 1 °C at cell temperature

Conductivity detector electronics	
Temperature range	Ambient +7 °C; 30 to 55 °C (86 to 130 °F)
Temperature stability	<0.01 °C

Conductivity cell with heat exchanger	
Cell body	Chemically inert polymeric material
Cell electrodes	Passivated 316 stainless steel; compatible with MSA
Cell volume	<1 µL
Maximum cell operating pressure	10 MPa (1500 psi)
Heat exchanger	Inert, tortuous path for low axial dispersion
Operating temperature range	30 to 55 °C (86 to 130 °F); must be at least 7 °C above ambient temperature

Vacuum degas assembly (optional)	
Channel	Single-channel degas channel with degas membranes
Pump	Dual-stage diaphragm vacuum pump
Materials	Wetted materials, PEEK, PTFE

Column heater (optional)	
Operating temperature range	30 to 60 °C (86 to 140 °F); minimum 5 °C above ambient temperature (settable range is equal to working range)
Temperature stability	±0.5 °C at sensor
Temperature accuracy	±0.5 °C at sensor, at 40 °C
Maximum column length	250 mm analytical column with 50 mm guard column

Suppressors	
Chemical suppression	2 mm and 4 mm anion and cation, membrane suppression bed types
Displacement chemical regeneration	2 mm and 4 mm anion and cation, membrane suppression bed types
Electrolytic suppression	2 mm and 4 mm anion and cation, membrane suppression bed types available
Electrolytic suppression with External Water Mode	2 mm and 4 mm anion and cation, membrane suppression bed types available

Suppressors	
Current control range	Dionex ADRS (2 mm): 0 to 150 mA in 1 mA increments Dionex ADRS (4 mm): 0 to 500 mA in 1 mA increments Dionex CDRS (2 mm): 0 to 110 mA in 1 mA increments Dionex CDRS (4 mm): 0 to 300 mA in 1 mA increments Dionex AERS 500 Carbonate (2 mm): 0 to 30 mA in 1 mA increments Dionex AERS 500 Carbonate (4 mm): 0 to 125 mA in 1 mA increments
Salt converter	2 mm and 4 mm versions available
Carbonic acid removal for anions	For hydroxide eluents: Dionex AERS 500 with Thermo Scientific™ Dionex™ CRD 200 Carbonate Removal Device For carbonate eluents: Dionex AERS 500 with Thermo Scientific™ Dionex™ CRD 300 Carbonate Removal Device
Nonsuppressed chromatography	Supported (both anion and cation)
Suppressor wear parts	None; peristaltic pump and inline filters not required
Suppression capacity	Anions: Dionex ADRS 600 (2 mm): 50 µeq/min Dionex ADRS 600 (4 mm): 200 µeq/min Dionex AERS 500 Carbonate (2 mm): 7.5 µeq/min Dionex AERS 500 Carbonate (4 mm): 30 µeq/min Cations: Dionex CDRS 600 (2 mm): 37.55 µeq/min Dionex CDRS 600 (4 mm): 110 µeq/min
Void volume	Anions: Dionex ADRS 600 (2 mm): <15 µL Dionex ADRS 600 (4 mm): <50 µL Dionex AERS 500 Carbonate (2 mm): <15 µL Dionex AERS 500 Carbonate (4 mm): <50 µL Cations: Dionex CDRS 600 (2 mm): <15 µL Dionex CDRS 600 (4 mm): <50 µL

Autosampler	
Automation using autosampler	Dionex AS-AP, Dionex AS-DV Autosampler, or third-party autosampler
Sequential or simultaneous injection	May be available; dependent on autosampler capabilities
Online sample degassing	Optional feature; Dionex CRD 200 or Dionex CRD 300 required
Online filtration	Available with a Dionex AS-DV or an inline filter
High automation flexibility	Available with Chromeleon software and post-run features

Physical specifications	
Power requirements	100 to 240 Vac, 50 to 60 Hz (auto-sensing power supply; no manual voltage or frequency adjustment required)
Fuses	Two 3.15 amp fast-blow IEC 127 fuses (P/N 954745)
Operating temperature	4 to 40 °C (40 to 104 °F); cold room-compatible (4 °C) as long as system power remains on
Operating humidity range	5% to 95% relative humidity, noncondensing
Operating pressure	35 MPa (5000 psi) maximum liquid path (tubing, valve, columns, etc.)
Control modes	Full control through Chromeleon software; alternative control through TTL or relay closures (two relay outputs, two TTL outputs, four programmable inputs)
USB communication protocol	One USB input; one built-in USB hub with two outputs
Dimensions (h × w × d)	56.1 × 22.4 × 53.3 cm (22.1 × 8.8 × 21.0 in) **Note:** Dimensions do not include Dionex EGC or eluent reservoir.
Weight	51 lbs (23 kg) net weight 64 lbs (29 kg) with boxes
Decibel level	<52 dBA

B

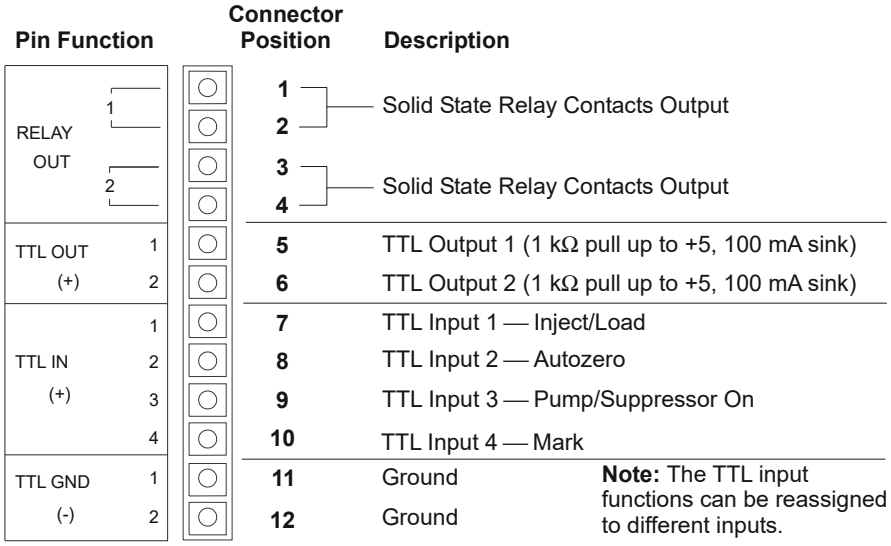
TTL and Relay Control

Contents

TTL and Relay Connections

The 12-pin connector strip on the Dionex Aquion RFIC rear panel provides two relay outputs, two TTL outputs, and four TTL inputs (see Figure 84).

Figure 84. TTL and relay connector on rear panel



IMPORTANT Relay loads in excess of 200 mA, or with included power supplies over 60 V, may damage the relay drivers on the CPU.

Note TTL 1 Input—Inject/Load applies only to the injection valve (not to the auxiliary valve, if installed).

The outputs can be used to control functions in external devices such as an autosampler or another Dionex module. When connected to a controlling device, the inputs can be programmed to perform the following Dionex Aquion RFIC functions:

- Switch the injection valve position (load/inject)
- Perform an autozero command (set the conductivity to zero)
- Turn the pump on and off

> **Note** Turning the pump on and off turns the suppressor on and off, also. If the pump is turned off while the Dionex CR-TC (and the Dionex EGC current) are on, the Dionex CR-TC is turned off automatically to prevent damage.

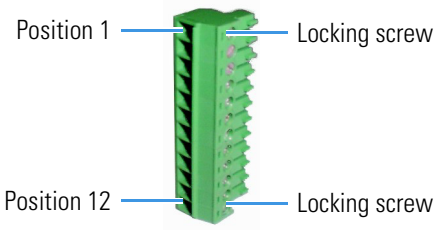
- Send a chart mark signal to the analog output (for example, to indicate the injection). The mark is 10% of the full-scale voltage and the duration is 0.5 second.

Relay outputs 1 and 2 can be programmed to switch any low-voltage control. Switched current must be less than 200 mA and 42 V peak.

❖ To connect a TTL or relay

1. Locate the twisted pair of wires (P/N 043598) and the 12-position connector plug (P/N 923686) (see Figure 85) in the Dionex Aquion RFIC Ship Kit (P/N 064375).

   Figure 85. 12-position connector plug

2. Connect the TTL or relays as follows:

   a. For each relay or TTL, connect an active wire (red) and a ground wire (black) to the 12-position connector plug at the appropriate pin locations. For the connector pin assignments, see Figure 84 or the label on the Dionex Aquion RFIC rear panel.

      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. If necessary, multiple ground wires can be attached to a single TTL input/output ground pin.

      > **IMPORTANT** When attaching wires to the connector plug, do not allow stray strands of wire to short to the adjoining position on the connector.

   b. Plug the connector into the 12-pin connector on the Dionex Aquion RFIC rear panel.

c. Connect the wires from the Dionex Aquion RFIC connector plug to the TTL or relay connector pins on the other module(s). Additional connector plugs are provided with other Dionex modules.

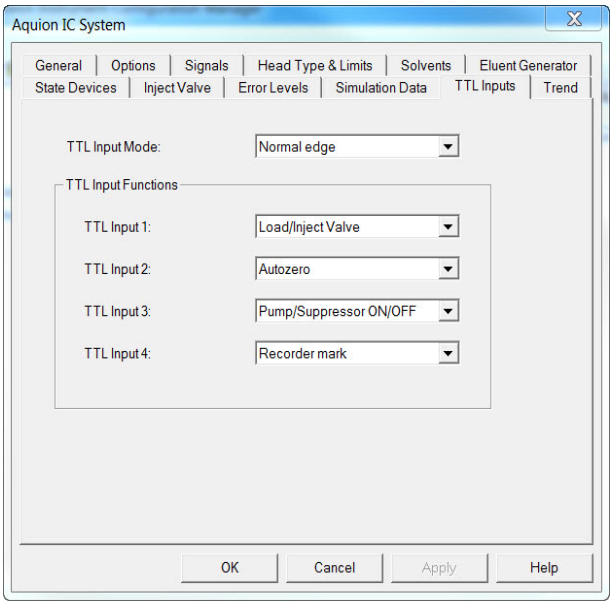
Note Verify the polarity of each connection. Connect signal wires to signal (+) pins and ground wires to ground (-) pins.

3. If you connected a TTL input, verify that the correct function is assigned to the input and that the correct input control type is selected. Select different settings, if necessary. Input functions and control types are assigned in Chromeleon (see "To select TTL input functions and control types" on page 133).

❖ To select TTL input functions and control types

1. Open the Chromeleon Instrument Configuration Manager.
2. Double-click the Aquion IC System icon under the instrument.
3. In the Properties dialog box, click the **TTL Inputs** tab (see Figure 86).

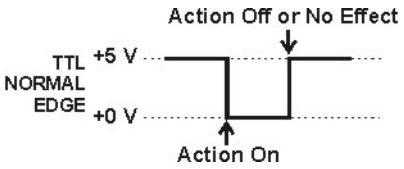
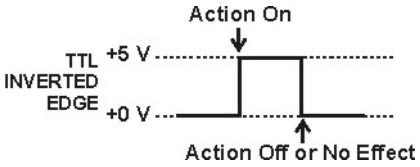
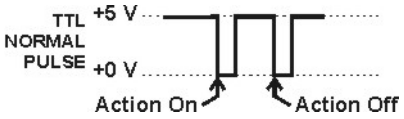
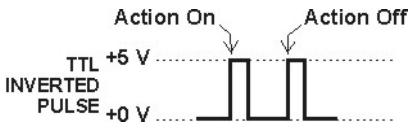
Figure 86. Properties dialog box: TTL Inputs tab page



TTL Input Control Types

The Dionex Aquion RFIC TTL inputs respond to four types of signals. The default control type, **Normal Edge**, is compatible with the output signals provided by the Dionex modules.

If the device connected to the Dionex Aquion RFIC does not send a normal edge signal, select the appropriate control type. To select the correct control type, refer to both the documentation provided with the controlling device and the information below.

Control Type	Schematic
Normal Edge: In normal edge operation, the negative (falling) edge of a signal turns on the function. For example, for the **Load/Inject** function, the negative edge switches the injection valve position to Load. The action of the positive (rising) edge depends on the function: • **Load/Inject** switches the injection valve to the Inject position. • **Pump On** turns off the pump (and suppressor). • **Autozero** and **Mark** have no effect.	
Inverted Edge: The inverted edge mode works identically to the normal edge mode, except that the positive and negative edges are reversed in function.	
Normal Pulse: In normal pulse operation, the negative (falling) edge of the TTL signal is the active edge and the positive (rising) edge is ignored. A pulse width of 50 ms or more is guaranteed to be detected. A pulse width of 4 ms or less is guaranteed to be ignored. The action for pulse widths that are greater than 4 ms and less than 50 ms is undefined.	
Inverted Pulse: The inverted pulse mode operates identically to the normal pulse mode, except that the positive and negative edges are reversed in function.	

Controlling TTL and Relay Outputs

The Dionex Aquion RFIC provides two TTL outputs and two relay contacts for control of functions in external devices, such as an integrator or autosampler. The relay outputs can be used to switch any low-voltage control. Switched current must be less than 200 mA and 60 V peak blocking. The relay-contact closures are normally open. When the relay is closed, current flows to the connected device.

IMPORTANT Relay loads in excess of 200 mA, or with included power supplies over 60 V, may damage the relay drivers on the CPU.

The TTL outputs are normally at 5 V. Setting a TTL output to 0 V turns on the action in the connected device.

The TTL and relay output states can be controlled by issuing direct control commands from the Chromeleon ePanel or by including the commands in an instrument method.

Reordering

Part number	Item
Eluent reservoirs	
046548	Plastic reservoir assembly, 2 L (includes stopper and cap)
039164	Plastic reservoir assembly, 4 L (includes stopper and cap)
060054	Air regulator accessory
Pump	
057937	Primary pump head assembly
055733	Secondary pump head assembly
045721	Outlet check valve assembly, 10-32
045722	Inlet check valve assembly, 1/4-28
045994	Check valve cartridges
052840	Piston
055870	Piston seal
048722	Piston rinse seal
055752	O-ring for waste valve or priming valve
057945	Eluent valve
079803	Syringe, 10 mL (for priming eluent lines)
Eluent generator consumables	
074532	Dionex EGC III KOH Potassium Hydroxide Eluent Generator Cartridge
074534	Dionex EGC III LiOH Lithium Hydroxide Eluent Generator Cartridge
074533	Dionex EGC III NaOH Sodium Hydroxide Eluent Generator Cartridge
088453	Dionex EGC 500 K_2CO_3 Potassium Carbonate Eluent Generator Cartridge

Part number	Item
074535	Dionex EGC III MSA Methanesulfonic Acid Eluent Generator Cartridge
058069	Dionex EGC holder (including degas tubing assembly)
060477	Dionex CR-ATC Continuously Regenerated Anion Trap Column
060262	Dionex CR-CTC II Continuously Regenerated Cation Trap Column
088467	Dionex EGC 500 Carbonate Mixer Kit for 2 mm columns
088468	Dionex EGC 500 Carbonate Mixer Kit for 4 mm columns
Injection valve and sample loop	
057968	Injection valve
042857	Sample loop, 25 µL
024305	Luer adapter fitting, 1/4-28 (for manual injections)
016388	Syringe, 1 cc (for manual injections)
075973	Valve Rebuild Kit (for 6-port valve)
Auxiliary valve	
061947	Auxiliary valve pod assembly (for 6-port valve)
075973	Valve Rebuild Kit (for 6-port valve)
061948	Auxiliary valve pod assembly (for 10-port valve)
AAA-061759	Valve Rebuild Kit (for 10-port valve)
Note: The auxiliary valve is not available for reorder.	
Suppressors	
088667	Dionex ADRS 600 Anion Dynamically Regenerated Suppressor (2 mm)
088666	Dionex ADRS 600 Anion Dynamically Regenerated Suppressor (4 mm)
088670	Dionex CDRS 600 Cation Dynamically Regenerated Suppressor (2 mm)
088668	Dionex CDRS 600 Cation Dynamically Regenerated Suppressor (4 mm)
085028	Dionex AERS 500 Carbonate Electrolytically Regenerated Suppressor (2 mm)
085029	Dionex AERS 500 Carbonate Electrolytically Regenerated Suppressor (4 mm)
045460	Suppressor waste, gas separator tube

Part number	Item
Relay/TTL	
923686	Connector plug, 12-position
043598	Twisted pair of wires
Miscellaneous	
954745	IEC 127 fast-blow fuses, rated 3.15 amps
960779	USB cable, 5 m (16 ft)
060392	External USB hub
Preventive Maintenance Kits	
057954	Dionex Aquion RFIC Preventive Maintenance Kit
075000	Dionex AS-AP Preventive Maintenance Kit
60-065335	Dionex AS-DV Preventive Maintenance Kit

FAQ

How do I hook up an autosampler?

For instructions on how to connect the system to an autosampler, refer to the Dionex Aquion RFIC installation instructions and the operator's manual for the autosampler.

How do I print?

In the Chromeleon Console, click **Print** on the Instrument toolbar above the ePanel Set.

Why are the retention times moving?

Retention times can shift if the pump flow is erratic, or if either the column or eluent is contaminated.

1. For pump flow rate troubleshooting, see "Erratic Flow and/or Pressure Reading" on page 64.
2. Clean the column as instructed in the column manual. If this does not eliminate the problem, replace the column.
3. If eluent is manually degassed or is sensitive to contamination, Thermo Fisher Scientific recommends pressurizing the reservoir with helium or nitrogen. For more information, see "Setting Up the Eluent Reservoir" on page 36.

How do I adjust retention times?

Retention times are calculated during calibration. The **Use Recently Detected Retention Time** parameter in the Chromeleon Processing Method Editor can be used to compensate for some types of retention time drift, such as evaporation of volatile components in pre-mixed solvents or an aging column. For details, refer to the Chromeleon Help or user's guide.

When should I remake standards?

Standards are used only for calibration and should always be made fresh (they have a lifetime of only one week).

When should I replace the eluent generator cartridge?

The Dionex Aquion RFIC monitors Dionex EGC use. When it is time to replace the cartridge, a message is displayed in the Chromeleon audit trail. To view the remaining cartridge life, click **EG Settings** on the Chromeleon ePanel.

How do I start Chromeleon?

1. Click **Start** on the Windows taskbar.
2. Select **All Programs** > **Thermo Chromeleon** 7 > **Chromeleon** 7.

How do I delete data?

1. In the Chromeleon Console, on the Navigation Pane, click the **Data** Category Bar.
2. In the data tree, right-click the sequence and click **Delete**.

How do I back up data?

Refer to the *Backup Procedure and Data File Locations* topic in the Chromeleon Help.

How do I shut off the system?

Turn off the power switch on the Dionex Aquion RFIC rear panel (see Figure 6).

How do I store columns?

Columns should be stored in eluent. Refer to the column manual for complete instructions.

How do I know when a column is dirty?

Refer to the troubleshooting section of the column manual.

How do I clean a column?

Refer to the troubleshooting section of the column manual.

Why is the conductivity high?

Possible reasons for high conductivity include:

1. The suppressor is not on. Turn on the suppressor from the Chromeleon ePanel.
2. The suppressor needs regeneration. For troubleshooting guidance, refer to the suppressor manual.
3. For additional troubleshooting information, see "High Cell Output" on page 66.

How do I configure and operate the auxiliary valve?

The auxiliary valve must be installed on-site by Thermo Fisher Scientific field service personnel.

For details about valve operation, see "Auxiliary Valve (Optional)" on page 26.

Glossary

Analytical Column

Synonymous with **Separator Column**.

Band Spreading

The broadening of the sample band as it travels through the column. Band spreading can also occur in the injection valve, conductivity cell, and interconnecting tubing.

Calibration Curve

A graph showing detector response in peak height or area versus analyte concentration.

Capacity Factor (k´)

The number of column volumes of eluent, pumped through the column, required to elute an analyte. Capacity factor is a dimensionless measure of retention which is independent of column length or eluent flow rate. It is calculated as follows:

$$k' = \frac{t_r - t_o}{t_o}$$

Where: t_r = retention time
t_o = retention time of unretained solute (column void volume)

Cell Constant (k)

A factor determined experimentally by measuring the conductance (G) of a standard solution of known equivalent conductivity (k).

$$k = \kappa / G$$

The value of k depends upon the surface area of, and distance between, the electrode faces in the conductivity cell.

$$k = l / A$$

Where: l = length
A = area of one electrode (the other electrode is equal to the first)

Channeling

The preferential flow of liquid along more open, less resistant paths through the column packing. This causes **Band Spreading**.

Column Efficiency (N)

A measure of the *narrowness* of analyte bands as they elute from the column. High efficiency is desirable because resolution between closely spaced bands improves with greater efficiency. For a symmetrical (Gaussian) peak, column efficiency can be determined by:

$$N = 5.54(t_1/W_{1/2})^2$$

Where: t_1 = the peak retention time (in seconds)
$W_{1/2}$ = the peak width at 1/2 height (in seconds)

Column efficiency is proportional to column length: for a given resin and column diameter, increasing the column length increases the column efficiency. Synonymous with **Theoretical Plates**.

Column Selectivity (a)

Describes the relative separation of the band maxima between two adjacent peaks. Selectivity can be determined by the following:

$$a = (t_2 - t_0)/(t_1 - t_0)$$

Where: t_1 and t_2 = retention time of components 1 and 2, respectively
t_0 = retention time of unretained components (void volume)

Concentrator Column

A short column used to retain and concentrate analytes from a measured volume of relatively clean sample. This allows large volumes of sample to be injected, lowering concentration detection limits.

Conductivity

A measure of the ease with which electrical current flows through a liquid contained between two opposite charged electrodes. Conductivity is a characteristic of ions in solution. Units are siemens.

Counterion

Ions carrying a charge opposite that of the sample ions (for example, Na^+) may be the counterion of a Cl^- analyte. These ions preserve electrical neutrality in solution.

% Crosslink

Divinylbenzene content in a polystyrene/divinylbenzene (PS-DVB) resin; this contributes to the mechanical strength of the resin and determines chromatographic properties.

Equivalent Conductivity (λ)

The contribution of an ionic species to the total conductivity of a solution as measured in a standard cell having electrodes 1 cm^2 in area and exactly 1 cm apart.

Guard Column

A small column that prevents poisoning of the separator column by sorbing organic contaminants and removing particulates. It is filled with the same packing as the separator column. Synonymous with **Pre-Column**.

HETP (H)

Height **E**quivalent to a **T**heoretical **P**late. A measure of column efficiency which allows comparison between columns of different lengths.

$$HETP = H = L/N$$

Where: L = the column length (in mm)
N = the number of theoretical plates

Ion-Exchange Capacity

The number of active ion exchange sites in a given weight or volume of resin; this is usually expressed in meq/g or meq/mL.

Ion-Exchange Resin

An insoluble polymer matrix containing fixed-charge exchange sites (anionic or cationic). IC resins are formed into small spherical particles (beads).

Packing

The material that fills a chromatographic column; usually a resin or silica-based material.

Pellicular Resin

A resin with a solid, nonporous core coated with a thin layer of more porous material. The exchange sites of pellicular ion exchange resins are located only on the surface layer of the bead. These resins have a low ion-exchange capacity.

Pre-Column

Synonymous with **Guard Column**.

Regenerant

A dilute acid or base that converts ion exchange sites in a Dynamically Regenerated Suppressor or an Electrolytically Regenerated Suppressor back to the form that suppresses the eluent conductivity.

Resin

See **Ion-Exchange Resin.**

Resolution (R)

A measure of the separation between two sample components. This is expressed as the ratio of the distance between the two peak maxima to the mean value of the peak width at the baseline.

$$R = 2(t_2 - t_1)/(W_2 + W_1)$$

Where: t_1 and t_2 = the retention times of components 1 and 2, respectively
W_1 and W_1 = the baseline width of peaks 1 and 2, respectively (measured in the same units as the retention time)
R is proportional to the square root of efficiency (N). A value of R = 1.5 represents "baseline separation" of the two peaks.

Retention Time

The time from injection to peak maximum; the basis for identification of a species in chromatographic analysis.

Separator Column

The column used to perform a chromatographic separation; also called an analytical column.

Siemens (S)

Unit measure of conductance; the reciprocal of the electrical resistance of a solution.

Suppressor

A device used to minimize eluent conductivity and convert sample species to a common form, thus increasing detection sensitivity.

Temperature Coefficient

The percentage of change in the conductivity of a solution with a 1 ^{o}C change in temperature. Every solution has a characteristic temperature coefficient which is determined experimentally.

Theoretical Plates (N)

See **Column Efficiency**.

Void Volume (V_0)

The volume occupied by the eluent in a packed column. This volume includes the volume between the injection valve and the column and between the column and the conductivity cell. Unretained components are eluted in the void volume.

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