



Thermo Scientific

Dionex Inuvion Ion Chromatography System

Operating Manual

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Thermo
SCIENTIFIC

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The Dionex Inuvion Ion Chromatography System is intended for use as General Laboratory Equipment (GLE) only. It is not intended for use in diagnostic procedures.

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Contents

Preface

This manual provides instructions for the operation of the Thermo Scientific™ Dionex™ Inuvion™ Ion Chromatography (IC) System.

Contents

- [Related Documentation](#)
- [Safety Information](#)
- [Regulatory Compliance](#)
- [Deionized Water Requirements for IC](#)
- [Contacting Us](#)

Related Documentation

In addition to this manual, the following documents are available on the Thermo Fisher Scientific website:

- Manuals for consumable products (including analytical columns, suppressors, and eluent generator cartridges)
- *Thermo Scientific Dionex AS-AP Autosampler Operator's Manual* (Document No. 065361)
- *Thermo Scientific Dionex AS-DV Autosampler Operator's Manual* (Document No. 065259)
- *Thermo Scientific Dionex AS-HV Autosampler Operator's Manual* (Document No. 065125)
- *Chromeleon 7 Installation Guide* (Document No. 7229.0003); also provided on the DVD for Thermo Scientific™ Chromeleon™ Chromatography Data System (CDS)

Safety Information

Technical information about the Dionex Inuvion IC System can be obtained from Thermo Fisher Scientific at the following address:

Thermo Fisher Scientific Inc.
1228 Titan Way
Sunnyvale, CA 94085

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

If there is a question regarding appropriate usage, contact Thermo Fisher Scientific Technical Support:

- In the U.S. and Canada, call 1-800-532-4752 and select **option 2**.
- Outside the U.S. and Canada, call the nearest Thermo Fisher Scientific office.

Safety and Special Notices

Make sure that 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.



WARNING Indicates a potentially hazardous situation which, if not avoided, could result in serious injury or death. Each WARNING notice is accompanied by an appropriate WARNING symbol.



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

This manual must be consulted in all cases where the DANGER, WARNING, or CAUTION symbol is marked on the instrument in order to determine the nature of potential hazards and any actions to be taken to avoid them.

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 Calls attention to certain information. It may alert the user to an unexpected result of an action, suggest how to optimize instrument performance and so on.

Tip Highlights helpful information that can make a task easier.

Messages de Sécurité en Français



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



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



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

Warnhinweise in Deutsch



GEFAHR Weist auf eine unmittelbare Gefahr hin, die, wenn sie nicht gebannt wird, zum Tod oder zu schweren Verletzungen führen wird.



ACHTUNG Weist auf eine potentielle Gefahr hin, die, wenn sie nicht gebannt wird, zum Tod oder zu schweren Verletzungen führen kann.



VORSICHT Weist auf eine potenzielle Gefahr hin, die, wenn sie nicht gebannt wird, zum leichten oder mittleren Verletzungen führen kann.

Cautions

When operating the system, observe the following safety guidelines.



CAUTION Do not misuse the system. Follow instructions on proper operation and use only as intended. Misuse could make the system inoperable.



CAUTION Do not apply excessive pressure or place unnecessary weight on the system. This could result in damage to the system or harm to users.



CAUTION Do not use this system in explosive or hazardous environments.



CAUTION Do not expose the system to extreme environment where the temperature or humidity is high. Such exposure could result in damage to the system or fire.

- Recommended temperature: 4 to 40 °C (40 to 104 °F)
- Recommended humidity: 20 to 80% relative humidity, noncondensing



MISE EN GARDE Veuillez à utiliser correctement le système. Suivez les instructions et les recommandations de bon fonctionnement et utilisez le système uniquement comme prévu et décrit dans le manuel. Une mauvaise utilisation pourrait rendre le système inutilisable, endommager le système et/ou d'autres équipements ou blesser les utilisateurs.



MISE EN GARDE N'appliquez pas de pression excessive ou ne placez pas de poids inutile sur le système. Cela pourrait endommager le système ou blesser les utilisateurs.



MISE EN GARDE N'utilisez pas ce système dans des environnements explosifs ou dangereux.



MISE EN GARDE N'exposez pas le système à un environnement extrême où la température ou l'humidité est élevée. Une telle exposition pourrait entraîner des dommages au système ou un incendie.

- Température recommandée : 4 à 40 °C (40 à 104 °F)
- Humidité recommandée : 20 à 80% d'humidité relative, sans condensation



VORSICHT Verwenden Sie das System nicht unsachgemäß. Befolgen Sie die Anweisungen zur korrekten Verwendung und nutzen Sie es nur für die vorgesehene Bestimmung. Eine missbräuchliche Verwendung könnte das System funktionsunfähig machen, das System und/oder andere Geräte beschädigen oder die Benutzer verletzen.



VORSICHT Üben Sie keinen übermäßigen Druck aus und belasten Sie das System nicht unnötig. Dies könnte zu Schäden am System oder zu Schäden für Benutzer führen.



VORSICHT Verwenden Sie dieses System nicht in explosionsgefährdeten oder gefährlichen Umgebungen.



VORSICHT Setzen Sie das System keinen extremen Umgebungen mit hoher Temperatur oder hoher Luftfeuchtigkeit aus. Eine solche Exposition könnte zu Schäden am System oder einem Brand führen.

- Empfohlene Temperatur: 4 bis 40 °C (40 bis 104 °F)
- Empfohlene Luftfeuchtigkeit: 20 bis 80 % relative Luftfeuchtigkeit, nicht kondensierend

Safety Symbols

These symbols appear on the Dionex Inuvion IC System 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



USB 2.0 port



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

Safety Practices

Observe the following safety precautions during operation of the Dionex Inuvion IC System.

❖ General Precautions

- Periodically check all liquid lines for leaks. Clean up spills appropriately and use DI (deionized) water to rinse dried reagents off system components.
- Make sure that gas and liquid lines do not become kinked, punctured, or otherwise damaged.
- Do not allow liquid waste to accumulate. Follow a regulated, approved waste disposal program. Never dispose of wastes containing organic solvents through the municipal sewage system.

❖ Precautions for Compressed Gas Cylinders

- Periodically check all pressure regulators to verify that pressure settings are within the recommended limits.
- Compressed gas cylinders are initially pressurized at 14 to 15 MPa (2200 to 2500 psi). Use a regulator to reduce the delivered air pressure to 690 kPa (100 psi) or less.
- Avoid connecting the inert gas supply line to two or more instruments unless a suitable regulator supplies the Dionex Inuvion IC System at 100 psi (690 kPa) or less.
- Fasten all cylinders securely to an immovable structure.
- Do not store or move a cylinder unless the safety cap is in place.
- Store or move cylinders in a vertical position only. Do not move cylinders with regulators attached.
- Store cylinders in a well-ventilated area, away from heat or ignition sources.
- Clearly label the cylinder with the contents.
- Use only approved regulators and tubing connections of the appropriate material and purity.

❖ Electrical Precautions



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



MISE EN GARDE Le cordon d'alimentation est utilisé comme dispositif principal de déconnexion. Assurez-vous que la prise de courant est située à proximité du système 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.

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.

These symbols appear on the Dionex Inuvion IC System or on labels affixed to the system.



TUV Rheinland North America Safety Approval



Conformité Européenne



United Kingdom Conformity Assessment



China RoHS Use Period

Table 1. China EEP Hazardous Substances Information

Inuvion Product Line (产品中有害物质的名称及含量) China EEP Hazardous Substances Information										
部件名称 Component Name	有害物质 Hazardous Substances									
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)	双(2-乙基己基)邻苯二甲酸酯 (DEHP)	邻苯二甲酸丁二酯 (BBP)	邻苯二甲酸二丁酯 (DBP)	邻苯二甲酸二异丁酯 (DIBP)
电缆组件 (Translation) Cable Assemblies	x	o	o	o	o	o	o	o	o	o
显示屏 (Translation) Display	x	o	o	o	o	o	o	o	o	o
机电组件 (Translation) Electromechanical Assemblies	x	o	o	o	o	o	o	o	o	o
紧固件 (Translation) Fasteners	o	o	o	o	o	o	o	o	o	o
灯具 (Translation) Lamps	o	o	x	o	o	o	o	o	o	o
机加工件 (Translation) Machined Parts	o	o	o	o	o	o	o	o	o	o
成型件 (Translation) Molded Parts	o	o	o	o	o	o	o	o	o	o
电路板 (Translation) PCBAs	x	o	x	o	o	o	o	o	o	o
电源供应器 (Translation) Power Supply	x	o	o	o	o	o	o	o	o	o
钣金件 (Translation) Sheetmetal	o	o	o	x	o	o	o	o	o	o
管道 (Translation) Tubing	o	o	o	o	o	o	o	o	o	o

(本表格依据SJ/T11364的规定编制) This table is compiled according to SJ/T 11364 standard.

O: (表示该有害物质在该部件所有均质材料中的含量均在GB/T26572规定的限量要求以下)
Indicates that the concentration of the hazardous substance in all homogeneous materials for the part is below the relevant threshold of the GB/T 26572 standard.

X: (表示该有害物质至少在该部件的某一均质材料中的含量超出GB/T26572规定的限量要求)
Indicates that the concentration of the hazardous substance in at least one homogenous material of the part is above the relevant threshold of the GB/T 26572 standard.

Compliance Information

Declarations of Conformity

The regulatory symbols on the Dionex Inuvion IC System model/data labels indicate that the system is in compliance with the following EMC and safety standards.

Reference	Description
	IEC 61010-1:2010/AMD1:2016/ COR1:2019 EN IEC 61010-2-010:2020 EN IEC 61010-2-081:2020 UL 61010-2-010:2019
Safety Specifications	CSA C22.2 No. 61010-2-010:19 UL 61010-2-081:2019 CSA C22.2 No. 61010-2-081:19 UL 61010-1:2012 R7.19 CAN/CSA-C22.2 NO. 61010-1-12 + GI1 + GI2 (R2017) +A1
EMC Specifications	EN 61326-1:2013, Basic environment US FCC Part 15 Canada ISED
RoHS Specifications	EN 63000:2018
The CE mark indicates that the Dionex Inuvion IC System is in compliance with the following European Union (EU) Directives as is evidenced by compliance to the associated standard where appropriate. The EU Declaration of Conformity can be downloaded from the Thermo Fisher Scientific website.	
Low Voltage Directive	2014/35/EU by conforming to EN 61010-1:2010 + A1:2016
EMC Directive	2014/30/EU by conforming to EN 61326-1:2013
RoHS Directive	2011/65/EU amended by 2015/863/EU by conforming to EN 63000:2018 (RoHS)

FCC/ISED Notices

This system complies with Part 15 of the FCC Rules and Industry Canada ICES-001 for a Class A system. Operation is subject to the following two conditions:

1. This system may not cause harmful interference, and
2. This system must accept any interference received, including interference that may cause undesired operation.

Note This is a Class A product. In a domestic environment, this product may cause radio interference, in which case the user may be required to take adequate measures.

AVIS FCC/ISDE

CANADA ICES-001 (A) / NMB-001 (A)

Notice on Lifting and Handling of the Dionex Inuvion IC System

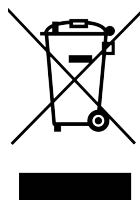
The Dionex Inuvion IC System can easily be moved by one person. Be sure to lift and carry the instrument by the base. Do not use the top rails as handles to lift or carry the instrument.

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.

WEEE Compliance

Dionex products comply with the European Union Waste Electrical & Electronic Equipment (WEEE) Directive 2012/19/EU. Dionex Inuvion IC Systems are marked with following symbol:



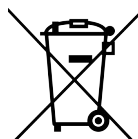
Thermo Fisher Scientific is registered with B2B Compliance (B2Bcompliance.org.uk) in the UK and with the European Recycling Platform (ERP-recycling.org) in all other countries of the European Union and in Norway. If this product is located in Europe and you want to participate in the Thermo Fisher Scientific Business-to-Business (B2B) 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 (include contact information)
- Appropriate pick-up time
- Declaration of decontamination stating that all hazardous fluids or material are 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

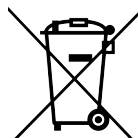
Ce produit est conforme avec la directive européenne (2012/19/EU) des Déchets d'Equipements Electriques et Electroniques (DEEE). Il est marqué par le symbole suivant:



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 2012/19/EU. 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 (18.2 megohm-cm) filtered and deionized water that meets the specifications listed in [Table 2](#).

Table 2. ASTM filtered, Type I deionized water specifications for ion chromatography

Contaminant	Specification
Ions–Resistivity	>18.2 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 our products

- In the U.S. and Canada, call 1-800-532-4752 and select **option 2**.
- Outside the U.S. and Canada, call the nearest Thermo Fisher Scientific office.

❖ For additional contact information

- Go to <https://www.thermofisher.com/us/en/home/technical-resources/contact-us.html>

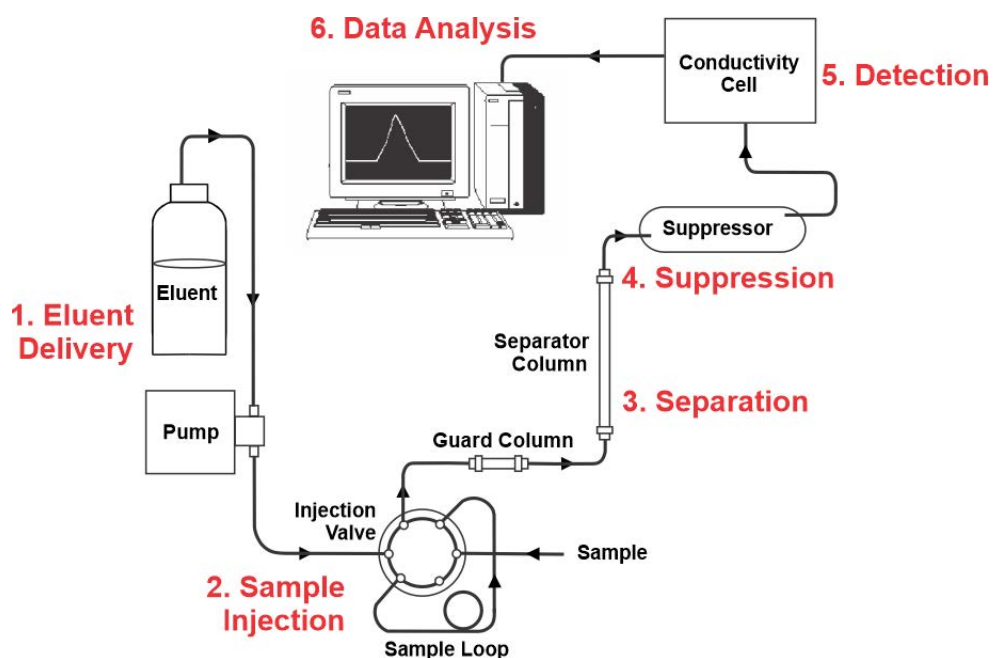
Introduction

Introduction to Ion Chromatography (IC)

An ion chromatography (IC) system typically consists of a liquid eluent, high-pressure pump, sample injector, guard column, analytical column, suppressor, conductivity detector, and data collection system. The Dionex Inuvion IC System provides additional accessories that may change or optimize the instrument configuration.

Before running a sample, the IC system is calibrated using a standard solution. The standard solution is normally diluted across the expected concentration range of the sample that is analyzed to create a calibration curve. By comparing the data obtained from a sample to that obtained from the standard calibration curve, 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 generates a report. A typical IC analysis consists of six stages (see [Figure 1](#)).

Figure 1. Ion chromatography process analysis



1. Eluent Delivery

- Eluent is a liquid that carries the sample through the ion chromatography system. The Dionex Inuvion IC System uses either manually prepared eluent or an eluent generator cartridge to generate eluent online from deionized water.
- Dionex Inuvion IC Systems enabled for Reagent Free Ion Chromatography (RFIC) use a Thermo Scientific™ Dionex™ Eluent Generator Cartridge (Dionex EGC) to automatically generate high-purity potassium hydroxide, carbonate, bicarbonate, or methanesulfonic acid (MSA) eluents electrolytically. Systems using a Dionex EGC can operate in two eluent delivery modes. In isocratic mode, the eluent concentration remains constant throughout the run. The system with RFIC also supports multi-step linear gradient methods (up to nine steps) by using a Dionex EGC to change the eluent concentration over time. The delivery mode is defined in the Chromeleon CDS Instrument Method Wizard. For more information, refer to the Chromeleon CDS Help.

2. Sample Injection

- The sample is loaded into a sample loop manually or automatically (if an automated sampler is installed). When triggered, the Dionex Inuvion IC System injects the sample into the eluent stream.
- The pump pushes the eluent and sample through the guard and analytical columns (chemically inert tubes packed with a functionalized polymeric resin). The guard column, shorter than the analytical column but with the same functionalization, filters and retains contaminants that could potentially clog or passivate the analytical column.

3. Separation

- As the eluent and sample are pumped through the analytical column, the sample ions are separated. In the Dionex Inuvion IC System, the mode of separation is called ion exchange. This mode 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 eluent conductivity.

5. Detection

- The conductivity cell within the conductivity detector measures the electrical conductance of sample ions as they emerge from the suppressor and produces a signal based on a chemical or physical property (for example, the charge) of the analyte.

6. Data Analysis

- The conductivity detector transmits the signal to a data collection system.
- The Chromeleon CDS, the data collection system for the Dionex Inuvion IC System, identifies the ions based on retention time and quantifies each analyte by integrating the peak area response. The data is quantified by comparing the sample peak areas in a chromatogram from a calibration curve produced from a set of standard solutions. The results are then displayed as a chromatogram, allowing for the automatic determination and tabulation of ionic analyte concentrations.

Overview of the Dionex Inuvion IC System

The Dionex Inuvion IC System is available in two configurations: with and without RFIC eluent generation. Systems can be upgraded between models and configurations by Thermo Fisher Scientific field service engineers.

Required consumables, including analytical columns, must be purchased to perform applications. Other consumables, such as suppressors and guard columns, are required for most applications, with some exceptions.

The Dionex Inuvion IC System is designed as a reliable, readily configurable, and easily operated instrument that supports a diverse array of applications, particularly when used with optional accessories.

Dionex Inuvion IC System are designed to be user-friendly and include these features:

- A simplified flow path
- Easy access to system components for user maintenance and upgrades
- A streamlined Chromeleon CDS user interface
- A smaller size, with a reduced footprint and greater portability
- An ergonomic, easily accessed eluent generator cartridge (Dionex EGC)
- A wide range of user-orderable and installable accessories
- Automated startup and shutdown procedures
- Faster baseline stability via updated electronics
- An upgraded analytical pump that provides greater reliability and durability
- An improved conductivity detector with a conductivity cell
- Automatic detection of one-wire enabled consumables
- Additional tubing clips and holders for improved and orderly tubing routings
- Improved column oven for uniform and faster heating

- (Optional) Tubing connections with Thermo Scientific™ Dionex™ IC PEEK™ Viper™ fittings for ease of use and improved connections
- Expanded training and user support

Standard System Configurations

The Dionex Inuvion IC System is available in the following configurations:

- The Dionex Inuvion Core IC System offers chemical suppression.
- The Dionex Inuvion IC System offers both chemical and electrolytic suppression. The system also includes internal low-pressure eluent degassing.
- The Dionex Inuvion IC System with RFIC offers the same features as the mid-range Dionex Inuvion IC System, with the addition of electrolytic eluent generation capabilities.

All standard Dionex Inuvion IC System configurations include the following features:

- Eluent organizer area and bottle
- System status LEDs
- Analytical pump
- Injection valve (6-port)
- Conductivity detector

Table 3 shows the additional components typically included in the standard system configuration.

Table 3. Dionex Inuvion IC System standard configurations

Model	Electrolytic suppressor	Eluent generator	Eluent degas ^a
Dionex Inuvion Core	No	No	No
Dionex Inuvion	Yes	No	Yes
Dionex Inuvion with RFIC	Yes	Yes	Yes

^a Pre-pump inline eluent degasser

Options

Many of the options described below are included in one or more of the standard system configurations (see Table 3). In addition, if an option was not installed at the factory, it can be ordered and installed on-site by either the user or by Thermo Fisher Scientific field service engineers.

Factory- or Field Service Engineer-Installable Upgrades

For safety reasons, the following upgrade kits must be ordered with the system and installed on-site by Thermo Scientific field service engineers.

- When upgrading from the Dionex Inuvion Core to either the Dionex Inuvion or Dionex Inuvion with RFIC
- When upgrading from the Dionex Inuvion to the Dionex Inuvion with RFIC
- Vacuum pump and degasser
- RFIC assembly

Note All other parts and accessories can be installed and maintained by users.

Chromeleon CDS

Operation of the Dionex Inuvion IC System is controlled remotely by a personal computer running the Microsoft® Windows® 10 or 11 operating systems and Chromeleon CDS, version 7.3.2 and later. Chromeleon CDS also provides data acquisition and data processing functions.

For communication with Chromeleon CDS, the Dionex Inuvion IC System must be connected to a USB (Universal Serial Bus) port on the computer or a USB hub.

Customer-Installable Options

The following items can be ordered at any time and installed on-site by either the user or Thermo Fisher Scientific field service engineers.

- Pump piston seal wash system
- Peristaltic pump for regenerant delivery
- Auxiliary high-pressure valve (6-port or 10-port)
- Low-pressure valves
- Conductivity detector
- Eluent Organizer (EO) gas regulator assembly
- Digital pressure regulator (also called a digital gas regulator)
- Eluent monitor
- Column heater

- All consumables (for example, columns, suppressors, and eluent generator cartridges)

Note Eluent generator cartridges and Thermo Scientific™ Dionex™ Continuously Regenerated Trap Columns are supported in the Dionex Inuvion with RFIC only.

- Thermo Scientific™ Dionex™ Electrolytic pH Modifier (Dionex EPM 500) with Dionex EGC Carbonate cartridges
- Dionex IC PEEK Viper fittings
- Autosampler (Dionex AS-AP, Dionex AS-DV, and Dionex AS-HV)

Figure 2. Dionex Inuvion Core IC System configuration and basic flow diagram

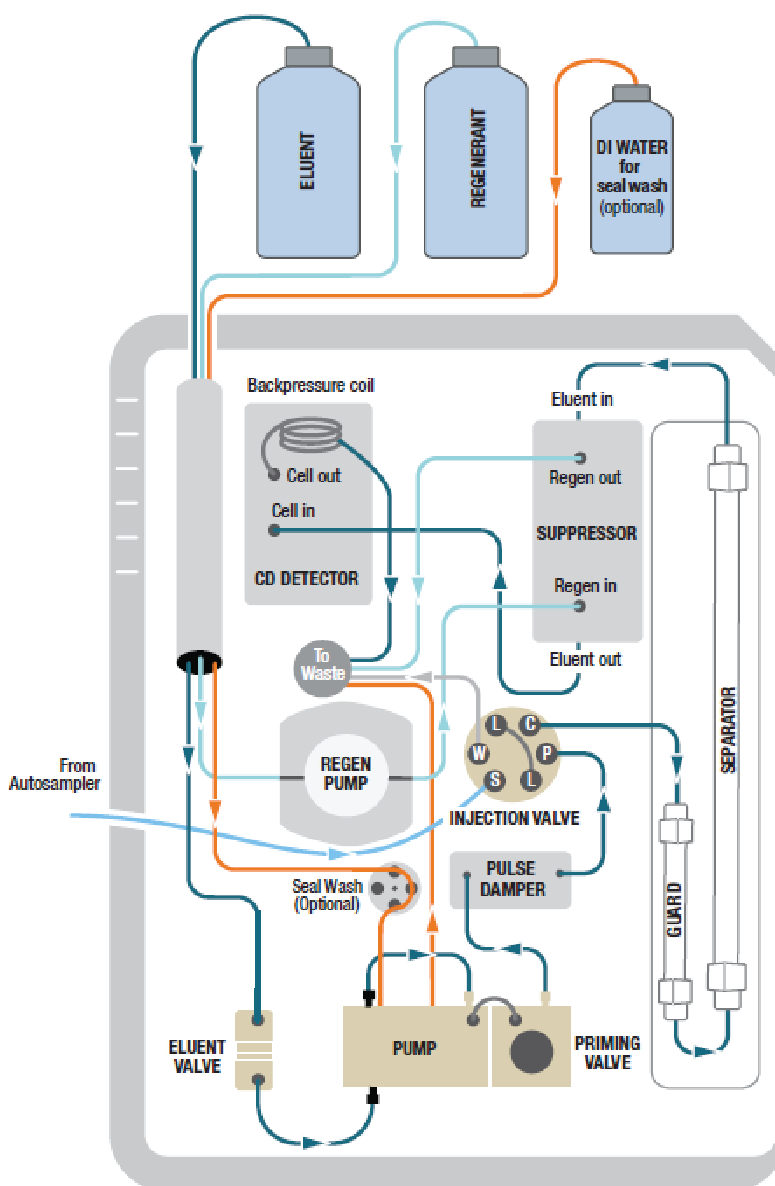


Figure 3. Dionex Inuvion IC System configuration and basic flow diagram

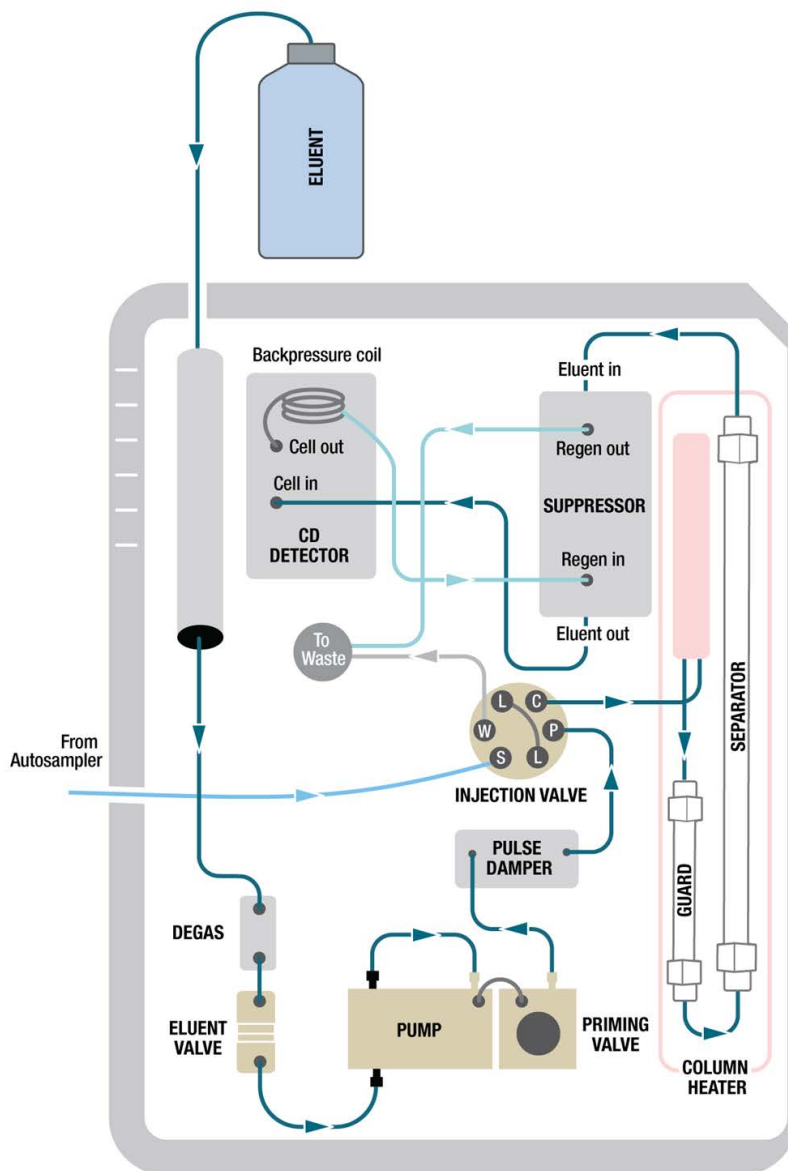
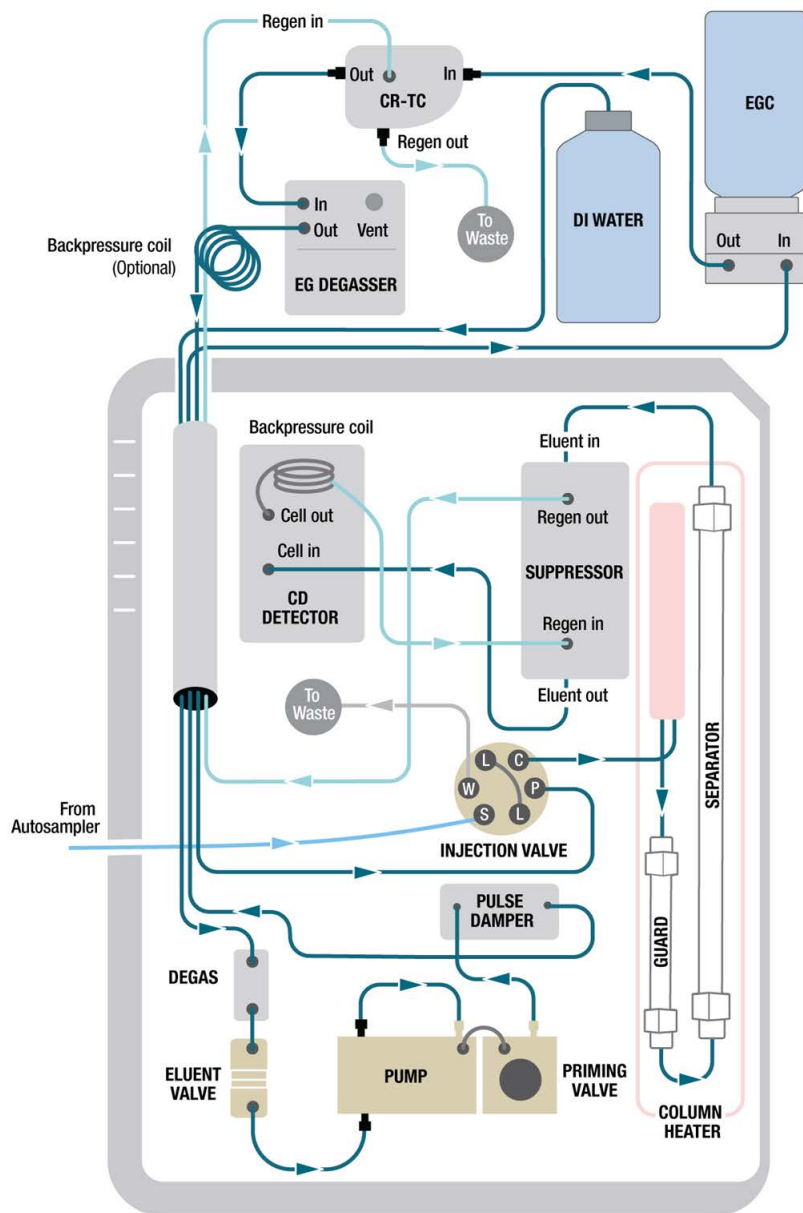


Figure 4. Dionex Inuvion with RFIC IC System configuration and basic flow diagram



Description

This chapter describes key features of all three Dionex Inuvion IC System configurations and addresses initial setup and operation. This chapter also introduces the Chromeleon CDS user interface.

- For more information about setup and operation, see [Chapter 3](#).
- For instructions for periodic maintenance and replacement of components, see [Chapter 4](#).

Contents

- [Operating Features](#)
- [Chromeleon CDS](#)
- [System Component Details](#)

Operating Features

Figure 4. Dionex Inuvion Core IC System component panel (with labels)

- 1 Digital pressure regulator (optional)
- 2 Conductivity cell
- 3 Tubing chase (to waste)
- 4 Tubing chase (to eluent organizer)
- 5 Regen pump (optional)
- 6 Seal wash pump (optional)
- 7 Pump
- 8 Leak sensor
- 9 Injection valve
- 10 Column holder
- 11 Suppressor
- 12 Eluent monitor (optional)



Figure 5. Dionex Inuvion Core IC System component panel (with column holder and regenerant pump installed)



Figure 6. Dionex Inuvion IC System component panel with column heater cover and auxiliary valve installed



Figure 7. Dionex Inuvion IC System with RFIC component panel



Figure 8. Dionex Inuvion IC System with RFIC rear panel

1. RFIC stand (optional)
2. Eluent tray drain
3. RFIC port
4. Exhaust vent
5. Digital gas pressure regulator (optional)
6. Vacuum pump exhaust vent
7. Relay, analog output, and TTL connectors
8. Tubing chase (from component panel)
9. Low-pressure valves (optional)
10. USB ports, USB receptacle, and USB status LEDs
11. Power switch, fuse holder, and power receptacle
12. Exhaust vent
13. Air intake fan






Chromeleon CDS

Chromeleon CDS controls aspects of the Dionex Inuvion IC System while managing the acquisition and processing of data.

Upon connection via USB, Chromeleon CDS automatically recognizes the system and its components (for example, the degasser, column heater, and auxiliary valve). Chromeleon CDS detects devices capable of auto-configuration and recognizes each model type. When a Dionex Inuvion IC System is connected, a single new Chromeleon CDS instrument is created and configured. Connecting a second system will create a separate Chromeleon CDS instrument. Note that the Chromeleon CDS auto-configures components during the initial setup only; components added later must be manually configured.

The Chromeleon CDS also loads the appropriate driver(s) and auto-saves the configuration in the Instrument Configuration Manager while assigning default values or parameters for all configured devices. Device configuration details are displayed in a dialog box which includes guidance on how to resolve warnings, errors, and other issues. [Table 4](#) describes the Chromeleon CDS audit trail severity levels and potential effects. For more information about error messages, see [Chapter 5, “Troubleshooting.”](#)

Table 4. Chromeleon CDS audit trail severity levels

Icon	Severity level	Description
	Warning	A message is displayed in the audit trail, but the current run is not interrupted.
	Error	A message is displayed in the audit trail, and the system attempts to correct the problem (sometimes by using an alternative parameter). An error never interrupts the current analysis; however, if it occurs during the Ready Check, the queue will not be started until the error is resolved.
	Abort	A message is displayed in the audit trail, and the running queue is aborted.

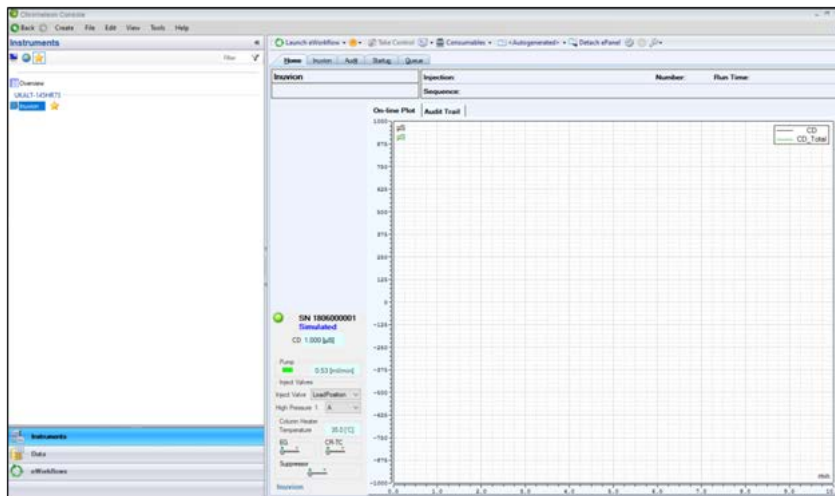
There are two modes of software control:


- 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 ePanel Set in Chromeleon CDS (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 ePanel Set includes system status information, a signal plot, and controls for the most commonly used system functions. Select 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 CDS” on page 43.

Figure 9. Example Inuvion ePanel Set



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

System Component Details

The component panel of the Dionex Inuvion IC System (see [Figure 4](#), [Figure 5](#), [Figure 6](#), [Figure 7](#), and [Figure 8](#)), located behind the front door, includes many user-accessible components.

This section provides details about system components such as the vacuum degas assembly, pump, eluent generator, injection valve, column heater, suppressor, conductivity detector, and cell.

Injection Port

Sample is delivered via manual sample injection or through an autosampler.

Samples requiring analysis can be manually injected into the injection port on top of the system (see [Figure 10](#)) with a syringe. A black adapter comes with Dionex Inuvion IC Systems, while a white luer adapter (P/N 024305) is included in the system Ship Kit. The white luer adapter is shown connected to the black adapter to indicate how to assemble and then install both components.

Figure 10. Manual injection port installation



Figure 11. Injection port and chase detail



For automated sample injection, the Dionex Inuvion IC System must be connected to an autosampler. The two tubing chases (left and right) on the component panel of the Dionex Inuvion IC System allow the autosampler to be placed on either side of the system, as the tubing can be directed through either chase.

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

- With an autosampler
- With a syringe or vacuum syringe via the injection port

Both the injection valve port and the autosampler are plumbed to the injection valve. The injection valve port is plumbed through the injection port chase and a channel in the column heater holder (if a column heater is installed), as shown in [Figure 12](#), or else around the column holder.

Figure 12. Injection port plumbing channel through the column heater cover



LEDs

The **Power** LED indicates whether the Dionex Inuvion IC System power is on. Other LEDs indicate the status of various system functions. Active LEDs are green (except when blinking), with the exception of **Alarm**, which is red when activated. For details, see [Table 5](#).

Table 5. Dionex Inuvion IC System front panel LED states

LED label	If on (solid)	Displayed on...
Power	Indicates that the system is on	Dionex Inuvion Core, Dionex Inuvion, Dionex Inuvion RFIC
Alarm	Indicates that an error occurred; the LED remains on until the error is resolved	Dionex Inuvion Core, Dionex Inuvion, Dionex Inuvion RFIC
Pump	Indicates that the pump is on and operating normally	Dionex Inuvion Core, Dionex Inuvion, Dionex Inuvion RFIC
SRS	Indicates that the suppressor is on and operating normally	Dionex Inuvion, Dionex Inuvion RFIC
RFIC	Indicates that the RFIC is on and operating normally	Dionex Inuvion RFIC

Figure 13. Dionex Inuvion IC System eluent organizer area (with Dionex EGC, Dionex CR-TC, and RFIC eluent degasser installed)



The top covers of the Dionex Inuvion Core IC System and Dionex Inuvion IC System offer the following features. The Dionex Inuvion IC System with RFIC includes all of these, as well as an RFIC stand.

- Eluent organizer for the eluent generator cartridge and eluent bottles
 - The Dionex EGC is installed in a holder that fits into the rear of the eluent organizer, which is located on top of the system.
 - Up to two 2-L polypropylene bottles (P/N 046548) or one 4-L polypropylene bottle (P/N 039164) and one 2-L polypropylene bottle (P/N 046548) can be installed in the eluent organizer.



WARNING Risk of bottle rupture or leakage: If pressurized bottles are required, use only 2-liter bottles (P/N 046548) with caps.



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



ACHTUNG Gefahr des Bruchs oder Auslaufens der Flasche: Wenn Druckflaschen erforderlich sind, verwenden Sie nur 2-Liter-Flaschen (Art.-Nr. 046548) mit Verschluss.

- The electrical cable from the Dionex EGC connects to the **EGC** connector.

- The Dionex CR-TC connects to the **CR-TC/EPM** connector via an electrical cable. For applications using the Dionex EGC 500 K_2CO_3 to make carbonate and bicarbonate eluents, a Dionex Electrolytic pH Modifier (Dionex EPM 500) can be installed in this port instead of a Dionex CR-TC. You can then switch between them as needed.

Alternatively, the **CR-TC/EPM** port can be used to power a Dionex EPM 500. While running RFIC-generated carbonate-based applications, the EPM replaces the Dionex CR-TC and uses the **CR-TC/EPM** port for its operation.

- The tubing chase routes tubing from the eluent organizer to the front of the system.

Vacuum Degas Assembly

The vacuum degas assembly is a standard component for the Dionex Inuvion and Dionex Inuvion with RFIC systems.

Note The Dionex Inuvion Core IC System does not include a vacuum degas assembly by default. In the field, the vacuum degas assembly can only be added to Dionex Inuvion Core IC Systems via a full configuration upgrade by Thermo Fisher Scientific field service engineers.

The function of the vacuum degas assembly is to facilitate continuous degassing of the eluent while the pump is delivering eluent to the chromatographic system. Under default settings, the vacuum degas pump follows the analytical pump's operation mode. The vacuum level for the degas pump can be adjusted by the user as per the application requirement.

Degassing the eluent improves the quality of the obtained chromatogram by improving the stability of the baseline. Small gas bubbles present in the eluent create pressure drops as they pass through the high-pressure pump, resulting in uneven flow with high flow/noise ripples. The assembly, which must be installed in the system at the factory or on-site by Thermo Fisher Scientific field service engineers, consists of:

- A single-channel degas chamber (with degas membranes) with an internal capacity of 500 μ L and flow rate of up to 10 mL/min
- A dual-stage diaphragm vacuum pump
- 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 Inuvion IC System monitors the degas pressure reading and turns the degas pump on and off as required. (This is the **Monitor** mode.)

The pump is turned off when the vacuum level drops or when the pump is unable to achieve a vacuum within the desired time, due to a leak.

Follow these instructions to select a different operating mode:

1. Open the Chromeleon Instrument Configuration Manager.
2. Right-click the Dionex Inuvion IC System icon under the instrument.
3. In the Properties dialog box, select the **Pump** tab.
4. Verify that the **Degas** check box is selected (see [Figure 14](#)).

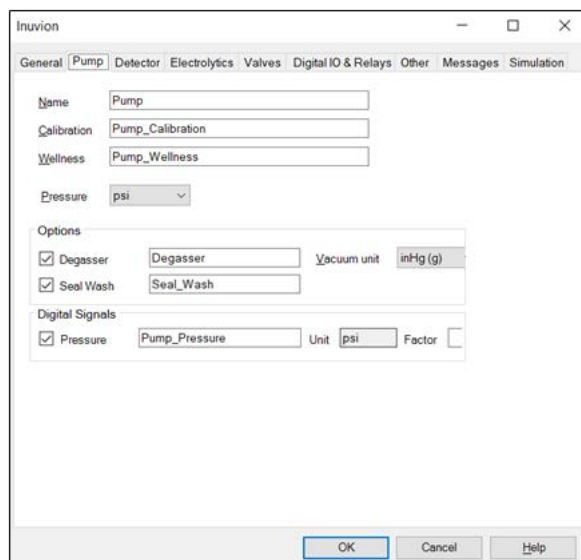
Front Panel

Users can maintain and/or replace the user-accessible components installed on the component panel behind the Dionex Inuvion IC System front door. Select the preferred options for components in the Properties dialog box.

❖ To select options

1. Open the Chromeleon Instrument Configuration Manager.
2. Double-click the Inuvion icon under the instrument.
3. In the Properties dialog box, select the Options tab (see [Figure 14](#)).
4. Select the preferred options.

Figure 14. Properties dialog box: Pump tab page



Eluent Valve

The eluent valve (see [Figure 15](#)) controls the flow from the eluent bottle. The eluent valve opens automatically when the pump starts and closes when the pump is turned off. This enables you to perform maintenance procedures on pump components with minimal eluent leakage.

Figure 15. Dionex Inuvion IC System eluent valve



Analytical Pump

The analytical pump is a microprocessor-based eluent delivery system. The pump's variable speed, dual-piston series design ensures pulse-free pumping for the most demanding applications.

Analytical Pump Head

The analytical pump head delivers eluent to the remainder of the chromatography system (the injection valve, column, and detector). The priming valve is on the front of the pressure transducer (see [Figure 16](#)).

The pump head assembly is comprised of two pressurizing features. The left-most side, which provides the inlet primary pressure, is connected to the right side of the pump head for the secondary pressure. The primary pump feature receives flow from the bottom, through an inlet check valve, and then delivers liquid flow out through the outlet check valve on the top of the pump.

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 at the bottom of the transducer block.

Figure 16. Dionex Inuvion IC System analytical pump assembly (pump to the left, pressure transducer to the right)



Note The prime valve must be open when the pump is being primed using the **Prime** button. This allows any trapped air to escape the system.

Pressure Transducer

Flow exiting the analytical pump head is directed to the pressure transducer (P/N 22185-60206) (see [Figure 16](#) or [Figure 17](#)), which measures system pressure. The pulse damper assembly is installed after the pressure transducer. Flow output from the pressure transducer continues to the pulse damper, which reduces minor pressure variations.

Figure 17. Dionex Inuvion IC System pressure transducer (marked with “61”)



Pressure readings are displayed on the Inuvion ePanel in Chromeleon CDS. Monitor the 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. Set the pressure limits in Chromeleon CDS, from either the Instrument Configuration Manager or the Inuvion ePanel.

Pulse Damper

Flow output from the pressure transducer continues to the pulse damper, located above the pressure transducer on the component panel of the system. The pulse damper reduces minor pressure variations for improved analysis. From there, flow is directed to the injection valve and the remainder of the chromatography system.

Piston Seal Wash

An optional pump piston seal wash assembly is available. When this option is installed in the system, the peristaltic pump 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 (18.2 megohm-cm) deionized water or a combination of deionized water and 10% or 20% isopropyl alcohol. For maintenance and replacement instructions, see [Chapter 4, “User Maintenance.”](#)

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 for the pump. For details, see [Chapter 4, “User Maintenance.”](#)

Eluent Generator Cartridge (Dionex EGC)

The high-pressure eluent generator produces high-purity acid, base, or carbonate/bicarbonate 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.

The eluent generator is standard with the Dionex Inuvion with RFIC system. For Dionex EGC hydration, installation, and removal instructions, see [Chapter 4, “User Maintenance.”](#)

The eluent generator consists of the following components:

- A high-precision programmable current source (power supply). The appropriate power supply option depends on the number of electrolytic devices installed in the system. For example, three electrolytic power supplies are needed for a system with a suppressor, Dionex EGC, and Dionex CR-TC.
- A disposable eluent generator cartridge (Dionex EGC) contains an electrolyte concentrate solution that is appropriate for the type of eluent being generated. The Dionex EGC must be ordered separately.
- A Continuously Regenerated Trap Column (Dionex CR-TC) is used to remove any extraneous contaminants from the deionized water source. The Dionex CR-TC is electrolytically-regenerated, which allows it to operate for extended periods without chemical regeneration. The Dionex CR-TC must be ordered separately.

- For carbonate/bicarbonate eluent, a Dionex EPM is required. The Dionex EPM produces a carbonate/bicarbonate mixture when installed with the Thermo Scientific™ Dionex™ EGC 500 K₂CO₃. The Dionex EPM must be ordered separately.

Note The waste, gas separator tube (P/N 045460) should be connected to the system waste line during installation.

Several eluent generator cartridge types are available for use with the Dionex Inuvion IC System (see Table 6). Each cartridge contains 900 mL of the appropriate electrolyte concentrate solution for eluent generation. For more information, refer to the Dionex EGC manual.

Table 6. Dionex eluent generator cartridges

Eluent generator cartridge	P/N	Description
Dionex EGC 500 KOH	075778	Generates potassium hydroxide eluent for anion exchange separations
Dionex EGC 500 MSA	075779	Generates methanesulfonic acid (MSA) eluent for cation exchange separations
Dionex EGC 500 K ₂ CO 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 ePanel in Chromeleon CDS. The allowable eluent concentration depends on the flow rate, suppressor type, and cartridge type (see Table 7).

Table 7. Eluent concentration ranges

Eluent generator cartridge	Eluent concentration range
Dionex EGC 500 KOH	Up 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 MSA	Up 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 ₂ CO ₃	Up 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 Inuvion IC System. The cartridge holder also houses a high-pressure degas cartridge assembly. Tubing and fittings for plumbing the cartridge, Dionex CR-TC, and degas assembly are included with the holder.

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 EG **DEGAS OUT** port. For more information, see [“Installing an Eluent Generator Cartridge \(Dionex EGC\)”](#) on [page 92](#).

Continuously Regenerated Trap Column (Dionex CR-TC)

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

- Dionex CR-CTC 600 Continuously Regenerated Cation Trap Column (P/N 088663)
- Dionex CR-ATC 600 Continuously Regenerated Anion Trap Column (P/N 088662)

For more information, refer to the trap 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)

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. See [Figure 20](#) for 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- μ L 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- μ L loop with a loop that has a different sample injection volume. Thermo Fisher Scientific offers sample loops in various sizes.

Column Heater (Optional)

The column heater (see [Figure 18](#)) provides temperature control for the analytical and guard columns.

Figure 18. 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.

A thermistor mounted in the heater block monitors the temperature. If the temperature exceeds 70°C, the column heater is shut off and an error message is displayed in the Chromeleon CDS audit trail. For troubleshooting guidance, see [“Column heater exceeds safe temperature limit”](#) on [page 119](#).

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

Suppressor

The suppressor reduces the eluent conductivity and enhances the conductivity response of the sample ions, thereby increasing detection sensitivity. For more information about the suppressors (or guidelines for selecting a suppressor for an application), refer to the suppressor manuals.

The following suppressors can be used with the Dionex Inuvion IC System.

- Thermo Scientific™ Dionex™ CRS™ 500 Chemically Regenerated Suppressor

- Thermo Scientific™ Dionex™ DRS™ 600 Dynamically Regenerated Suppressor
- Thermo Scientific™ Dionex™ ERS™ 500 Carbonate Electrolytically Regenerated Suppressor
- Thermo Scientific™ Dionex™ ERS™ 500e Electrolytically Regenerated Suppressor

For more information, see “[Suppressor](#)” on [page 27](#).

Pressure Transducer

The pressure transducer measures the system backpressure.

Digital Pressure Regulator (Optional)

Dionex Inuvion IC System eluent bottles can be pressurized as needed. Pressurized bottles allow eluents to be stored under a specific atmosphere. With the optional digital pressure regulator installed, the eluent bottles can support pressures to <0.07 MPa (10 psi).



DANGER Do not directly pressurize an eluent bottle from a gas source. For example, connecting a non-regulated gas flow from an industrial gas cylinder will expose the bottle to several thousand psi of gas. The resulting over-pressure will cause a catastrophic bottle failure resulting in bodily injury to the user.



DANGER Ne pas mettre directement un bidon d'éluant sous pression à partir d'une source de gaz. Par exemple, le raccordement d'un débit de gaz non régulé à partir d'une bouteille de gaz industriel exposera le bidon à plusieurs milliers de psi de gaz. La surpression qui en résulte entraînera une défaillance catastrophique du bidon et un préjudice corporel pour l'utilisateur.



GEFAHR Setzen Sie eine Eluentenflasche nicht direkt über eine Gasquelle unter Druck. Wenn Sie beispielsweise einen nicht regulierten Gasfluss aus einer Industriegasflasche anschließen, wird die Flasche einem Gasdruck von mehreren tausend psi ausgesetzt. Der daraus resultierende Überdruck führt zu einem katastrophalen Versagen der Flasche und damit zu körperlichen Verletzungen des Benutzers.

Note that the digital pressure regulator can be installed during the initial system installation by the Thermo Fisher Scientific field service engineers, or by users after the initial setup. Thermo Scientific recommends pressurizing bottles with helium or nitrogen under the following circumstances:

- When using eluents that are sensitive to contamination.
- When combining aqueous and nonaqueous components (for example, water and acetonitrile).



DANGER Acetonitrile is a flammable, colorless liquid with a sweet odor and taste. Although widely used in chemistry and chromatography, acetonitrile is highly toxic in larger doses and must be handled with caution due to risk of injury or death when ingested, inhaled, or absorbed through skin contact. Exercise special caution when using acetonitrile in pressurized applications such as ion chromatography due to the risk presented by spills, leaks, and potential vapors.



DANGER L'acétonitrile est un liquide inflammable et incolore caractérisé par une odeur et un goût sucrés. Bien que largement utilisé en chimie et en chromatographie, l'acétonitrile est hautement toxique à fortes doses et doit être manipulé avec prudence en raison du risque de blessure ou de décès en cas d'ingestion, d'inhalation ou d'absorption par contact avec la peau. Il convient de faire preuve de prudence lors de l'utilisation de l'acétonitrile dans des applications sous pression telles que la chromatographie à échange d'ions en raison du risque présenté par les déversements, les fuites et les vapeurs potentielles.



GEFAHR Acetonitril ist eine brennbare, farblose Flüssigkeit mit süßem Geruch und Geschmack. Obwohl Acetonitril in der Chemie und Chromatographie weit verbreitet ist, ist es in höheren Dosen hochgiftig und muss mit Vorsicht gehandhabt werden, da bei Verschlucken, Einatmen oder Absorption durch Hautkontakt Verletzungs- oder Todesgefahr besteht. Bei der Verwendung von Acetonitril in Druckanwendungen wie der Ionenchromatographie ist besondere Vorsicht geboten, da das Risiko von Verschüttungen, Undichtigkeiten und möglichen Dämpfen besteht.

Leak Sensor

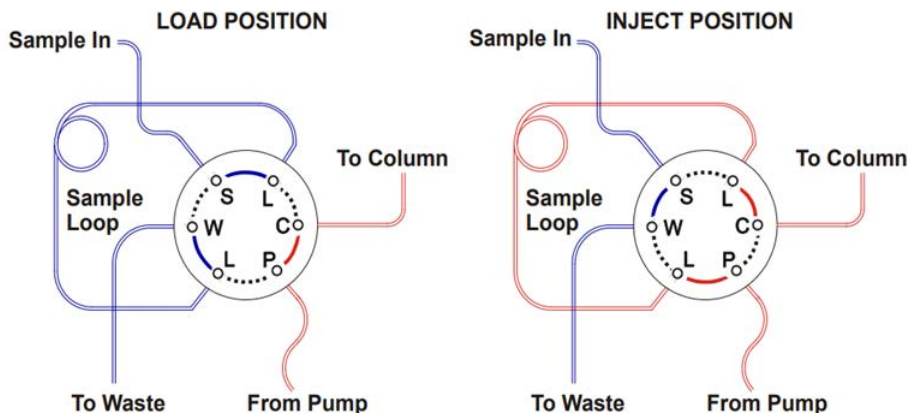
A leak sensor is installed in the drip tray at the bottom of the front panel. If liquid accumulates in the tray, the front panel **Alarm** LED lights up and an error message is logged in the Instrument audit trail.

Injection Valve

The injection valve (P/N 057968) is a 2-position, electrically-activated Rheodyne™ valve. A 25- µL sample loop (P/N 042857) is included in the Dionex Inuvion IC System Ship Kit. The injection valve shares the same part number (and is identical to) the 6-port auxiliary valve. However, this valve is used and installed differently, depending on whether it will function as an injection valve or an auxiliary valve.

The valve has two operating positions: Load and Inject (see [Figure 19](#)).

Figure 19. Injection valve flow schematics (red indicates the active path)

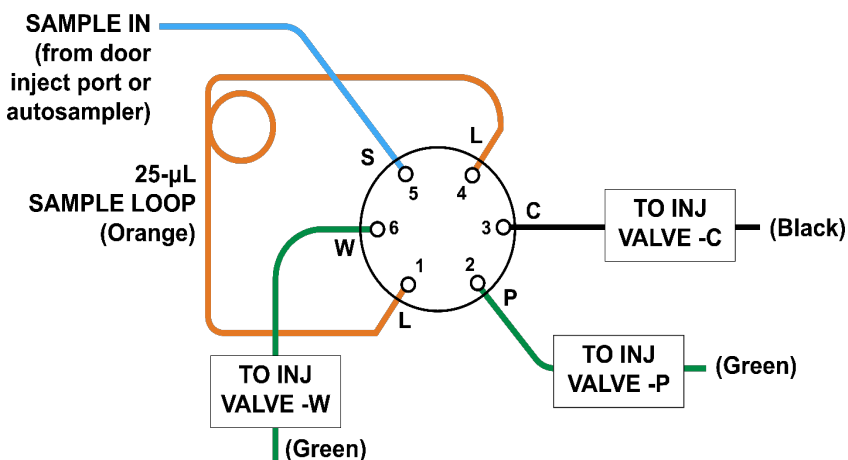


Eluent flows through the Load or Inject path, depending on the valve position.

- 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. To inject samples, see [“Loading and Injecting Samples”](#) on page 51.

Figure 20 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- μ L PEEK sample loop (P/N 042857) is installed between ports L (1) and L (4). Thermo Fisher Scientific offers sample loops in various sizes. If necessary, replace the pre-installed 25- μ L loop with a loop that has a different sample injection volume.

Figure 20. Injection valve connections



Auxiliary Valve (Optional)

Like the injection valve, the auxiliary valve is a 2-position, electrically-activated Rheodyne valve. This high-pressure PEEK valve is offered in two models: 6-port (with a port diameter of at least 0.009 in) and 10-port (with 0.010-in diameter ports).

Note The Dionex Inuvion IC System can accommodate either an auxiliary valve or a regenerant pump, but not both.

The auxiliary valve enables a variety of sample preparation activities, including:

- Inline filtration
- Matrix elimination (for example, the removal of high backgrounds of chloride or organic material)
- Concentrator-based techniques
- Conditional injections (large loop or 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™ is used when it is necessary to quantify anionic contaminants in concentrated bases. It solves the analytical problem of achieving good detection limits of trace anions in concentrated bases by neutralizing the base, using a membrane-based neutralizer device.
- Matrix diversion prior to MS (mass spectrometry) detection

The auxiliary valve can be installed on-site by a Thermo Fisher Scientific field service engineer or by users.

Conductivity Detector

The conductivity detector consists of a temperature-controlled conductivity cell and electronics that produces conductivity data and relays it to the computer and analog output. The flow-through conductivity cell measures the electrical conductance of analyte ions as they pass through the cell via two passivated 316 stainless steel electrodes which are permanently sealed into the PEEK cell body. The cell design provides efficient sweep-out, low volume, and low dispersion.

Conductivity Detector Temperature Control

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

System provides temperature control of the cell. A heater inside the cell regulates temperature, supporting values between 30 and 60°C. For optimum performance, set the temperature at least 7 °C above the ambient temperature, and 5 °C above the column oven temperature. For more information, see “[Conductivity Cell](#)” on page 32.

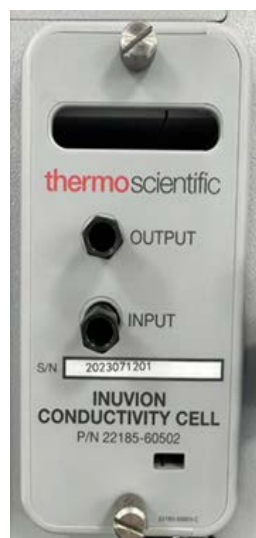
Conductivity Detector Temperature Compensation

Built-in temperature compensation minimizes changes in the baseline or peak heights when the operating temperature differs from the cell calibration temperature. The default temperature compensation value is 1.7% per °C. This value is adjustable between 0% and 3.0% per °C, depending on the eluent used. If ambient laboratory temperature increases, an upward baseline shift indicates an overly low compensation factor. Reset the factor to a higher value via Chromeleon CDS.

Conductivity Cell

The flow-through conductivity cell (see [Figure 21](#)) located within the conductivity detector measures the electrical conductance of analyte ions passing through the cell. A heat exchanger inside the cell regulates temperature, supporting values between 30 and 60°C. For optimum performance, set the temperature to at least 7 °C above the ambient temperature, and 5 °C above the column oven temperature.

Figure 21. Conductivity cell



Suppressor

The suppressor reduces the eluent conductivity and enhances the conductivity of the sample ions, thereby increasing the detection sensitivity. The Dionex Inuvion IC System supports a single one-wire and other suppressor connections, and is compatible with the following 2 mm or 4 mm electrolytic and chemical suppressors:

[Table 8](#) lists the suppressors that can be used with the Dionex Inuvion IC System.

Table 8. Suppressors for the Dionex Inuvion IC System

Part number	Suppressor
085090	Dionex ACRS 500 Anion Dynamically Regenerated Suppressor (4 mm)
085091	Dionex ACRS 500 Anion Dynamically Regenerated Suppressor (2 mm)
088666	Dionex ADRS 600 Anion Dynamically Regenerated Suppressor (4 mm)
088667	Dionex ADRS 600 Anion Dynamically Regenerated Suppressor (2 mm)
302661	Dionex AERS 500e Electrolytically Regenerated Suppressor (4 mm)
302662	Dionex AERS 500e Electrolytically Regenerated Suppressor (2 mm)
085029	Dionex AERS 500 Carbonate Electrolytically Regenerated Suppressor (4 mm)
085028	Dionex AERS 500 Carbonate Electrolytically Regenerated Suppressor (2 mm)
085092	Dionex CCRS 500 Cation Dynamically Regenerated Suppressor (4 mm)
085093	Dionex CCRS 500 Cation Dynamically Regenerated Suppressor (2 mm)
088668	Dionex CDRS 600 Cation Dynamically Regenerated Suppressor (4 mm)
088670	Dionex CDRS 600 Cation Dynamically Regenerated Suppressor (2 mm)
302663	Dionex CERS 500e Electrolytically Regenerated Suppressor (4 mm)
302664	Dionex CERS 500e Electrolytically Regenerated Suppressor (2 mm)

Analytical and Guard Columns

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

Tubing Chases

The upper tubing chase routes tubing from the eluent organizer to the component panel. The lower tubing chase routes tubing from the component panel, through the interior of the system, and then to the rear panel.

Two additional tubing chases (on the left and right sides of the component panel) direct tubing from the autosampler to the injection valve, depending on where the autosampler is placed to the left or right of the Dionex Inuvion IC System. For more details, see “[Injection Valve](#)” on [page 29](#).

Autosampler (Optional)

The Dionex Inuvion IC System supports many autosampler types, including the Dionex AS-AP, Dionex AS-DV, Dionex AS-HV, and some third-party autosamplers. See https://knowledge1.thermofisher.com/Chromatography/Ion_Chromatography for more information about autosamplers and how their use can reduce labor-intensive sample preparation and other time-consuming tasks.

Rear Panel

[Figure 22](#) shows the Dionex Inuvion IC System rear panel; this system has an RFIC installed.

Analog Output Connector

The analog output connector outputs conductivity data (as a 0 to 1 V signal) to an integrator or recording device.

Figure 22. Dionex Inuvion IC System rear panel



USB Connectors

The USB receptacle provides a connection to the computer on which Chromeleon CDS is installed. Three USB ports are available for connections to other USB devices.



WARNING Do not exceed USB cable lengths of 10 m (32.8 feet) and do not use additional hubs or extenders. Excessive cable length or unapproved hubs or extenders can increase RF electromagnetic emissions or affect the sensitivity of the Dionex Inuvion IC System.



AVERTISSEMENT Ne pas employer de câbles USB de plus de 10 m (32,8 pieds) de long et ne pas utiliser de concentrateurs ou de rallonges supplémentaires. L'utilisation de câbles trop longs ou de concentrateurs ou de rallonges non approuvés peut augmenter les émissions électromagnétiques de radiofréquences ou affecter la sensibilité du système de CEI Dionex Inuvion.



ACHTUNG Überschreiten Sie nicht die Länge des USB-Kabels von 10 m (32,8 Fuß) und verwenden Sie keine zusätzlichen Hubs oder Extender. Übermäßige Kabellänge oder nicht zugelassene Hubs oder Extender können die elektromagnetischen HF-Emissionen erhöhen oder die Empfindlichkeit des Dionex Inuvion IC-Systems beeinträchtigen.

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 more details, see [“TTL and Relay Control.”](#)



WARNING Use only Thermo Scientific twisted-pair wires (P/N 043598) for TTL/relay connections. Excessive cable length can increase RF electromagnetic emissions or affect the sensitivity of the Dionex Inuvion IC System.



AVERTISSEMENT Utiliser uniquement des câbles à paire torsadée Thermo Scientific (réf. 043598) pour les branchements TTL/relais. L'utilisation de câbles trop longs peut augmenter les émissions électromagnétiques de radiofréquences ou affecter la sensibilité du système de CEI Dionex Inuvion.



ACHTUNG Verwenden Sie für TTL-/Relaisverbindungen ausschließlich Thermo Scientific Twisted-Pair-Drähte (Art.-Nr. 043598). Übermäßige Kabellängen können die elektromagnetischen HF-Emissionen erhöhen oder die Empfindlichkeit des Dionex Inuvion IC-Systems beeinträchtigen.

Tubing Clips

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

Gas Regulator Mounting Location

An optional gas regulator for pressurizing the eluent, regenerant, or reagent bottles can be installed on the rear of the eluent organizer at the top of the system.

Low-Pressure Valve

A low-pressure three-way (or three-port) valve (P/N B51001290) can be used for on/off control of liquid flow (for example, to turn flow on and off from a reagent or external regenerant bottle). Up to two low-pressure valves can be supported.

Power Switch

The power switch provides on/off control of power to the Dionex Inuvion IC System.

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 Inuvion IC System 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.

2 Description

System Component Details

Operation and User Setup

This chapter describes initial setup and routine operating procedures for the Dionex Inuvion IC System.

Chromeleon CDS automatically detects and configures Dionex Inuvion IC System components when the system is first started. Instructions in this chapter detail the initial setup (including configuring the system in a Chromeleon CDS instrument) following installation by a Thermo Fisher Scientific field service engineer.

Components added after initial setup must be added manually because Chromeleon CDS detects components during initial setup only. Complete resetting of the Dionex Inuvion IC System will cause Chromeleon CDS to automatically detect all currently installed components, but is not generally recommended.

For more information about installation and maintenance procedures that users can perform, see [User Maintenance](#).

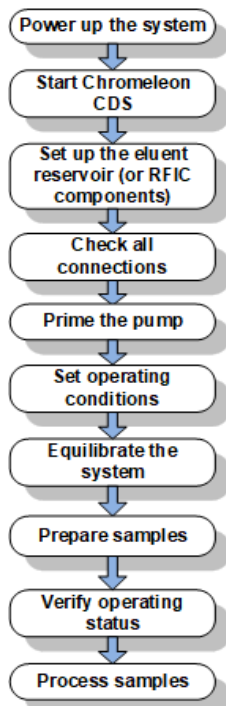
Contents

- [Operation Overview](#)
- [Turning On the System Power](#)
- [Connecting to Chromeleon CDS](#)
- [Setting Up the Eluent Bottle](#)
- [Checking All Connections](#)
- [Pump Setup and Priming](#)
- [Setting System Operating Conditions](#)
- [Equilibrating the System and Verifying Operational Readiness](#)
- [Preparing Samples](#)
- [Loading and Injecting Samples](#)
- [Processing Samples](#)

Operation Overview

Figure 23 details simplified steps for routine operation of the Dionex Inuvion IC System.

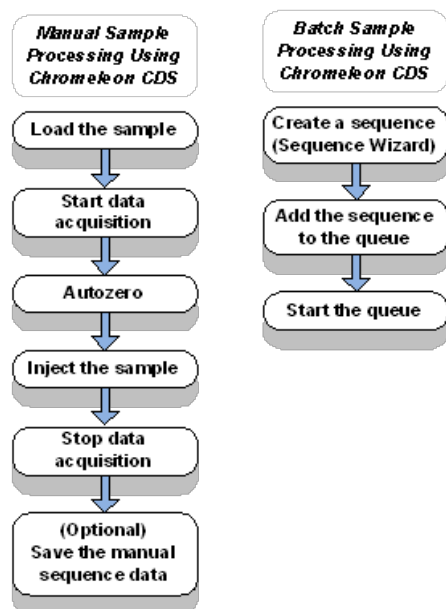
Figure 23. System operation overview



Sample Processing Overview

Samples can be run manually (one at a time) or grouped and run automatically in batches. [Figure 24](#) shows the typical steps for each type of sample processing.

Figure 24. Sample processing overview



Turning On the System Power

❖ **To turn on the power**

1. Press the main power switch on the Dionex Inuvion IC System rear panel (see [Figure 25](#)).
2. Turn on the power of the computer and the autosampler (if installed).

Figure 25. Dionex Inuvion IC System rear panel






Table 9. Dionex Inuvion IC System power-up conditions

Feature	Power-up condition
Pump	Off
Injection valve	Load position
Cell	Reading current value
Suppressor	Off*
Cell heater	Off. When turned on, the cell returns to the last value used. When the system is turned on for the first time, the default is 35 °C.
Column oven temperature (optional)	Off. When turned on, the column oven returns to the last value used. When the system is turned on for the first time, the default is 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 CDS

❖ 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**.

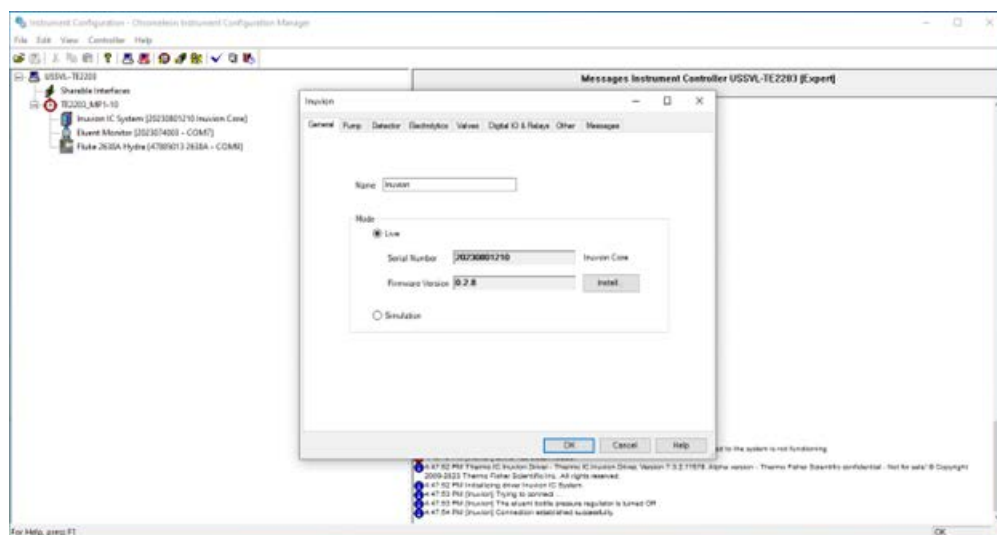
❖ To start the Chromeleon CDS client

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

❖ To display the Chromeleon CDS ePanel Set

1. In the Console, click the **Instruments** Category Bar.
2. Select the name of the instrument in which the Dionex Inuvion IC System is configured. Chromeleon CDS will connect to the instrument and display the ePanel Set (see [Figure 26](#)).

Figure 26. Example Chromeleon CDS ePanel Set



Setting Up the Eluent Bottle

The Dionex Inuvion IC System does not require pressurized bottles. However, if the eluent is manually degassed or is sensitive to contamination, Thermo Fisher Scientific recommends pressurizing the bottle with helium or nitrogen.

An eluent monitor module can be added to the instrument configuration to continuously monitor the eluent volume and alert you when the level is below the user-specified threshold. Each eluent monitor can support one bottle. You can monitor up to three bottles, using the appropriate kit(s):

- Liquid Level Sensing Kit for 2-liter bottles (P/N 22815-62707)
- Liquid Level Sensing Kit for 4-liter bottles (P/N 22815-62708)

For more information, see [“Installing the Eluent Monitor”](#) on page 106.

The digital pressure regulator (PN 22185-62706) required for pressurizing eluent bottle(s) must be ordered separately. Do not directly pressurize an eluent bottle from a gas source.



WARNING Risk of bottle rupture or leakage: If pressurized bottles are required, use the Thermo Scientific Digital Pressure Regulator (P/N 22185-62706).



WARNING Risk of bottle rupture or leakage: Do not pressurize eluent bottles above 10 psi (69 kPa).



AVERTISSEMENT Risque de rupture ou de fuite du bi-don : Si des bidons sous pression sont nécessaires, utiliser le régulateur de pression numérique Thermo Scientific (réf. 22185-62706).



AVERTISSEMENT Risque de rupture ou de fuite du bidon : Ne pas mettre les bidons d'éluant sous pression à plus de 10 psi (69 kPa).



ACHTUNG Gefahr des Bruchs oder Auslaufens der Flasche: Wenn Druckflaschen erforderlich sind, verwenden Sie den digitalen Druckregler von Thermo Scientific (Art.-Nr. 22185-62706).



ACHTUNG Gefahr des Bruchs oder Auslaufens der Flasche: Setzen Sie Eluentenflaschen nicht unter einen Druck von mehr als 10 psi (69 kPa).

❖ **To filter the deionized water**

Filtering removes small particulates in deionized water that may contaminate the pump check valves and cause erratic flow rates or loss of prime. Filtration is advised, but not required, when using a Dionex Inuvion IC RFIC System.

1. Locate the end-line filter (P/N 045987) provided in the Dionex Inuvion IC System Ship Kit (PN 22185-62000).
2. Install the end-line filter at the end of the deionized water line, inside the bottle.
3. For Dionex Inuvion IC Systems using manually prepared eluent (not RFIC), verify that the end of the filter extends to the bottom of the bottle and that the filter is submerged in deionized water. This prevents air from entering into the lines.

❖ **To fill the eluent bottle**

Fill the bottle with ASTM filtered, Type I (18.2 megohm-cm) deionized water that meets the specifications in [“Deionized Water Requirements for IC”](#) on page xvi.

❖ **To connect the eluent bottle**

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

Checking All Connections

1. Make sure the eluent bottle is filled.
2. Make sure the **ELUENT BOTTLE OUT** line from the bottle cap is connected to the **ELUENT IN** line, which extends from the tubing chase on the top cover of the Dionex Inuvion IC System.
3. Make sure the Dionex EGC electrical cable is connected to the **EGC** connector.
4. Make sure the Dionex CR-TC electrical cable is connected to the **CR-TC/EPM** connector.

Pump Setup and Priming

This section contains instructions for priming the analytical pump and the regenerant pump.

Priming the Analytical Pump

❖ To prepare the system

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

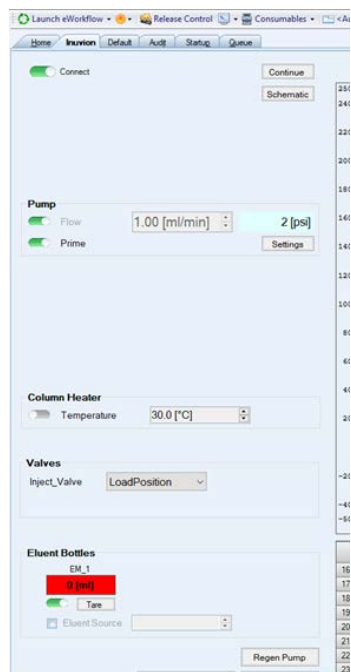
❖ To prime the eluent lines and analytical pump head

1. Open the priming valve on the analytical pump head by turning the knob one-quarter to one-half turn counterclockwise.

Note Opening the priming valve directs the eluent flow path to waste and eliminates backpressure.

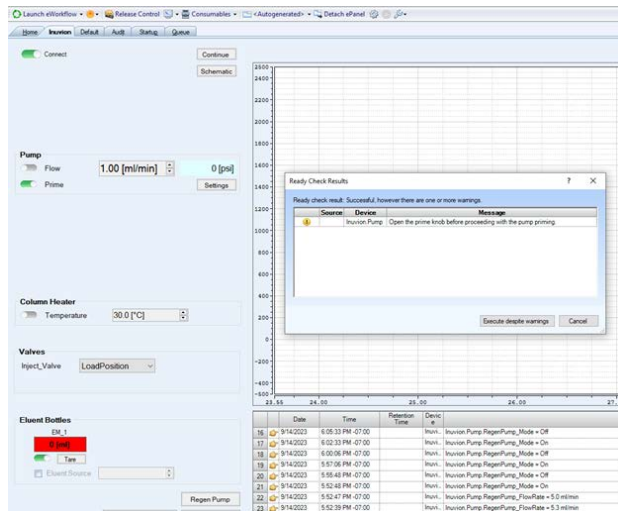
2. On the Chromeleon CDS ePanel Set, select the **Inuvion** tab.
3. Under **Pump**, select the **Prime** button (see [Figure 27](#)).

Figure 27. Chromeleon CDS analytical pump priming window



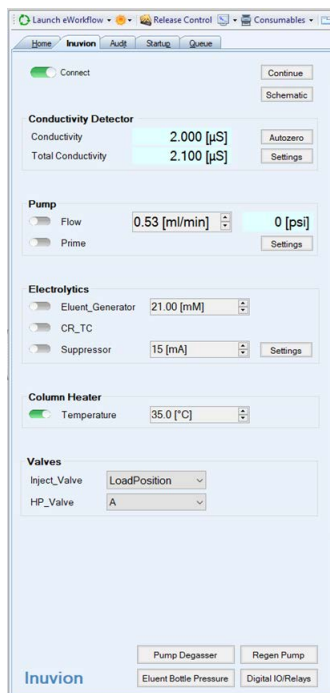
- When Chromeleon CDS displays a message reminding you that the priming valve is open, select OK (see Figure 28). The pump will begin pumping at about 3 mL/min.

Figure 28. Chromeleon CDS modal with the prime knob warning



- Monitor the pump waste line for air bubbles. When no air bubbles are visible in any tubing lines, turn off the pump priming and close the priming valve (see Figure 29). Do not overtighten the valve.

Figure 29. Chromeleon CDS pump priming window



Priming the Regenerant Pump

A regenerant pump (P/N 22185-62702) is an optional accessory for the Dionex Inuvion Core System, the Dionex Inuvion System, and the Dionex Inuvion IC System with RFIC.

If you purchase the regenerant pump, it will be installed when the Thermo Fisher Scientific field service engineer sets up the Dionex Inuvion IC System. However, users may also need to install, maintain, and/or replace the regenerant pump, as detailed here.

To begin, check that the following items are on hand: regenerant pump, any tubing and connectors included in the regenerant pump ship kit (P/N 22185-62702), and a Phillips-head screwdriver.

1. Open the Dionex Inuvion IC System front door and find the accessory panel cover located to the left of the main injection valve.
2. Using a Phillips-head screwdriver, unscrew the two panel screws, and pull the accessory panel off the system.
3. If an auxiliary valve is already installed, remove this to access the accessory port.
4. The accessory opening contains two electrical connectors of differing sizes. Connect the regenerant pump to the matching electrical connector.
5. Attach the pump to the system by fastening the two outermost screws.
6. Turn the regenerant pump knob 180 degrees counterclockwise to open the pump casing and access the rollers that squeeze tubing to create the peristaltic pressure.
7. Install the regenerant pump tubing on top of the rollers. Align the tubing along the grooves located at each side of the pump opening. Turn the knob clockwise 180 degrees to close the roller access opening.
8. Ensure the correct positioning of tubing extending beyond the pump casing; the tubing should lay between the grooves without any pinching or misalignment.
9. Attach the regenerant source tubing to the front end of the pump tubing, using the connector provided in the ship kit. Attach waste tubing to the other end of the pump and route it to waste.
10. On the Inuvion ePanel, select the Regen Pump button from the Valves section to turn on the regenerant pump and set the preferred flow rate. When the system is turned on, the flow rate is set to the default of 3.0 mL/min.

Setting System Operating Conditions

This section provides an overview of the steps required to start the system and select the initial system operating parameters. Appropriate 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 the system operating parameters from the Inuvion ePanel. Parameters can also be set automatically, by loading a Chromeleon CDS sequence.

Note Selecting the **On** or **Off** button on the Inuvion ePanel starts or stops the pump, suppressor, Dionex EGC, and Dionex CR-TC. Selecting **On** restores the flow rate, suppressor current, and eluent concentration settings that were in effect when the system was last 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. If installed, verify that the Dionex EGC is on and that the eluent concentration setting is correct.
4. If installed, verify that the Dionex CR-TC is on.
5. If installed, verify that the column heater temperature is set to the correct value.

Equilibrating the System and Verifying Operational Readiness

This section provides an overview of how to equilibrate the system and verify operational readiness. After completing these steps, the system is ready for sample processing.

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

1. Monitor the background conductivity to ensure that it is appropriate for your application.

2. Monitor the system pressure to ensure that it is at the expected pressure for the installed column and is stable.
 - If the pressure is lower than expected, gas is probably 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 Analytical Pump”](#) on page 46).
 - If the pressure is higher than expected, there may be a restriction in the system plumbing.

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 suppressed anion analyses using carbonate-based eluent and <2 μS for hydroxide-based eluent. An unexpected reading may be due to the following factors: the conductivity is too high, or there is a baseline drift or excessive baseline noise (large fluctuations in readings).

3. 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.
4. 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.

Preparing Samples

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

Note Sample preparation can occur 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. Remnant ions may interfere with analysis.

If samples will not be analyzed on the day of collection, 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, surface water, and wastewater samples before injection, unless samples are 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 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 concentrations are so low that dilution is not necessary.

To dilute the sample, use either eluent or ASTM filtered, Type I (18.2 megohm-cm) deionized water that meets the specifications in [“Deionized Water Requirements for IC”](#) on [page xvi](#). 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 Inuvion IC System front panel

For autosampler injections, the injection port tubing must be disconnected from the Dionex Inuvion IC System 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 31). The injection valve (or auxiliary valve) must be specified as the injection valve and linked to the autosampler in the Chromeleon CDS for the configured instrument. For more information, refer to the Chromeleon CDS Help.

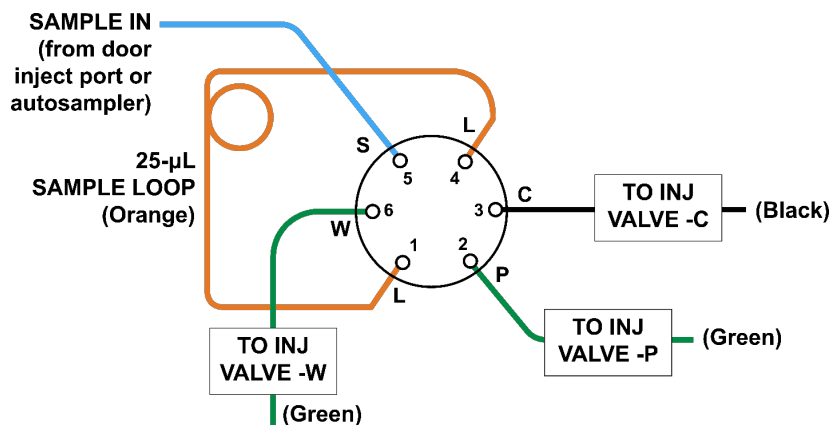
Setting Up the Autosampler

To use an autosampler, the Dionex Inuvion IC System injection valve must be specified as the injection valve and linked to the autosampler in the Chromeleon CDS instrument. For more information, refer to the Chromeleon CDS Help or the operator’s manual for the autosampler.

❖ To load samples with a syringe

1. Verify that the injection port on the Dionex Inuvion IC System front panel is connected to sample port **S (5)** on the injection valve (see Figure 30).

Figure 30. Injection valve plumbing connections



2. Fill the 10-cc syringe (P/N 079803) provided in the system Ship Kit (PN 22185-62000) with a calibration standard or sample.
3. Insert the syringe into the injection port on the component panel.
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.

❖ **To load samples with a vacuum syringe**

1. Disconnect the waste line from port **W (6)** on the injection valve 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 10-cc syringe (P/N 079803) provided in the Dionex Inuvion IC System Ship Kit (PN 22185-62000) into the injection port on the front door 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 53).

❖ **To load samples with an autosampler**

6. Verify that the autosampler output line is connected to sample port **S (5)** on the injection valve.
7. Prepare and fill the sample vials and place them in the autosampler tray or cassette. For detailed instructions, refer to the autosampler manual.
8. The sample loading process depends on the autosampler model. In general, one of the following steps is required (for details, refer to the autosampler operator’s manual):
9. Include the commands for controlling the sample loading in a Chromeleon CDS method. For details, refer to the Chromeleon CDS Help.
10. Enter the commands for loading the sample on the autosampler front panel. Switch the injection valve to the Inject position.

❖ **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:** Select the **Inject** button on the Chromeleon CDS ePanel.
- **Automatically:** Include an Inject command in a Chromeleon CDS instrument method. For details, refer to the Chromeleon CDS Help.

Processing Samples

There are two options for processing samples:

- Run samples manually, one at a time (see [page 54](#))
- Group samples and run them automatically, in batches (see [page 55](#))

Manual Sample Processing

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

1. Complete the instructions near the beginning of this chapter through “[Setting System Operating Conditions](#)” on [page 49](#) to prepare the Dionex Inuvion IC System for operation and to prepare the sample for processing.
2. Load the sample, using one of the following: a syringe, a vacuum syringe, or an autosampler.
3. On the Inuvion ePanel, select the **Autozero** button.
4. Inject the sample. The signal plot is displayed on the ePanel.
5. Monitor the chromatogram. When the sample data has been collected, select 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 select **File > Save As**.
2. Enter a new name for the sequence.
3. Select the **Save raw data** check box.
4. Select **Save**.

Automated (Batch) Sample Processing

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

To process samples automatically, first add the sample injections to a Chromeleon CDS 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 CDS:

- 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.

3 Operation and User Setup

Processing Samples

User Maintenance

This chapter describes maintenance and repair procedures (routine and periodic) that users can perform for the Dionex Inuvion IC System.

The Dionex Inuvion IC System is available in three configurations: the Dionex Inuvion, the Dionex Inuvion Core, and the Dionex Inuvion with RFIC. This chapter addresses all three models; therefore, some sections will not apply to certain models. For example, the standard Dionex Inuvion Core System does not include RFIC, so sections covering components such as the Dionex EGC and Dionex CR-TC are not applicable for these systems—unless those components were added during or after the initial installation process.

Note that [Chapter 3, “Operation and User Setup,”](#) includes setup procedures that can overlap with maintenance procedures. Review that chapter for initial setup and operation procedures that users can perform. (Disregard any procedures related to maintenance or initial installation that are performed by Thermo Fisher Scientific field service engineers.)

All maintenance procedures not included in this manual, including electronics-related repair procedures, must be performed by Thermo Fisher Scientific field service engineers.

- In the U.S. and Canada, call 1-800-532-4752 and select **option 2**.
- 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 system component troubleshooting information in [Chapter 5, “Troubleshooting.”](#)

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



CAUTION Before servicing the Dionex Inuvion IC System, allow any heated components to cool.



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



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

Contents

- Routine User Maintenance
- Periodic User Maintenance
- Replacing the Auxiliary or Injection Valve Pod
- Replacing the Regenerant Pump
- Cleaning and Replacing the Pump Check Valves
- Replacing the Seal Wash Pump
- Replacing Components in the Analytical Pump Head Assembly
- Installing or Replacing the Eluent Valve
- Installing or Replacing the Low-Pressure Valve
- Replacing the Leak Sensor
- Removing an Expended Eluent Generator Cartridge (Dionex EGC)
- Installing an Eluent Generator Cartridge (Dionex EGC)
- Installing or Replacing the Continuously Regenerated Trap Column (Dionex CR-TC)
- Installing or Replacing the Ion Chromatography Column
- Installing or Replacing the Carbonate Removal Device (Dionex CRD)
- Installing the Auxiliary Valve
- Installing or Replacing the Column Heater
- Installing and Pressurizing the Digital Gas Pressure Regulator
- Pressurizing the Eluent Bottle
- Changing the Main Power Fuses

Routine User Maintenance

This section describes routine user maintenance procedures for all three configurations of the Dionex Inuvion IC System. The remainder of the chapter addresses periodic maintenance procedures. As mentioned previously, maintenance procedures not included here must be performed by Thermo Fisher Scientific field service engineers.

Daily Maintenance

- Check the Dionex Inuvion IC System component panel for leaks or spills, especially around the drip tray (see [Figure 5](#) on [page 11](#) and [Figure 6](#) on [page 12](#)).
- Wipe up spills. Isolate and repair leaks (see “[Liquid Leaks](#)” on [page 144](#)). Rinse off any dried eluent with deionized water.
- Check the eluent bottle. When necessary, refill the eluent bottle with eluent for the Dionex Inuvion Core and Dionex Inuvion IC Systems. If the Dionex Inuvion IC System with RFIC is installed (or any system with RFIC capabilities), refill the eluent bottle with ASTM filtered, Type I (18.2 megohm-cm) deionized water that meets the specifications listed in “[Deionized Water Requirements for IC](#)” on [page xvi](#).
- Monitor the waste container and empty it as needed.

Weekly Maintenance

- Replace the end-line filter (P/N 045987) on the deionized water line.
- Check for crimps or discoloration in the fluid lines. Replace any pinched or damaged tubing promptly. Tubing associated with the regenerant pump should be replaced every three months (see [Figure 33](#) and [Figure 34](#)).

Note Pay particular attention to tubing under mechanical stress, such as the tubing used within and around the peristaltic regenerant and seal wash pumps, which is compressed between rollers to create pressure. This repeated mechanical stress fatigues the tubing, stiffening it and reducing both output and system performance.

Figure 31. Open view of the regenerant pump, showing tubing placement



Figure 32. Tubing placed between the rollers of the regenerant pump



- Check for evidence of liquid leaks around all pump tubing connections. 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 resulting wear may gradually cause small liquid leaks around the piston seal. If unchecked, these leaks will eventually contaminate the piston housing, causing the pump to operate poorly. If leaks occur, replace the piston seals (see [“To remove and replace the pistons, analytical pump seals, and O-rings”](#) on [page 80](#)).

Semiannual Maintenance

- To ensure pump reliability, replace the pump piston rinse seals, piston seals, and O-rings in the pump housing every 6 months, or whenever you replace the main piston seals (see [“Replacing Components in the Analytical Pump Head Assembly”](#) on [page 80](#)) for the Dionex Inuvion IC System pump
- Replace the seal wash pump tubing.

Annual Maintenance

- Thermo Fisher Scientific recommends performing preventive maintenance of the Dionex Inuvion IC System annually, and before any scheduled Operational Qualification tests. The Dionex Inuvion Preventive Maintenance Kit (P/N B51001547) includes replacement parts. Annual preventive maintenance is generally performed by Thermo Fisher Scientific field service engineers due to the technical complexity and required expertise associated with the procedure.

Note Operational Qualification tests are an optional service performed on-site by Thermo Fisher Scientific field service engineers. These regimented tests are typically performed only by those working in a highly regulated environment.

- Rebuild the auxiliary valve, if installed (see “[Rebuilding the Injection Valve or Auxiliary Valve](#)” on [page 63](#)).
- If a Dionex AS-AP Autosampler is installed, ensure that the recommended annual preventive maintenance procedure is performed. The Dionex AS-AP Preventive Maintenance Kit (P/N 075000) includes replacement parts and instructions.
- If a Dionex AS-DV Autosampler is installed, ensure that the recommended annual preventive maintenance procedure is performed. The Dionex AS-DV Preventive Maintenance Kit (P/N 072678) includes replacement parts and instructions.
- If a Dionex AS-HV Autosampler is installed, ensure that the recommended annual preventive maintenance procedure is performed. The Dionex AS-HV Preventive Maintenance Kit (P/N 072678) includes replacement parts and instructions.

Periodic User Maintenance

Isolating a Restriction in the Tubing

A restriction in the liquid or gas plumbing can cause excessive system backpressure.

❖ **To isolate a restriction**

1. (Optional) Check that lint-free paper towels are on hand to dry any liquid leaks (or use a small container to collect liquid leaks).
2. Begin pumping eluent throughout the system (including the columns).
3. Follow the flow schematic (see [Figure 2](#), [Figure 3](#), or [Figure 4](#)) 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 significantly indicates the point of restriction.

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

4. In some cases, restrictions may create high pressure blockages that stop operation. If this happens, loosen all connections and work through the flow schematic, adding parts one at a time until a significant pressure increase (and hence, the restriction) is found.
5. Clear restrictions in tubing or fittings by back flushing or by replacing the tubing or fitting (see “[Replacing Tubing and Fittings](#)” on [page 62](#)).

Replacing Tubing and Fittings

The Dionex Inuvion IC System 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 PEEK (P/N 014175)	Clear	Connection from pump to degas or eluent bottle; pump waste
25- μ L sample loop (P/N 042857)	Orange	Connection between injection valve ports L (1) and L (4)

- 10-32 fittings (P/N 22000-98001) and ferrules (P/N 043276) are used for most tubing connections.
- 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 bottle.

Installing and Tightening Ferrule Fittings

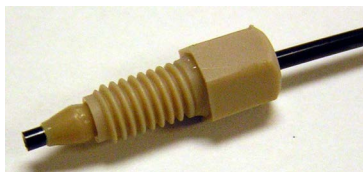
Follow these guidelines to install and tighten a 10-32 fitting bolt (P/N 22000-98001) and 10-32 double-cone ferrule (P/N 043276).

For tightening requirements for IC PEEK Viper fittings, refer to the instructions provided with the fittings.

❖ **To install a 10-32 double-cone ferrule fitting**

1. Install the fitting bolt and ferrule onto the tubing. Position the ferrule 1 to 2 mm (0.04 to 0.08 in) from the end of the tubing (see [Figure 33](#)).

Figure 33. Ferrule and fitting bolt placement for tubing connections



2. Insert the tubing into the port until it stops.
3. While maintaining pressure on the tubing to keep it in place in the port, tighten the fitting bolt finger-tight and then tighten the fitting further by following the instructions below.

❖ **To tighten a 10-32 double-cone ferrule fitting**

1. Use your fingers to tighten the fitting bolt as tight as you can. Then, use a wrench to tighten the fitting an additional three-quarter turn (270 degrees).
2. If leaks occur, replace the fitting bolt, ferrule, and tubing.

Rebuilding the Injection Valve or Auxiliary Valve

Every Dionex Inuvion IC System, regardless of configuration, includes an injection valve. An auxiliary valve—a supplement to the main injection valve—is an optional accessory for the Dionex Inuvion Core system. Users can install, maintain, and/or replace both the injection and auxiliary valves.

Note The auxiliary valve connects to the auxiliary port, which is also used by the regenerant pump. Only one of these components can be used at a time, so you must switch between the valve and pump as needed.

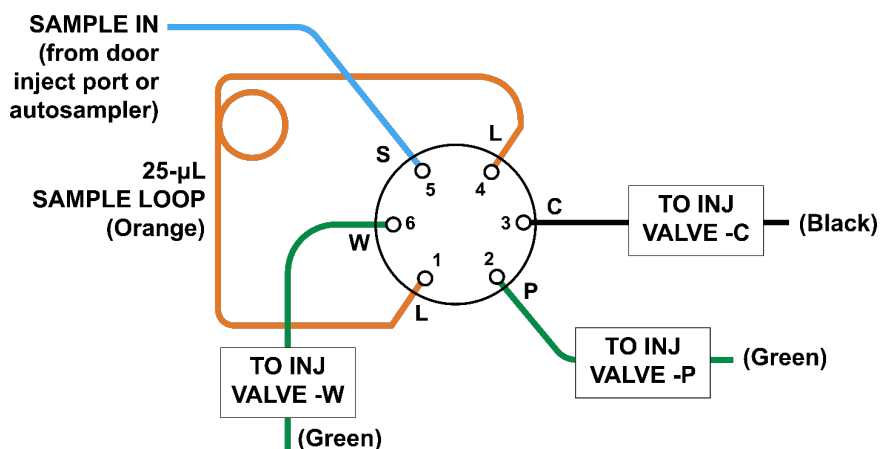
The following kits are available:

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

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 [“Replacing the Auxiliary or Injection Valve Pod”](#) on page 64.

❖ **To rebuild the injection valve or auxiliary valve**

1. Turn off the pump from the Chromeleon CDS ePanel.
2. Open the Dionex Inuvion IC System front door.
3. Disconnect all tubing 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 34](#)) or auxiliary valve.

Figure 34. Injection valve plumbing

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

Replacing the Auxiliary or Injection Valve Pod

This procedure describes how to replace the mechanical part (the “pod”) of both the standard injection valve and the optional auxiliary valve. This procedure is usually an easier and faster alternative to rebuilding the valve (see [page 63](#)).

Note Service on internal electronics of the Dionex Inuvion IC System and accessories must be performed by Thermo Fisher Scientific field service engineers.

❖ **To replace an auxiliary or injection valve pod**

1. Turn off the pump flow from the Chromeleon CDS ePanel.
2. Open the Dionex Inuvion IC System 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 35](#)) and remove the ring.

Figure 35. Auxiliary and injection valve black locking rings



5. Grasp the front of the valve pod and pull firmly to remove it from the system.
6. Verify that the new pod (6-port, P/N 07597; 10-port, P/N 075972) 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 Inuvion IC System. 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.
8. Also verify that the two splines on the pod are aligned with the matching splines inside the valve holder. If necessary, twist the end of the pod to adjust the position of the splines as shown in [Figure 36](#).

Figure 36. Auxiliary valve pod and pod holder



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.
13. Check for leaks from the valve and tighten fittings as required (see [“Liquid Leaks”](#) on [page 144](#)).
14. Close the front door.

Replacing the Regenerant Pump

A regenerant pump is included in the Dionex Inuvion and Dionex Inuvion with RFIC Systems. The pump is installed when the Thermo Fisher Scientific field service engineer sets up the system. However, users may need to install, maintain, and/or replace the regenerant pump.

The parts required include the regenerant pump, any tubing and connectors included in the regenerant pump kit (P/N 22185-62702), and a Phillips-head screwdriver.

1. Turn off the Dionex Inuvion IC System main power switch on the rear panel of the system.



DANGER HIGH VOLTAGE—Disconnect the main power cord from its source and also from the rear panel of the Dionex Inuvion IC System.



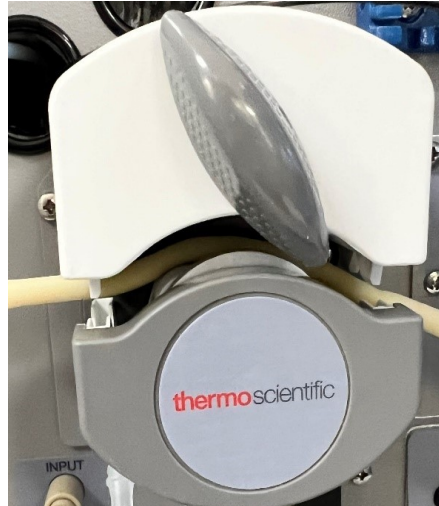
DANGER HAUTE TENSION—Débranchez le cordon d'alimentation principal de sa source et du panneau arrière du Dionex Inuvion IC System.



GEFAHR HOCHSPANNUNG—Trennen Sie das Hauptstromkabel von der Quelle und auch von der Rückseite des Dionex Inuvion IC-Systems.

2. Open the system front door and locate the auxiliary port; this is located to the left of the main injection valve and is covered with a panel.
3. Using a Phillips-head screwdriver, unscrew the two panel screws and pull the auxiliary port panel off the system.
4. If an auxiliary valve is already installed, remove this to access the auxiliary port.
5. The auxiliary port contains two electrical connectors of differing sizes. Connect the regenerant pump to the matching electrical connector.
6. Attach the pump to the system by fastening the two outermost screws.
7. Turn the regenerant pump knob 180 degrees counterclockwise to open the pump casing and access the rollers that squeeze tubing to create the peristaltic pressure.
8. Install the regenerant pump tubing on top of the rollers. Align the tubing along the grooves located at each side of the pump opening (see [Figure 37](#)).

Figure 37. Laying the tubing across the regenerant pump rollers



9. Turn the knob clockwise 180 degrees to close the roller access opening. Verify that the tubing extending beyond the regenerant pump casing is correctly positioned between the grooves and is not misaligned or pinched.

Figure 38. Closing the regenerant pump cover after tubing installation

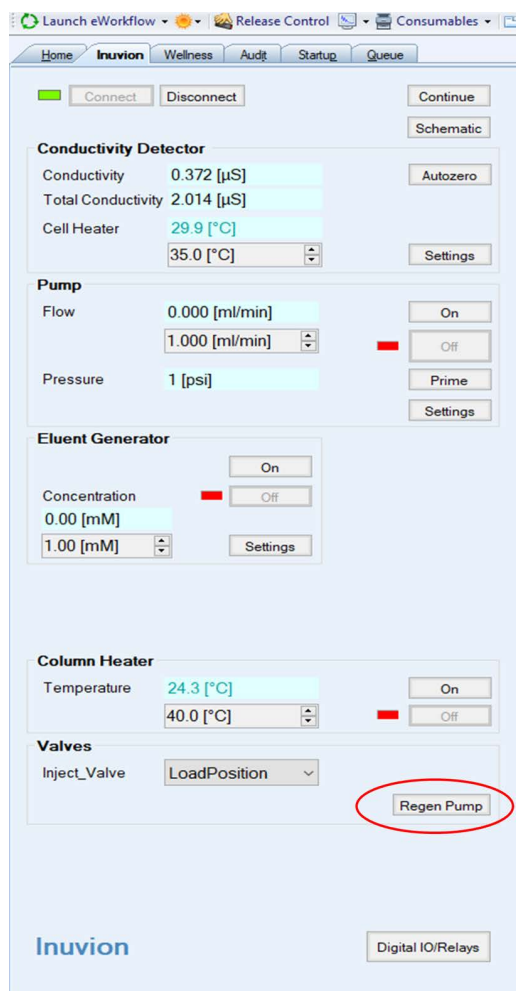


10. Attach the regenerant source tubing to the front end of the regenerant pump tubing, using the connector provided in the Ship Kit. (In terms of flow, the source is to the left and the destination is to the right.)
11. Attach the waste tubing to the other end of the pump and direct it to waste.
12. Reconnect the main power cord and turn on the power.

❖ **Using Chromeleon CDS to hydrate the regenerant pump**

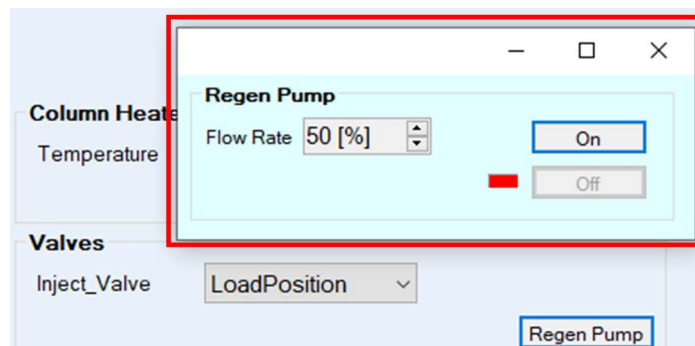
1. On the Inuvion ePanel, select the **Regen Pump** button in the **Valves** section (see [Figure 39](#)).

Figure 39. Hydrate the regenerant pump



2. This opens the **Regen Pump Settings** window. To start the regenerant pump, select the **On** button.
3. Note that the default value for the pump flow rate is 3.00 mL/min, which is adjustable from 0 to 10 mL/min (the minimum rate is 0.10 mL/min) (see [Figure 40](#)). The flow rate is adjustable, based on the suppressor regenerant flow required for an application. The included regenerant pump tubing supports a maximum flow rate of 10 mL/min.

Figure 40. Chromeleon CDS Regen Pump flow rate panel



4. After reaching the desired flow rate, close the **Regen Pump Settings** window. The regenerant pump is now ready for application testing.

Note In instances where the conductivity background increases over time, check the regenerant flow rate. In general, the best practice is to confirm flow rate every other day; also check the flow rate when refilling regenerant and adjust as needed.

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. Replace dirty check valves whenever possible. However, 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 CDS ePanel.
2. Turn off the Dionex Inuvion IC System main power switch on the rear panel.
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. Contamination from tiny particles of dust or dirt on the check valves or piston can affect the inside of the pump head, leading to poor pump performance.

4. Disconnect any tubing and fittings from the inlet and outlet check valve assemblies on the pump head (see [Figure 41](#)).

4 User Maintenance

Cleaning and Replacing the Pump Check Valves

Figure 41. Pump components



Note The inlet check valve assembly housing has a 1/4-28 port. The outlet check valve assembly housing has a 10-32 port (see [Figure 42](#)).

Figure 42. Inlet and outlet check valve assemblies



Inlet check valve assemblies

Outlet check valve assemblies

5. Using a 1/2-inch wrench, loosen both check valve assemblies. Remove the check valve assemblies from the pump head.
6. Remove the cartridges from the housings.
 - For the inlet check valve:
 - Place a new cartridge (P/N 045994), with the double-hole end of the cartridge visible, in the housing.
 - Install the check valve assembly on the bottom of the pump head.
 - For the outlet check valve:
 - Place a new cartridge, with the single-hole end visible, in the housing.
 - Install the check valve assembly on the top of the pump head.

7. 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, make sure the double-hole end of the cartridge is visible (see [Figure 42](#)). If it is not, remove the cartridge from the housing and install it correctly.
 - When placing the cartridge in the outlet housing, make sure the single-hole end is visible (see [Figure 42](#)). 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.

8. Install the inlet check valve assembly (P/N 045722) on the bottom of the pump head.
9. Install the outlet check valve assembly (P/N 045721) on the top of the pump head.
10. 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.

11. Reconnect the liquid lines.
12. Close the front door.
13. Turn on the Dionex Inuvion IC System main power switch.
14. Prime the pump (see [“Priming the Analytical Pump”](#) on [page 46](#)).
15. 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 (18.2 megohm-cm) deionized water that meets the specifications listed in [“Deionized Water Requirements for IC”](#) on [page xvi](#).
4. To reinstall the check valves and complete the procedure, see [Step 6](#) through [Step 14](#) above.

Replacing the Seal Wash Pump

Thermo Fisher Scientific recommends using a seal wash pump when eluents are manually prepared. Seal washing prolongs the life of the pistons and seals by preventing crystallization and particle deposits on the piston surfaces and seals of the pump head. These can affect pump performance.

Note The piston seal wash option is not intended for use with the RFIC setup, which pumps only deionized water.

1. Turn off the Dionex Inuvion IC System main power switch on the rear panel of the system.



DANGER HIGH VOLTAGE—Disconnect the main power cord from its source and also from the rear panel of the Dionex Inuvion IC System.



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



GEFAHR HOCHSPANNUNG—Trennen Sie das Hauptstromkabel von der Quelle und auch von der Rückseite des Dionex Inuvion IC-Systems.

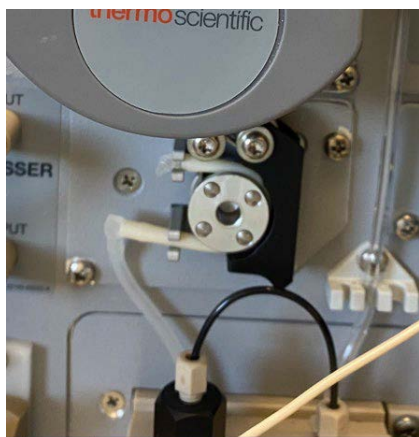
2. Locate the new seal wash pump kit (P/N 22185-62701) (see [Figure 43](#)).

Figure 43. Seal wash assembly kit



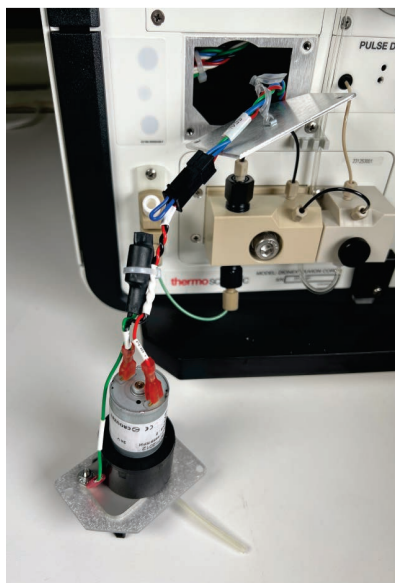
3. Open the front door of the Dionex Inuvion IC System.
4. Disconnect the seal wash IN and OUT tubing.
5. Remove the two metal mounting screws that secure the sheet metal front plate (see [Figure 44](#)). Set the screws aside for reuse later.

Figure 44. Seal wash pump with metal mounting screws visible



6. Pull the seal wash pump assembly off the component panel, and then gently pull the attached cables out of the opening.
7. When both cables are outside the panel, unlink the seal wash pump cable and system connection (see [Figure 45](#)).

Figure 45. Seal wash cable connection



8. Connect the new seal wash pump cable connector to the system cable connector.
9. Gently push both cables inside the Dionex Inuvion IC system.
10. Align the seal wash pump with the component panel opening and attach it to the system with the reserved metal screws.
11. Reconnect both the seal wash IN and OUT tubing.
12. Close the front door.
13. Reconnect the main power cord and turn on the power.

Maintaining and Replacing the Analytical Pump Head

The analytical pump head (P/N 22185-60213) consists of the entire analytical pump head assembly. For expanded views, see [Figure 46](#) and [Figure 47](#).

Figure 46. Analytical pump head components

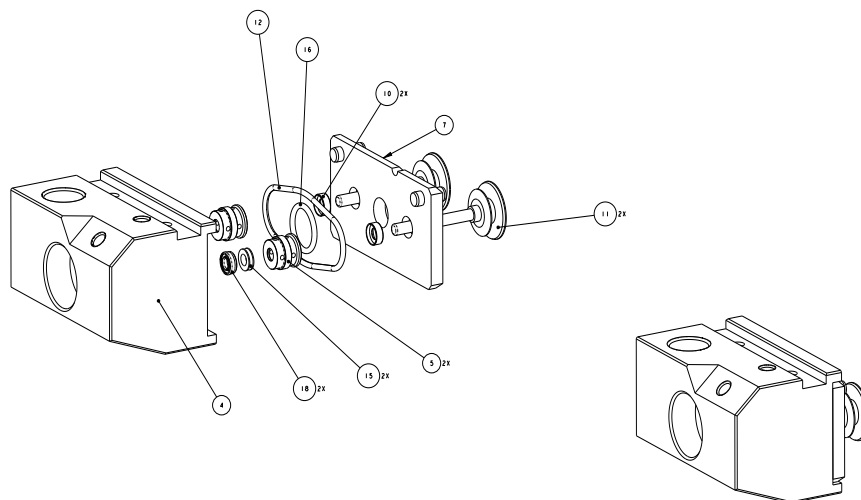
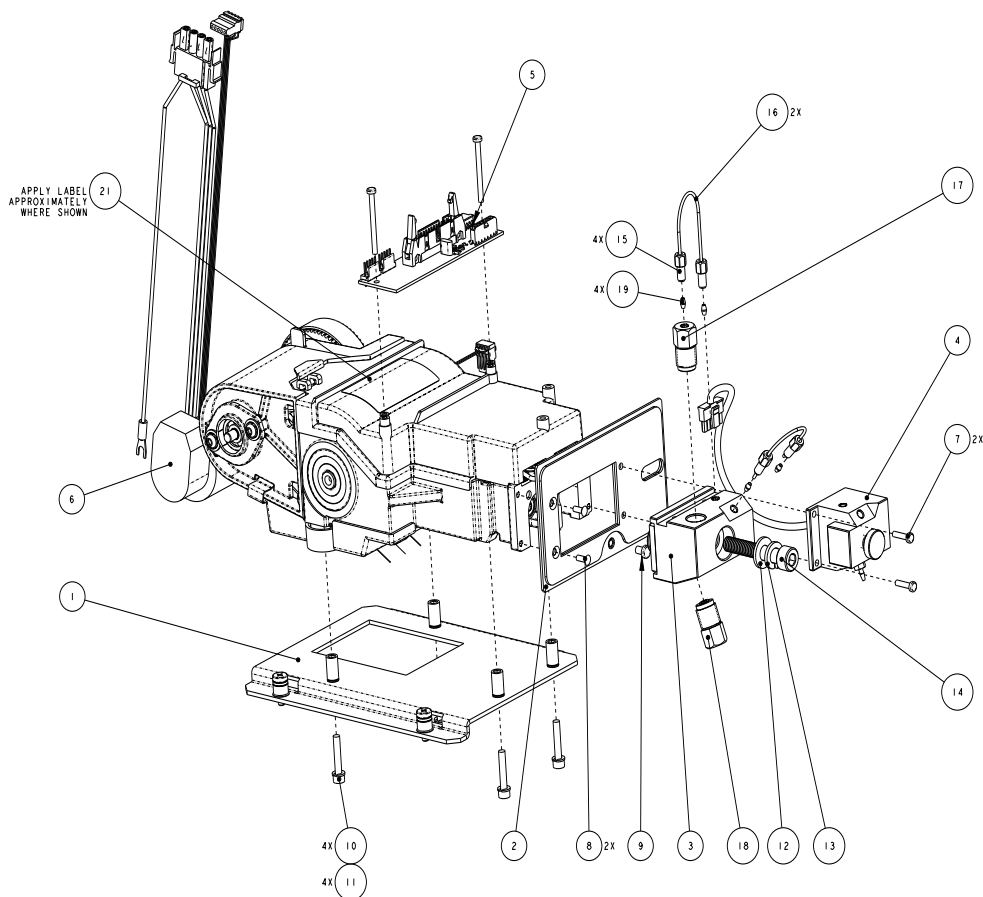


Table 10. Analytical pump head components

Item	Part number	Description	Quantity
1	22185-20211	Pump head block	1
2	22185-20212	Seal wash housing	2
3	22185-60214	Pump head rear plate	1
4	22185-98201	Piston seal	2
5	22185-98202	Sapphire piston	2
6	B51002818	Large O-ring	2
7	22185-98205	Ceramic washer	2
8	B51002819	Small O-ring	1
9	B51000563	Piston seal	2

Figure 47. Analytical pump head components (view 2)**Table 11.** Analytical pump head components (view 2)

Item	Part number	Description	Quantity
1	22185-10201	Mounting plate	1
2	22185-10202	Face plate	1
3	22185-60213	Flangeless pump head	1
4	22185-60206	Transducer	1
5	22185-61008R	Pump patch PCB	1
6	22185-98200	Pump mechanism	1
7	045938	Screw to secure transducer block to mechanism	2
8	049649	Screw to secure face plate to mechanism	2
9	60-045686	Screw, M04 X0 70X006	1
10	60-050485	Screw for mounting plate	4
11	60-050490	Locking washer for mounting plate	4

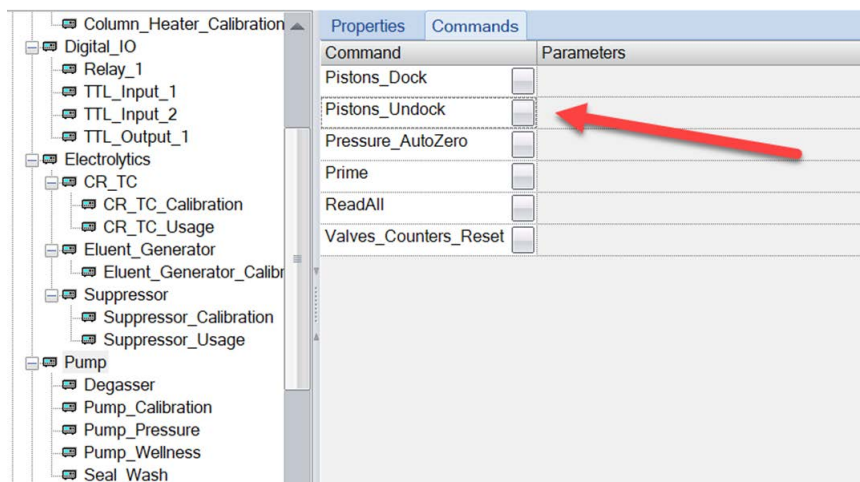
Table 11. Analytical pump head components (view 2), continued

Item	Part number	Description	Quantity
12	00470-06315	Flat washer for M8 bolt	1
13	00671-01-00025	Locking washer for M8 bolt	1
14	C0619-01-00155	M8 bolt	1
15	22000-98001	PEEK fitting	4
16	22185-30201	Tubing	2
17	22185-60208	Outlet check valve	1
18	22185-60209	Inlet check valve	1
19	043276	Double-cone ferrule	4
20	B51003205	Label	1

Replacing the Analytical Pump Head Assembly

1. Verify that the Dionex Inuvion IC System is connected to Chromeleon CDS.
2. Verify that the pump flow is off. If the pump is on, turn off the pump from the Chromeleon CDS ePanel.
3. Open the purge valve.
4. Open the Chromeleon CDS Command window and select the **Pistons_Undock** check box (see [Figure 48](#)).

Figure 48. Analytical pump undock command in Chromeleon CDS



5. Remove all tubing connections to the analytical pump head (see [Figure 49](#)).

Figure 49. Analytical pump head fluidic connections



6. Using a size 6 hexagon wrench, loosen and remove the large, metal pump head screw on the left side of the pump (see [Figure 50](#)). Save the screw for reuse.

Note While loosening screws, support the pump head with your hand to prevent it from falling off the system.

Figure 50. Analytical pump head screw



7. Remove the whole pump head assembly by pulling it straight out of the system (see [Figure 51](#)).

4 User Maintenance

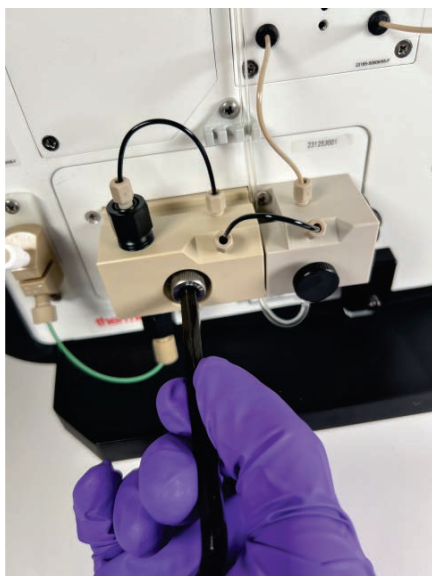
Maintaining and Replacing the Analytical Pump Head

Figure 51. Analytical pump head assembly



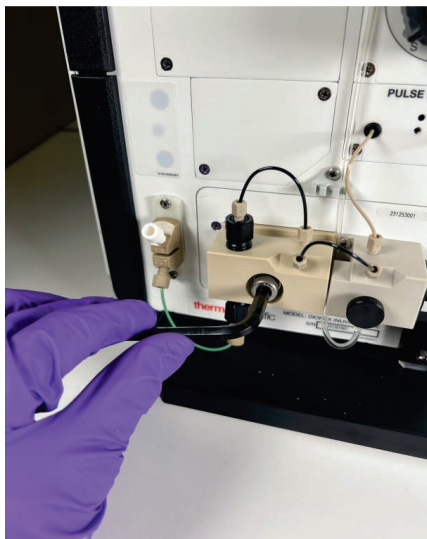
8. Install the replacement pump head assembly in reverse order; start by placing the new pump head assembly into the system.
9. Use the reserved screw to reattach the pump head to the system. Tighten the screw to finger-tight initially (see [Figure 52](#)).

Figure 52. Analytical pump head initial finger-tight procedure



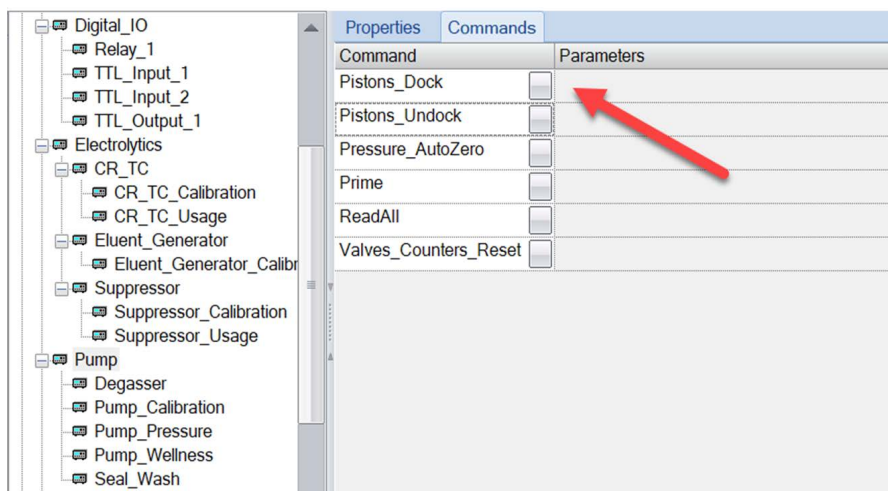
10. Use the short arm of the hexagon wrench to turn the screw 45 degrees (one-quarter turn) to finish tightening the screw (see [Figure 53](#)). **Do not overtighten the screw.**

Figure 53. Analytical pump head final tightening procedure



11. Reconnect all tubing previously removed from the old analytical pump head.
12. Open the Chromeleon CDS Command window and select the **Pistons_Dock** check box (see [Figure 54](#)).

Figure 54. Analytical pump dock command



13. Prime the analytical pump, and then close the purge valve.
14. Start the analytical pump from the Inuvion ePanel.

Replacing Components in the Analytical Pump Head Assembly

The following parts can be ordered as replacement or spare parts for the analytical pump head assembly.

Table 12. Analytical pump head components

Part number	Item
B51000563	Piston seal
B51002818	O-ring, 32-mm ID x 35-mm OD
B51002819	O-ring, 11-mm ID x 14-mm OD
22185-98201	Duron seal, 1/8-in
22185-98202	Piston
045994	Check valve cartridge

Removing and Installing the Check Valve Cartridges

1. To prevent contamination of analytical pump parts, put on powder-free, oil-free, and particle-free disposable laboratory gloves before disassembling the analytical pump head.

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

2. Using a 1/2-in wrench (P/N 062336), loosen both check valve assemblies and remove them from the analytical pump head.
3. Remove both check valve cartridges from the housings.
4. **For the inlet check valve:** Place a new cartridge (P/N 045994) into the housing, ensuring that the double-hole end of the cartridge is visible and facing out.
5. Reinstall the check valve assembly on the bottom of the analytical pump head.
6. **For the outlet check valve:** Place a new cartridge into the housing, ensuring that the single-hole end is visible and facing out.
7. Reinstall the check valve assembly on the top of the analytical pump head.

❖ To remove and replace the pistons, analytical pump seals, and O-rings

1. Remove the any tubing connections on the analytical pump head that connect to the transducer.

2. Use a size 6 hexagon wrench to loosen and remove the large, metal analytical pump head screw on the left side of the analytical pump. Save the screw for reuse.

Note While loosening screws, support the analytical pump head with your hand (see [Figure 55](#) and [Figure 56](#)).

3. Disassemble the analytical pump head.
4. Remove the pistons from the analytical pump head (see [Figure 55](#)); replace the pistons as needed.

Figure 55. Removing the piston from analytical pump



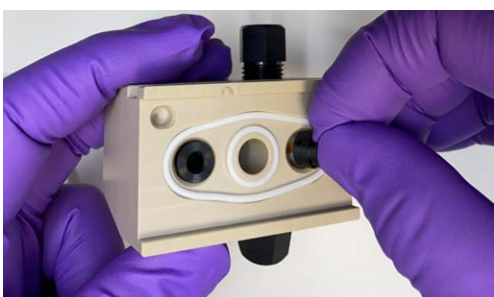
5. Remove the rear seal plate (see [Figure 56](#)).

Figure 56. Analytical pump head rear seal plate



6. Remove the black seal wash bodies (see [Figure 57](#)).

Figure 57. Seal wash bodies



4 User Maintenance

Replacing Components in the Analytical Pump Head Assembly

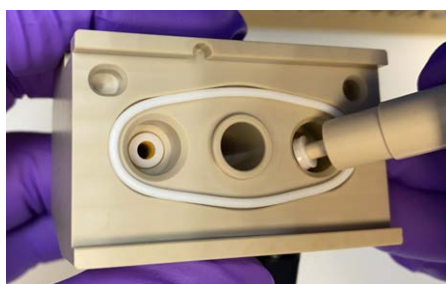
7. Remove the white support rings (see [Figure 58](#)) with the seal tool (P/N 22185-20210). Be careful, as the support rings tend to drop or fall and may become lost.

Note If the existing support rings are lost or damaged, you must order them separately. The Dionex Inuvion Preventive Maintenance Kit does not include support rings.

Figure 58. Support ring



Figure 59. Supporting rings visible after seal wash body removal

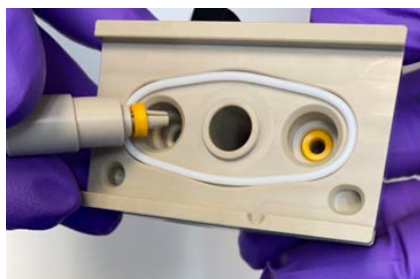


8. Remove the orange high-pressure seals (see [Figure 60](#) and [Figure 61](#)) with the seal tool (P/N 22185-20210) included in the Ship Kit.

Figure 60. Seal tool

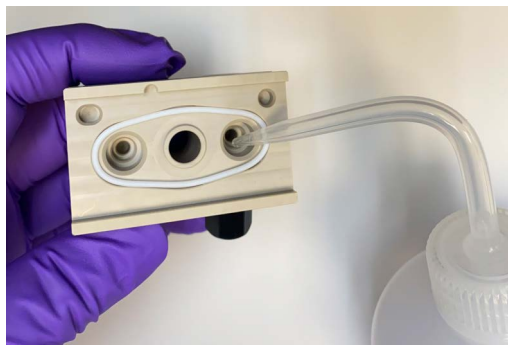


Figure 61. Removing an analytical pump seal with the seal tool



9. Pipette a few drops of deionized water or isopropanol onto the edge in the analytical pump head (see [Figure 62](#)).

Figure 62. Adding deionized water or isopropanol onto the analytical pump head components



10. Clean the white support rings, using deionized water or isopropanol, a cleaning swab, and a lint-free cloth or tissue.

Note Support rings are non-wearing parts, which means they are usually not replaced during preventive maintenance.

11. Use the insertion tool to stack the piston seal and support ring in correct order:
 - Correct assembly order: white support ring first, followed by the orange piston seal.
 - Correct piston seal orientation: spring facing the analytical pump head away from the tool.

Figure 63. Orange piston seal (spring side up) and white support ring



Piston seal



Support ring

Figure 64. Piston seal and support ring placed on the seal tool (spring side up)



12. Lubricate the seal with deionized water or isopropyl alcohol. Then, begin pushing the piston seal tool into the analytical pump head until it hits the bottom (see [Figure 65](#)). Repeat this action for the other side.

4 User Maintenance

Replacing Components in the Analytical Pump Head Assembly

Figure 65. Inserting the piston seal with the piston seal tool



13. Remove the piston seal tool from the analytical pump head; the piston seal and the support ring should remain in the analytical pump head (see [Figure 66](#)).

Figure 66. View of piston seal and support ring in the analytical pump head



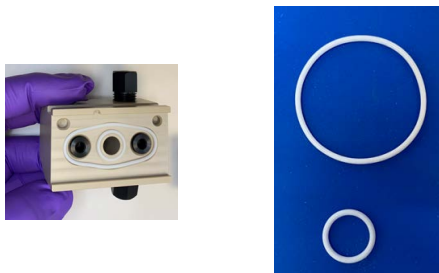
14. Reinstall the black seal wash bodies into analytical pump head, with the larger diameter hole facing up (see [Figure 67](#)). Be sure the orientation is correct.

Figure 67. Rear seal wash body



15. Replace both the white large and small seal rings (see [Figure 68](#)).

Figure 68. Seal rings



16. From the channel side (see [Figure 69](#)), push the seal wash seals out of the rear seal plate.

Figure 69. Seal wash seals and channel side of rear seal plate

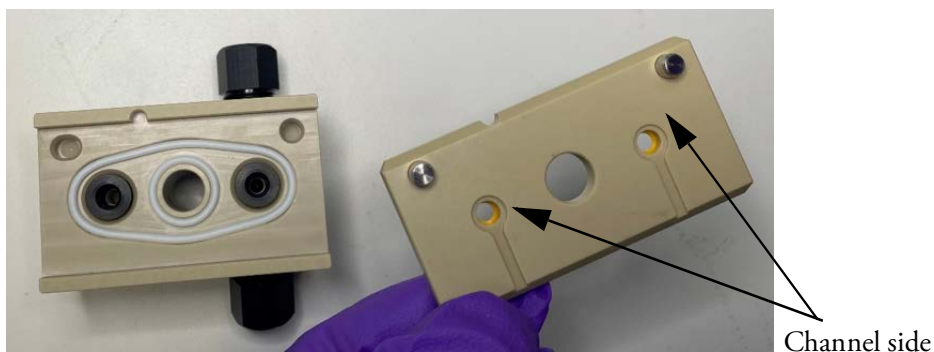
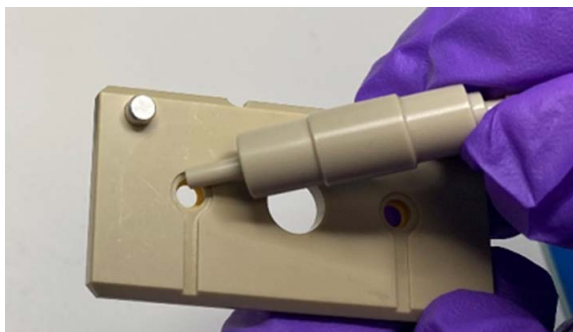


Figure 70. Removing the seal wash rear seals with the seal wash tool



17. Clean the plate with deionized water or isopropyl alcohol, and wipe it dry with a lint free tissue.
18. Push the new rear seals into the holes of the rear seal plate (see [Figure 71](#)).

Note Unlike the main piston seals, the yellow seal wash seals have no correct orientation, and may be installed facing either direction.

Figure 71. Installing the rear seals

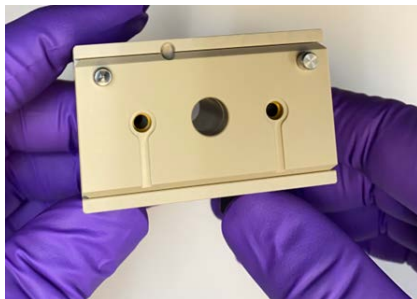


19. Reinstall the rear seal plate (see [Figure 72](#)). Rear seals should face the analytical pump head.

4 User Maintenance

Installing or Replacing the Eluent Valve

Figure 72. Installing the analytical pump rear plate



20. Soak a clean, lint-free wipe with isopropyl alcohol and wipe both pistons (P/N 222185-98202). Check each piston surface for scratches or contamination and replace, if necessary.
21. Finish reassembling the analytical pump head by rotating and pushing both pistons into the analytical pump head until they hit the bottom (see [Figure 73](#)).

Figure 73. Reinstalling the pistons into the analytical pump head assembly



22. Reinstall the analytical pump head. For instructions, see [“Analytical pump head components \(view 2\)”](#) on [page 75](#).

Installing or Replacing the Eluent Valve

The eluent shutoff valve (PN 22185-63027) controls the flow from the eluent bottle. The valve opens automatically when the analytical pump is started and closes when the analytical pump is turned off. This lets you perform service procedures on analytical pump components without eluent leaks occurring.

❖ To replace the eluent valve

1. Locate the new eluent valve and turn off the Dionex Inuvion IC System main power switch.
2. Open the Dionex Inuvion IC System front door to access the component panel.

3. Disconnect and remove the PEEK tubing from the **IN** and **OUT** ports of the eluent valve (see [Figure 74](#)). This prevents eluent leaks.

Figure 74. Eluent valve



4. Unscrew and remove the two metal screws securing the valve mounting plate to the component panel (see [Figure 75](#)). **Save the screws.**

Figure 75. Eluent valve control wires



5. Slowly pull the eluent valve straight out, being careful not to damage the attached cable.
6. Disconnect the connector with the blue control wires before completely removing the valve from the system.
7. Connect the cable from the new valve to the Dionex Inuvion IC system cable. Feed the cables back inside the system.
8. Using the metal screws, attach the new valve to the component panel. Make sure the eluent **IN** port is positioned at the top when installed.
9. Reconnect the tubing to both ports.
10. Turn on the Dionex Inuvion IC system main power switch.
11. Prime the analytical pump (see [“Priming the Analytical Pump”](#) on [page 46](#)).

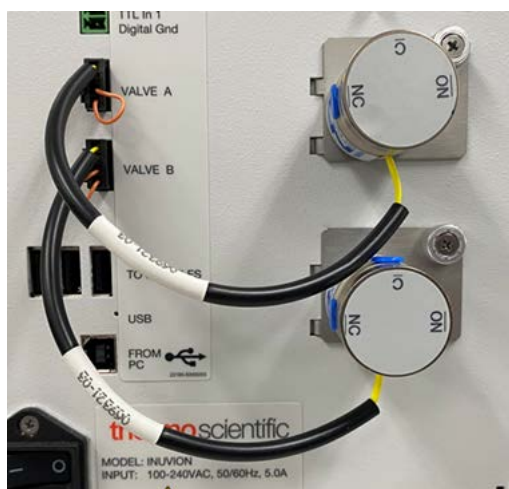
Installing or Replacing the Low-Pressure Valve

A low-pressure three-way valve (P/N B51001290) can be used for on/off control of liquid flow (for example, to turn flow on and off from a reagent or external regenerant bottle).

❖ To install a low-pressure valve

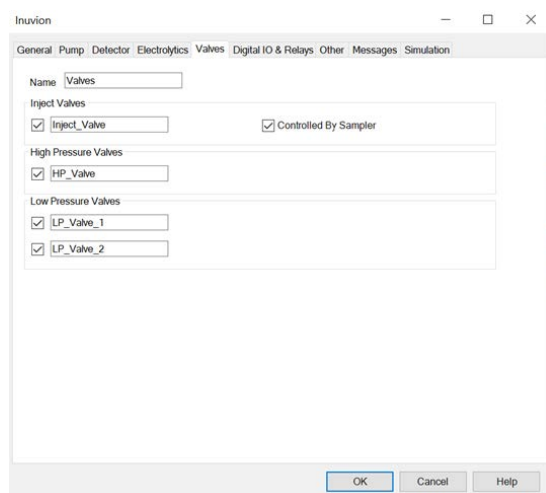
1. Locate the Low-Pressure Valve Kit (P/N 22185-60701).
2. Locate the low-pressure valve mounting locations on the rear of the system (see [Figure 76](#)).
3. Insert the two tabs on the valve mounting plate into the slots. Tighten the thumbscrew.
4. Connect the valve's power connector to the Valve A or B socket.

Figure 76. Installing the low-pressure valve



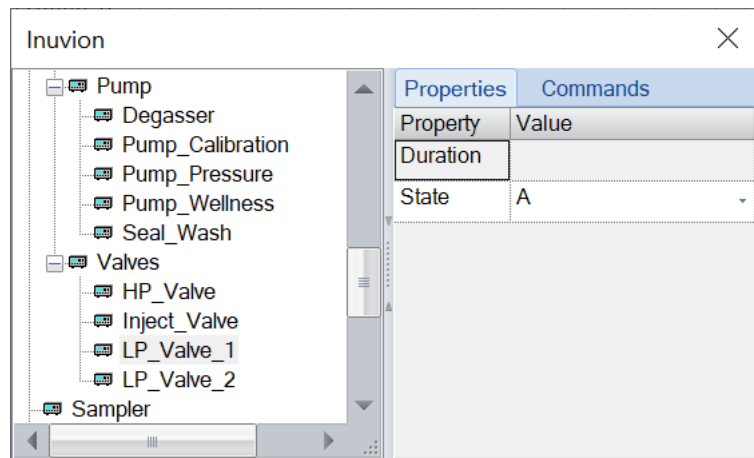
5. When the low-pressure valve is installed properly, Chromeleon CDS will automatically detect it.

Figure 77. Chromeleon CDS Valves tab page



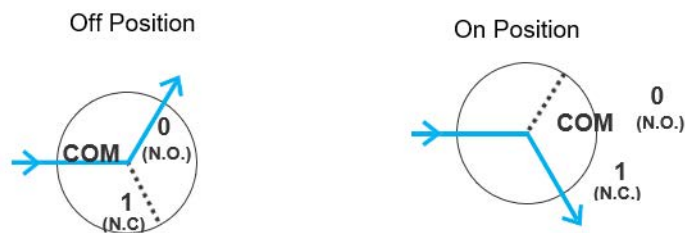
6. To control the valve in Chromeleon CDS, use one of the following options:
 - Add commands to an instrument method.
 - Select commands in the Command window.

Figure 78. Chromeleon CDS Command window



7. Plumb the valve as required for the application. [Figure 78](#) shows a plumbing example for a three-way valve.

Figure 79. Low-pressure valve flow schematics



N.C. = normally closed
N.O. = normally open
COM = common flow

Note: When the valve is off (not energized), port 0 is open (N.O.) and port 1 is closed (N.C.). Conversely, when the valve is on, port 1 is open and port 0 is closed.

Replacing the Leak Sensor

The Dionex Inuvion IC System leak sensor detects leaks via an infrared emitter path and the leak sensor board circuitry. The system can also detect when the leak sensor is missing.

❖ **To replace the leak sensor**

1. Locate the new leak sensor assembly (P/N 22185-60201) (see [Figure 80](#)).

Figure 80. Leak sensor assembly

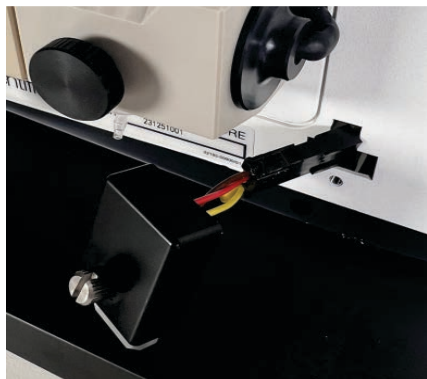


2. Turn off the Dionex Inuvion IC System main power switch.
3. Open the Dionex Inuvion IC System front door.
4. Loosen the screw on the front of the leak sensor (see [Figure 81](#)). The screw should remain attached to the sensor.

Figure 81. Leak sensor with mounting screw



5. Pull the leak sensor off the component panel and then gently pull the attached cables out of the opening.
6. When both cables are outside the panel, unlink the system and leak sensor cable connection (see [Figure 82](#)).

Figure 82. Leak sensor cable

7. Connect the new leak sensor cable connector to the system cable connector.
8. Gently push both cables inside the Dionex Inuvion IC system.
9. Align the leak sensor with the component panel opening and finger-tighten the thumbscrew on the front of the sensor.
10. Check that the leak sensor is not in contact with the bottom of the drip tray, which is located at the bottom of the component panel.
11. Close the front door.
12. Turn on the Dionex Inuvion IC System main power switch.

Removing an Expended Eluent Generator Cartridge (Dionex EGC)

❖ To remove an old Dionex EGC

1. From the Chromeleon CDS ePanel, turn off the analytical pump.
2. Disconnect the Dionex EGC electrical cable from the **EGC** connector on the Dionex Inuvion IC System top cover (see [Figure 13](#)).
3. Remove the Dionex EGC **VENT** line from the cartridge by unscrewing the luer lock from the luer adapter.

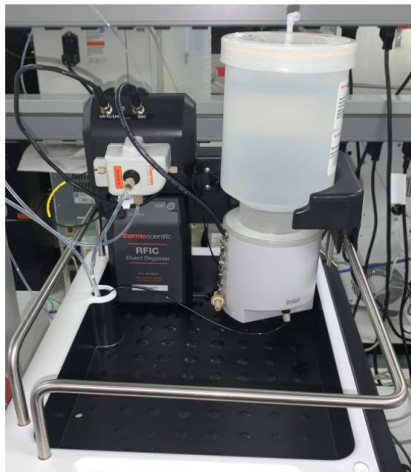
Tip If necessary, use a wrench to hold the luer adapter in place while unscrewing the vent line.

4. 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 6](#)).
5. Lift the Dionex EGC straight up and out of the cartridge holder.
6. Turn the Dionex EGC upside down and set it in the cartridge service area on top of the Dionex Inuvion IC System (see [Figure 83](#)).

4 User Maintenance

Installing an Eluent Generator Cartridge (Dionex EGC)

Figure 83. Dionex EGC service area within the eluent organizer area



7. Disconnect the **EGC IN** and **EGC OUT** lines from the **INLET** and **OUTLET** ports on the Dionex EGC.
8. 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.

Installing an Eluent Generator Cartridge (Dionex EGC)



CAUTION The Dionex EGC contains one of the following: a corrosive base (KOH), 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), 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), eine korrodierende Säure (MSA) oder eine konzentrierte K_2CO_3 -Lösung. Tragen Sie daher beim Umgang mit Kartusche eine Schutzbrille und Handschuhe.

❖ To install the new Dionex EGC

1. Remove the new Dionex EGC from the shipping box.

Note Save the Dionex EGC shipping container; it may be required for storage or disposal of the cartridge.

2. The Dionex EGC cable is attached to a vent fitting with a cable tie. Cut the cable tie to release the cable. Confirm that the 10-32 fitting plug in the vent opening is tightened. This prevents leakage during installation.

3. Orient the Dionex EGC with the fittings facing up and remove the plugs from the **INLET** and **OUTLET** ports.
4. Set the Dionex EGC in the service area on top of the Dionex Inuvion IC System. Orient the cartridge with the electrical cable toward the Dionex EGC holder.
5. Connect the **EGC IN** line to the **INLET** port on the Dionex EGC.
6. Locate the yellow 0.5 mL/min, 7 MPa (1000 psi) backpressure coil (P/N 053765) in the Dionex Inuvion IC System Ship Kit (P/N 064375).
7. Connect one end of the backpressure coil to the **OUTLET** port on the Dionex EGC. 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.

8. Turn the Dionex EGC over so the fittings face down. Shake the cartridge vigorously and tap it with the palm of your hand 10 to 15 times to dislodge all bubbles trapped in the eluent generation chamber.



CAUTION The Dionex EGC contains one of the following: a corrosive base (KOH), 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), 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), eine korrodierende Säure (MSA) oder eine konzentrierte K_2CO_3 -Lösung. Tragen Sie daher beim Umgang mit Kartusche eine Schutzbrille und Handschuhe.

9. Install the vent fitting in the vent opening of the Dionex EGC.
10. Slide the Dionex EGC straight down onto the holder until it stops. Ensure 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.

11. Remove the plug from the **EGC** connector on the Dionex Inuvion IC System top cover.
12. Orient the black 4-pin electrical cable connector for the Dionex EGC. Push the cable connector onto the **EGC** connector on the Dionex Inuvion IC System top cover. Twist the ring on the cable connector finger-tight to secure it.

4 User Maintenance

Installing an Eluent Generator Cartridge (Dionex EGC)

13. 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 condition the Dionex EGC

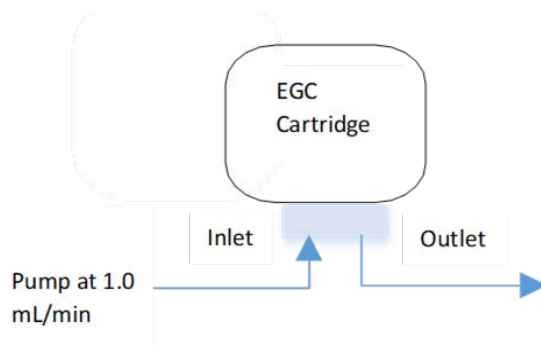
Always condition a new Dionex EGC for 30 minutes before initial use. For most cartridge types, this requires directing the backpressure coil connected to the cartridge outlet to waste, and then generating 50 mM of eluent at 1.00 mL/min for 30 minutes. For the Dionex EGC 500 K₂CO₃, generate 9 mM of eluent at 1.00 mL/min for 30 minutes.

1. Set a temporary waste container (for example, a beaker) on top of the Dionex Inuvion IC System.
2. Connect one end of the backpressure coil to the Dionex EGC **OUTLET** port. Direct the yellow backpressure coil from the Dionex EGC **OUTLET** port to the waste container. (This is a temporary connection.)

Note A minimum of 14 MPa (2000 psi) of backpressure is required.

3. On the top of the Dionex EGC, unscrew the vent fitting (on a high-pressure cartridge) or 10-32 fitting plug (on a standard-pressure cartridge). Save the fitting for reuse.
4. Connect the vent line to the vent opening.
5. From the Chromeleon CDS ePanel, set the flow rate to 1.0 mL/min (see [Figure 84](#)). Select **On** to activate the analytical pump.

Figure 84. Flush and condition the Dionex EGC



6. Set the Dionex EGC concentration to the value required for the cartridge type. For a Dionex EGC 500 K_2CO_3 , set the concentration to 9 mM. For all other cartridge types, set the concentration to 50 mM.
7. Flush the Dionex EGC for 30 minutes and then turn off the Dionex EGC and analytical pump.
8. Disconnect the backpressure coil from the Dionex EGC **OUTLET** port.

IMPORTANT To ensure proper ventilation, always connect the luer fitting and vent line to the Dionex EGC before operation. If you need to remove the Dionex EGC from the system, reinstall the vent fitting or 10-32 fitting plug to prevent leaks.

9. From the Chromeleon CDS ePanel, select these operating conditions:
 - a. Set the analytical 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 analytical pump flow remains on during the conditioning procedure, no flow will reach either the suppressor or Dionex CR-TC.

10. Verify that the eluent bottle is filled with ASTM filtered, Type I (18.2 megohm-cm) deionized water that meets the specifications listed in “[Deionized Water Requirements for IC](#)” on [page xvi](#).
11. Turn on the analytical pump.
12. Run at the selected settings (1.00 mL/min at 50 mM) for 30 minutes.
13. Turn off the analytical pump.
14. Disconnect the Dionex EGC electrical cable from the **EGC** connector.
15. Remove the temporary backpressure tubing from the waste container and remove the waste container.
16. Lift the Dionex EGC out of the holder, turn it over, and set it in the service area.
17. Disconnect the backpressure coil from the Dionex EGC **OUTLET** port.
18. Connect the Dionex EGC OUT line from the holder to the Dionex EGC **OUTLET** port.
19. Turn over the Dionex EGC (fittings facing down) and check for bubbles. If necessary, shake and tap the cartridge to remove bubbles.
20. Reinstall the Dionex EGC in the holder.
21. Reconnect the Dionex EGC electrical cable.

22. Reconnect the Dionex CR-TC electrical cable.

The new Dionex EGC is ready for routine operation.

Installing or Replacing the Continuously Regenerated Trap Column (Dionex CR-TC)

Note Using an eluent generation setup (including a Dionex EGC) also requires the use of a Dionex CR-TC.

This section details the installation process for the continuously regenerated trap column. For a list of Dionex CR-TCs that are compatible with the system, see [Chapter 2, “Description.”](#)

Thermo Fisher Scientific field service engineers can install the Dionex CR-TC during the initial system installation. Users can also install and/or replace the Dionex CR-TC.

1. To start, you will need the Dionex CR-TC and any tubing and connectors included in the ship kit, including the following items:
 - a. 1/8-inch tubing with fittings/ferrules
 - b. ¼-28 to 10-32 union
 - c. PEEK tubing with fittings/ferrules
2. Remove any packaging, including the shipping plugs on the Dionex CR-TC.
3. Turn off and unplug the Dionex Inuvion IC System.
4. Connect the PEEK tubing from the Dionex EGC outlet to the Dionex CR-TC **ELUENT IN** port.
5. Connect the PEEK tubing to the ¼-28 to 10/32 union. Do not over-tighten the connection; a one-quarter turn of the wrench is adequate.
6. Connect the ¼-inch tubing to the other end of the union.
7. Connect the Dionex CR-TC **ELUENT OUT** to the Dionex CR-TC **REGEN IN**.
8. Connect the Dionex CR-TC **REGEN OUT** to the long translucent tubing. This enables waste liquid to be directed into an adjacent waste beaker.
9. From the Inuvion ePanel in Chromeleon CDS, turn on the analytical pump with the flow rate set at 1 mL/min. The pressure will increase; wait for 10 minutes.
10. Turn off the analytical pump by selecting the Off button on the Inuvion ePanel; the pressure will drop.
11. Disconnect and remove the **REGEN OUT**, **REGEN IN**, and **ELUENT OUT** tubing from the Dionex CR-TC. Do not disconnect the **ELUENT IN** port tubing.
12. Mount the Dionex CR-TC on the mounting pins.

13. Connect the **REGEN OUT** tubing and direct it to waste.
14. Connect the Dionex CR-TC **REGEN IN** to the suppressor **REGEN OUT** tubing.
15. Connect the Dionex CR-TC **ELUENT OUT** to the Dionex EGC degasser **ELUENT IN** tubing.
16. Connect the Dionex CR-TC electronics cable to the CR-TC port on the Dionex Inuvion IC System.

Installing or Replacing the Ion Chromatography Column

Users will periodically install and replace IC columns throughout the life of the system. For example, split peaks may be a sign of column void, in which case the column should be replaced. Other indications that a column should be replaced include insufficient peak resolution, peak splitting, and missing peaks.

❖ Items needed

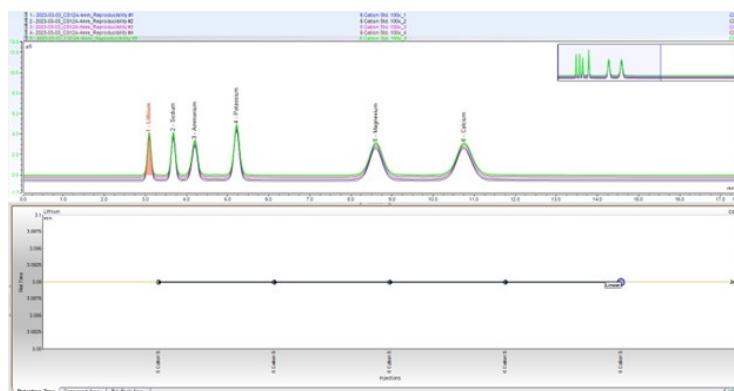
- 500 mL plastic waste beaker
 - Analytical column
 - Guard column
 - Eluent in the eluent bottle (or DI water if using eluent generation)
 - Standard pre-cut PEEK tubing or Viper tubing
1. Turn off the Dionex Inuvion IC System.
 2. Open the column packaging. You'll see several items inside: the column, a QAR form, and an instruction sheet. Place these items on a clean working surface near the Dionex Inuvion IC System.
 3. If you are replacing a column, open the system front door and remove the old column. Save any fittings for subsequent installation of the new column.
 4. Flush the column storage solution. Prepare eluent or set the eluent concentration to that listed in the QAR if using eluent generation.
 5. Remove the plugs from the guard column and connect the analytical pump outlet to the guard column inlet.
 6. Note the direction of flow and verify that the column is oriented correctly.
 7. Connect the guard column outlet to the analytical column inlet.
 8. Rest the end of the guard column outlet on the edge of a waste beaker or other waste outlet.

4 User Maintenance

Installing or Replacing the Carbonate Removal Device (Dionex CRD)

9. From the Chromeleon CDS ePanel, turn on the analytical pump and set the eluent flow to the standard rate recommended for the column: 0.25 mL/min for 2 mm.
10. The backpressure will increase, and eluent will drip from the column into the waste beaker.
11. Flush the column for 30 minutes, and then turn the analytical pump off on the Chromeleon CDS.
12. Connect the analytical column outlet to the suppressor **ELUENT IN** port.
13. On the Chromeleon CDS ePanel, turn on the analytical pump. Set the eluent flow to the standard rate recommended for the column: 0.25 mL/min for 2 mm.
14. Flush the column for 30 minutes and then turn off the analytical pump.
15. Once a steady baseline is reached, begin column injection of standards; once reproducible injection times are observed, column equilibration is complete. The following image shows multiple runs of standard overlaid.

Figure 85. Multiple runs of standard overlaid



Installing or Replacing the Carbonate Removal Device (Dionex CRD)

❖ Items needed

- Dionex CRD 200, 2 mm (P/N 062986)
 - 5 cc disposable plastic syringe (P/N 016640)
 - 10-32 luer adapter (P/N 046888)
 - Degassed DI water
1. Place the required items on a clean work surface near the Dionex Inuvion IC System. Unbox the Dionex CRD and remove the plugs and any other packing material.
 2. To hydrate the Dionex CRD, push approximately 3 mL of degassed DI water through the **ELUENT IN** port, using the 5 cc syringe and 10-32 luer adapter.

3. Discard the effluent from the **ELUENT OUT** port into the waste beaker.
4. Using the 5 cc syringe, push 5 mL of degassed water through the **REGEN IN** port.

IMPORTANT Use gentle (but steady) pressure to prevent damage to the membrane of the Dionex CRD.

5. Discard effluent from the **REGEN OUT** port into the waste beaker.
6. Wait approximately 10 minutes to fully hydrate the membrane in the Dionex CRD.
7. Then, connect the suppressor **ELUENT OUT** to the Dionex CRD **ELUENT IN**.
8. Place the Dionex CRD in the holder to the left of the suppressor.
9. Connect the CRD **ELUENT OUT** to the conductivity cell **INPUT**.
10. Direct the CRD **REGEN OUT** to waste.
11. Connect the CRD **REGEN IN** to the suppressor **REGEN OUT**.

Installing the Auxiliary Valve

The auxiliary valve is used for sample preparation and as an additional injection valve. Auxiliary valves are available in two different port configurations:

- The 10-port valve kit (P/N 22185-62703)
 - The 6-port valve kit (P/N 22185-62704)
1. To start, locate the auxiliary valve kit and a medium-sized Phillips-head screwdriver.
 2. Turn off the Dionex Inuvion IC System main power switch on the rear panel of the system.
 3. Open the system door and find the accessory panel located to the left of the main injection valve. The auxiliary valve and regenerant pump use the same space on the component panel. If neither is installed, the port is covered with a metal panel; remove the panel by using a Phillips-head screwdriver to unscrew the two panel screws, and then pull the panel off the system.
 4. If a regenerant pump is installed, disconnect the electrical cable and set the pump aside.
 5. The accessory opening contains two electrical connectors of differing sizes. Connect the auxiliary valve to the matching electrical connector.
 6. Secure the valve to the system by aligning the holes so that the two outermost screws can be tightened in place.
 7. Close the system door and turn on the main power switch.

Installing or Replacing the Column Heater

1. Locate the column heater kit (P/N 22185-62400) and a medium-sized flathead screwdriver.
2. Open the front door of the system and locate the column mounting plate at the right side of the system.
3. Remove the magnetic column heater cover by pulling it straight out.
4. Unscrew the three screws for the column mounting plate and remove it by pulling it straight out.
5. Align the column heater with the four pegs and electrical connector on the system component panel; then push the column heater into place.
6. Use the thumbscrews to fasten the column heater to the mounting plate. You will need to use a screwdriver for the top screw, due to limited finger access.
7. Install the columns in the new heater by gently snapping them into the clips, and then snap the magnetic cover back into place.
8. Close the system door and turn on the main power switch.

Installing and Pressurizing the Digital Gas Pressure Regulator

The Digital Pressure Regulator Kit (P/N 22185-62706) contains the following items.

Table 13. Digital Pressure Regulator Kit

Quantity	Description	Part number
1	Digital pressure regulator	22185-60706
1	Tubing, air line, 10 ft	052297
2	Tubing assembly for gas source	063942
1	Fitting for tubing	063505
5	Hex bolts	049538
2	Stainless steel screw	045795

Installing the Digital Pressure Regulator

1. Unpack the components from the Digital Pressure Regulator Kit and place them on a clean surface near the Dionex Inuvion IC System.
2. Turn off the Dionex Inuvion IC System main power switch on the rear panel of the system.

3. Locate the digital display blank cover just above the conductivity detector (see [Figure 86](#)). Remove the two screws on the cover plate and save the screws for reinstallation.

Figure 86. Blank cover without digital pressure regulator display



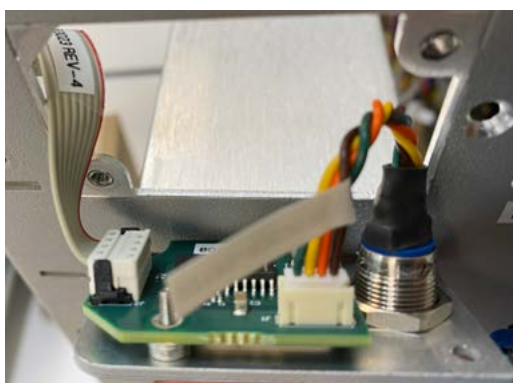
4. Loosen the twist tie securing the cable to the cover plate (see [Figure 87](#)).

Figure 87. Digital display back cable



5. Connect the digital display cable to the digital display connector (see [Figure 88](#)).

Figure 88. Digital pressure regulator cable connection



6. Place the digital regulator display into position (see [Figure 89](#)). Fasten both screws to secure the display to the assembly.

4 User Maintenance

Installing and Pressurizing the Digital Gas Pressure Regulator

Figure 89. Digital regulator display view



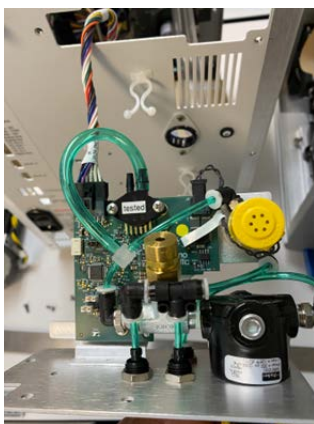
7. On the back of the Dionex Inuvion IC System, remove the five 3 mm hex bolts securing the blank cover (see [Figure 90](#))

Figure 90. Digital pressure regulator port location (with port cover)



8. Untie the twist tie securing the inside cable to the back of the cover plate.
9. Connect this back cable to the digital pressure regulator connector (see [Figure 91](#)).

Figure 91. Digital regulator cable connection



10. Put the digital pressure regulator assembly into position and fasten all five hex bolts (see [Figure 92](#)).

Figure 92. Installed digital pressure regulator

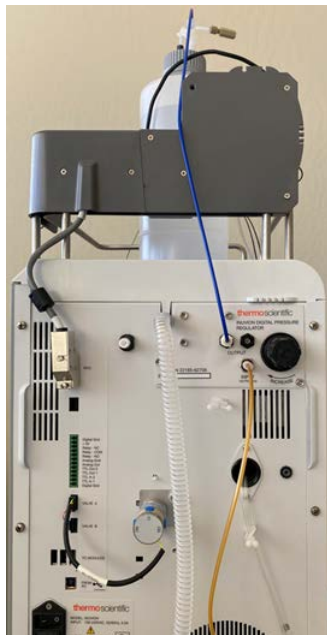
Connecting a Gas Source to the Pressure Regulator

1. Locate the air line tubing (P/N 052297) in the kit.
2. Push one end of the orange tubing into the Input connection on the digital pressure regulator.
3. Connect the other end of the orange tubing to a clean helium or nitrogen source regulated to between approximately 172 and 345 kPa (25 and 50 psi). If necessary, use the adapter to connect the tubing to the gas source.
4. Locate a gas source tubing assembly (see [Figure 93](#)) in the kit.

Figure 93. Gas source tubing assembly

5. Remove the black cap from the quick-disconnect fitting on the blue tubing and twist off the bottom half of the quick-disconnect fitting. (This half of the fitting is not needed.)
6. Push the fitting onto the Output connection on the regulator (see [Figure 94](#)) and twist to complete the connection.

Figure 94. Gas connections to the regulator and eluent bottle



7. Push the luer/valve fitting onto the luer fitting on the eluent bottle cap. This is the gas shutoff valve for the eluent bottle.
8. Turn on the Dionex Inuvion IC System main power switch.

Pressurizing the Eluent Bottle

IMPORTANT Before pressurizing the eluent bottle, connect the liquid line from the pump to the eluent bottle and fill the eluent bottle.



WARNING Risk of bottle rupture or leakage: If pressurized bottles are required, use only 2-liter bottles (P/N 046548) with caps.



CAUTION Never pressurize eluent bottles above 69 kPa (10 psi). Pressurizing an eluent bottle above this limit can cause the eluent bottle to leak or burst.



CAUTION Never pressurize eluent bottles directly from a gas source. Pressurize bottles only when using the Dionex digital pressure regulator (PN 22185-62706); otherwise, the eluent bottle may leak or burst.



CAUTION Avoid connecting the inert gas supply line to two or more instruments unless a suitable regulator supplies the Dionex Inuvion IC System at 100 psi (690 kPa) or less.



AVERTISSEMENT Risque de rupture ou de fuite du bidon : Si des bidons sous pression sont nécessaires, utiliser uniquement des bidons de 2 litres (réf. 046548) munis de bouchons.



MISE EN GARDE Risque de rupture ou de fuite du bidon : Ne pas mettre les bidons d'éluant sous pression à plus de 10 psi (69 kPa).



MISE EN GARDE Ne jamais mettre les bidons d'éluant sous pression directement à partir d'une source de gaz. Mettre les bidons sous pression uniquement lors de l'utilisation du régulateur numérique Dionex (réf. 22185-62706) ; dans le cas contraire, le bidon d'éluant risque de fuir ou d'éclater.



MISE EN GARDE Éviter de raccorder la conduite d'alimentation en gaz inerte à deux instruments ou plus, à moins qu'un régulateur adapté n'alimente le système de CEI Dionex Inuvion à 100 psi (690 kPa) ou moins.



ACHTUNG Gefahr des Bruchs oder Auslaufens der Flasche: Wenn Druckflaschen erforderlich sind, verwenden Sie nur 2-Liter-Flaschen (Art.-Nr. 046548) mit Verschluss.



VORSICHT Setzen Sie Eluentenflaschen niemals unter einen Druck von mehr als 69 kPa (10 psi). Wird eine Eluentenflasche über diesen Grenzwert hinaus unter Druck gesetzt, kann dies dazu führen, dass die Eluentenflasche ausläuft oder platzt.



VORSICHT Setzen Sie Flaschen nur unter Druck, wenn Sie den digitalen Druckregler von Dionex (Art.-Nr. 22185-62706) verwenden. Andernfalls kann die Eluentenflasche auslaufen oder platzen.



VORSICHT Vermeiden Sie den Anschluss der Inertgasversorgungsleitung an zwei oder mehr Instrumente, es sei denn, ein geeigneter Regler versorgt das Dionex Inuvion IC-System mit 100 psi (690 kPa) oder weniger.

1. Turn the gas regulator knob fully counterclockwise. This ensures that there is no pressure to the eluent bottle when the gas source is turned on.

IMPORTANT When pressurizing the eluent bottle(s), if the regulator knob is inadvertently adjusted so that the bottle pressure exceeds 124 to 152 kPa (18 to 22 psi), you may hear gas hissing from the instrument (this is normal). To avoid wasting gas, correct the outlet pressure to between 34 and 41 kPa (5 and 6 psi) as soon as possible.

2. Close the gas shutoff valve on the eluent bottle cap.

3. Turn on and adjust the gas source to between 172 and 345 kPa (25 and 50 psi). DO NOT exceed an input pressure of 690 kPa (100 psi), as this may damage the digital pressure regulator or eluent bottle(s).
4. Pull out the gas regulator knob, turn it clockwise, and adjust the pressure to between 34 and 41 kPa (5 and 6 psi). Push back the regulator knob to lock. You can monitor the pressure from the digital display in the upper-left corner of the component panel.
5. If the liquid line from the pump is connected, you may slowly open the gas shutoff valve on the eluent bottle cap.

Installing the Eluent Monitor

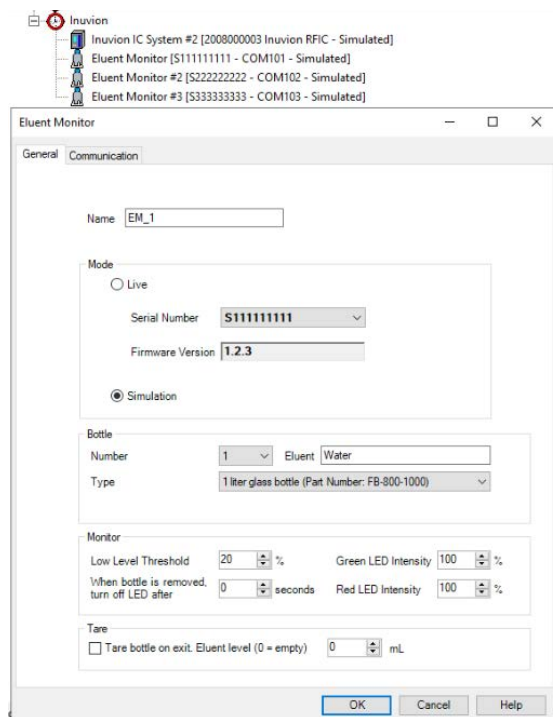
An eluent monitor can be installed to continuously monitor the eluent volume and alert you when the eluent level drops below the user-specified threshold. Each eluent module can support one eluent bottle. The Dionex Inuvion IC System can monitor up to three bottles, using the appropriate kit(s):

- Liquid Level Sensing Kit for 2-liter bottles (P/N 22815-62707)
- Liquid Level Sensing Kit for 4-liter bottles (P/N 22815-62708)

❖ To install the eluent monitor

1. Place the eluent monitor on the bench near the Dionex Inuvion IC System.
2. Plug the eluent monitor into a USB port on the rear panel of the Dionex Inuvion IC System.
3. On the Chromeleon CDS Setup screen, select the **Advanced options** button. A new screen is displayed.
4. Under **Third party vendor instrument control**, select the **Silicon Labs USB to Com Port Driver** check box.
5. Select **Install** to begin installation of the driver. When this is completed, open the Chromeleon Instrument Configuration Manager.
6. Add the eluent monitor to the instrument that includes the Dionex Inuvion IC System.
7. Right-click the eluent monitor in the instrument to display the **Eluent Monitor** dialog box (see [Figure 95](#)).

Figure 95. Eluent Monitor dialog box



8. Select the preferred properties, including:

- The low level threshold that will trigger an alert.
- The intensity of the green and red LEDs that indicate whether the eluent level is above or below, respectively, the threshold.
- The number of the eluent bottle. When installing more than one eluent monitor, be sure to assign a unique number to each bottle.
- If you want to tare the eluent monitor, place an empty eluent bottle on the platform or use a known eluent volume in a bottle.

Changing the Main Power Fuses

❖ To change the fuses

1. Turn off the Dionex Inuvion IC System main power switch on the rear panel (see [Figure 96](#)).

Figure 96. Main power switch and fuse holder



DANGER HIGH VOLTAGE—Disconnect the main power cord from its source and also from the rear panel of the Dionex Inuvion IC System.



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



GEFAHR HOCHSPANNUNG—Ziehen Sie das Netzkabel aus der Steckdose und der Netzbuchse auf der Rückseite des Dionex Inuvion IC System.

2. The fuse holder is part of the main power receptacle on the Dionex Inuvion IC System rear panel (see [Figure 96](#)). To remove the fuse holder, squeeze the tab on top of the holder to release it and pull the holder straight out of its compartment.

Figure 97. Main power fuse holder



3. Replace the two fuses in the holder with new fuses (P/N 00006-03-00013) rated 8 amps. Thermo Fisher Scientific recommends always replacing both fuses.
4. Reinsert the fuse holder into its compartment and push it into the instrument until the tab locks in place.
5. Reconnect the main power cord and turn on the power.

4 User Maintenance

Changing the Main Power Fuses

Troubleshooting

This chapter describes how to troubleshoot issues that may occur during operation of the Dionex Inuvion IC System.

If you are unable to resolve a problem by following the instructions here, contact Thermo Fisher Scientific Technical Support.

- In the U.S. and Canada, call 1-800-532-4752 and select **option 2**.
- Outside the U.S. and Canada, call the nearest Thermo Fisher Scientific office.

Contents

- [Audit Trail Error Messages](#)
- [Troubleshooting Error Messages](#)
- [Troubleshooting System Component Symptoms](#)

Troubleshooting Strategies

For any system, the initial troubleshooting objective is to isolate the source of the problem to a specific system component or to an aspect of the analysis. Once this has been done, corrective action can be taken. Although this manual cannot address every possible symptom and failure, the techniques discussed here can be applied to problem solving throughout the system.

A solid understanding of system operation is necessary for troubleshooting. Rather than immediately assuming that a problem exists, first check the user manuals to verify that correct operating procedures are being followed.

Also, it is essential that users keep a log of all maintenance-related activities (for example, when eluents are prepared and when columns are changed). Tracking these events can provide valuable insights. For example, if the chromatogram on an anion system seems to have undergone a radical and sudden change, check the log or audit trail for the date that the latest batch of eluent was placed in service. If the problem was first observed with the new batch, verify that the eluent was properly prepared. Maintaining a written record of problems and their resolution can help solve similar problems in the future.

In summary, an effective troubleshooting strategy requires that users:

1. Understand the operation of the entire system.
2. Keep a maintenance log.
3. Isolate the problem to either the hardware or chemistry.
4. Refer to the troubleshooting and maintenance sections of the appropriate user manual.

Audit Trail Error Messages

The instrument control firmware installed in the Dionex Inuvion IC System periodically checks the status of certain parameters. If a problem is detected, it is reported to the Chromeleon Chromatography Data System (CDS) 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 14). You can change the severity level assigned to a problem whenever appropriate.

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

Table 14. Chromeleon CDS audit trail severity levels




Icon	Severity level	Description
	Warning	A message is displayed in the audit trail but the current run is not interrupted.
	Error	A message is displayed in the audit trail. The system attempts to correct the problem (sometimes by using an alternative parameter). An Error never interrupts the current analysis. If it occurs during the Ready Check, the queue will not be started until the error is resolved.
	Abort	A message is displayed in the audit trail and the running queue is aborted.

Table 15 lists the most frequently observed Dionex Inuvion IC System error messages and their default severity levels. For troubleshooting guidance, refer to the page indicated in the table.

Table 15. Audit trail error messages



Default severity	Error message	See
	Ambient temperature sensor malfunction	page 118
	The auxiliary valve is disconnected	page 118

Table 15. Audit trail error messages, continued























Default severity	Error message	See
	CD board hardware revision does not match the FPGA code version	page 118
	Cell heater exceeds safe temperature limit	page 118
	Cell temperature is lower than expected	page 119
	Column heater exceeds safe temperature limit	page 118
	The column heater is disconnected	page 119
	Column heater memory reset to defaults	page 119
	Column heater open circuit	page 120
	Column heater short circuit	page 120
	Column heater temperature calibration failed	page 120
	Compression limit reached at 100%	page 120
	The conductivity detector is disconnected	page 121
	CR-TC board hardware revision does not match the FPGA code version	page 121
	CR-TC memory reset to defaults	page 121
	CR-TC not installed	page 122
	CR-TC over current—hardware detected	page 122
	CR-TC over power	page 122
	CR-TC over voltage—firmware detected	page 123
	CR-TC over voltage—hardware detected	page 123
	CR-TC short circuit	page 123
	CR-TC status not ready	page 123
	CR-TC stops because EGC is off	page 124
	CR-TC stops for zero flow	page 124

Table 15. Audit trail error messages, continued























Default severity	Error message	See
	Degasser is in Fault status	page 124
	Detector memory reset to defaults	page 124
	The device is busy—please retry after 1 minute	page 125
	EG board hardware revision does not match the FPGA code version	page 125
	EG status not ready	page 125
	EGC cartridge disconnected	page 125
	EGC cartridge not installed	page 126
	EGC invalid activation date	page 126
	EGC invalid concentration	page 126
	EGC invalid ion count	page 126
	EGC invalid serial number	page 127
	EGC memory reset to defaults	page 127
	EGC over current—firmware detected	page 127
	EGC over current—hardware detected	page 127
	EGC over power	page 128
	EGC over voltage—firmware detected	page 128
	EGC over voltage—hardware detected	page 128
	EGC stops for zero flow	page 128
	EGC wrong cartridge error	page 129
	The eluent bottle is empty	page 129
	The eluent generator cartridge has expired. Will abort the sequence after current injection.	page 129
	Eluent generator cartridge ion count is low	page 130

Table 15. Audit trail error messages, continued




















Default severity	Error message	See
	The eluent generator cartridge's expiration date is approaching	page 130
	Entry fan tachometer timeout	page 130
	Flash memory reset to defaults	page 130
	Flow is on—cannot undock piston	page 131
	FPGA flash memory erase failed	page 131
	FPGA flash memory write failed	page 131
	FPGA Main is not configured	page 131
	The Hall sensor did not signal the zero position over more than 5 revolutions	page 132
	The Hall sensor reported an impossible zero position	page 132
	High pressure valve busy	page 132
	High pressure valve failed to reach commanded position	page 132
	Inject valve busy	page 133
	Inject valve failed to reach commanded position	page 133
	The inject valve is disconnected	page 133
	The leak sensor is wet	page 134
	Load or Inject valve error	page 134
	The low pressure valve 1 is disconnected	page 134
	The low pressure valve 2 is disconnected	page 134
	Motor power failure detected	page 134
	Pressure exceeds upper limit	page 135
	Pressure fallen below lower limit	page 135
	The pressure sensor is malfunction	page 135

Table 15. Audit trail error messages, continued



































Default severity	Error message	See
	Pressure slope calibration error	page 136
	Pressure was larger than 725 psi in maintenance mode	page 136
	Preventive maintenance interval is approaching	page 136
	Pump board memory reset to defaults	page 136
	Pump flow limit exceeded	page 137
	Pump FPGA hardware over pressure. The pressure limiter circuit detected an overpressure condition.	page 137
	Pump FPGA motor encoder error	page 137
	The pump is not ready because it was switched into standby mode	page 137
	The pump is not ready because the self-test did not finish successfully	page 138
	Pump is still in undock position	page 138
	Pump motor over current	page 138
	Pump motor position error. The motor control was not able to move the motor to the correct position.	page 138
	Pump Off for lost USB communication	page 139
	Pump pressure hardware error	page 139
	Pump pressure sensor calibration failed	page 139
	Pump priming cannot start—system pressure too high	page 139
	Pump seal wash stopped because it is switched to standby	page 140
	Pump stopped due to lost USB communication error	page 140
	Purge pressure limit exceeded	page 140
	Suppressor board hardware revision does not match the FPGA code version	page 141
	Suppressor memory reset to defaults	page 141

Table 15. Audit trail error messages, continued

Default severity	Error message	See
	Suppressor not installed	page 141
	Suppressor over current—firmware detected	page 142
	Suppressor over voltage—firmware detected	page 142
	Suppressor over current—hardware detected	page 141
	Suppressor over power	page 142
	Suppressor over voltage—firmware detected	page 142
	Suppressor over voltage—hardware detected	page 142
	Suppressor status not ready	page 142
	Suppressor stops for zero flow	page 142
	Suppressor type has changed	page 143
	There is not enough pressure data	page 143
	The waste bottle is full	page 143
	Wrong hardware configuration	page 143

Troubleshooting Error Messages

Ambient temperature sensor malfunction

This error indicates that the temperature sensor on the CPU board has failed.

❖ To troubleshoot

Contact Thermo Fisher Scientific Technical Support for assistance.

Note Service on internal electronics of the Dionex Inuvion IC System and accessories must be performed by Thermo Fisher Scientific field service engineers.

The auxiliary valve is disconnected

This error occurs when the auxiliary valve is disconnected from the component panel.

❖ To troubleshoot

Reconnect the auxiliary valve to the component panel (see [“Installing the Auxiliary Valve”](#) on page 99).

CD board hardware revision does not match the FPGA code version

This error indicates that the conductivity detector board installed in the system is not compatible with the code for the FPGA (field-programmable gate array).

❖ To troubleshoot

Contact Thermo Fisher Scientific Technical Support for assistance.

Note Service on internal electronics of the Dionex Inuvion IC System and accessories must be performed by Thermo Fisher Scientific field service engineers.

Cell heater exceeds safe temperature limit

This error occurs when the temperature of the cell heater exceeds the maximum allowed. This may occur, for example, if the system is operating in an environment in which the temperature is greater than 70 °C (158 °F).

❖ To troubleshoot

1. For environmental specifications, see [“Physical”](#) on page 160.
2. If the error occurs again, contact Thermo Fisher Scientific Technical Support for assistance.

Cell temperature is lower than expected

This error occurs when the cell temperature is less than 2 °C (35.6 °F).

❖ To troubleshoot

1. Verify that cell is installed correctly and that the front door of the system is closed fully.
2. Check the Chromeleon CDS instrument method to verify that the cell temperature is turned on.

Column heater exceeds safe temperature limit

This error occurs when the temperature of the column heater exceeds the maximum allowed. This may occur, for example, if the system is operating in an environment in which the temperature is greater than 70 °C (158 °F).

❖ To troubleshoot

For environmental specifications, see [“Physical”](#) on [page 160](#).

The column heater is disconnected

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

❖ To troubleshoot

1. Verify that the column heater is plugged into the component panel.
2. If the error persists, the column heater may be faulty. Replace the column heater (see [“Installing or Replacing the Column Heater”](#) on [page 100](#)).

Column heater memory is reset to defaults

This error occurs when no valid data is read from the column heater memory after system power-up. As a result, all parameters are reset to their defaults.

❖ To troubleshoot

Contact Thermo Fisher Scientific Technical Support for assistance.

Note Service on internal electronics of the Dionex Inuvion IC System and accessories must be performed by Thermo Fisher Scientific field service engineers.

Column heater open circuit

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

To troubleshoot

1. Verify that the column heater is plugged into the component panel.
2. If the error persists, the column heater may be faulty. Replace the column heater (see [“Installing or Replacing the Column Heater”](#) on page 100).

Column heater short circuit

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

To troubleshoot

If the error persists, replace the column heater (see [“Installing or Replacing the Column Heater”](#) on page 100).

Column heater temperature calibration failed

This error occurs when the calibration value for the column heater temperature is out of range. This causes the calibration procedure to fail.

To troubleshoot

Replace the column heater (see [“Installing or Replacing the Column Heater”](#) on page 100).

Compression limit reached at 100%

This error occurs when the pump is unable to regulate the pressure any further (i.e., the Maintenance_Pump_K_Value cannot be increased).

It may also indicate an overcurrent in the pump drive bridge.

To troubleshoot

1. Systematically eliminate or bypass each component in the flow path until the compression limit returns to normal.
2. Before resuming routine operation, regenerate or replace the consumable(s) that caused this error.
3. If the error occurs again, contact Thermo Fisher Scientific Technical Support for assistance.

The conductivity detector is disconnected

This error indicates that the conductivity detector is disconnected from the component panel.

To troubleshoot

1. Connect the conductivity detector to the component panel.
2. In the Chromeleon Instrument Configuration Manager, configure the conductivity detector in the same instrument as the Dionex Inuvion IC System.

CR-TC board hardware not installed

This error occurs when the system receives a Dionex CR-TC command from Chromeleon CDS but is unable to recognize the Dionex CR-TC controller board.

To troubleshoot

Contact Thermo Fisher Scientific Technical Support for assistance.

Note Service on internal electronics of the Dionex Inuvion IC System and accessories must be performed by Thermo Fisher Scientific field service engineers.

CR-TC board hardware revision does not match the FPGA code version

This error indicates that the Dionex CR-TC board installed in the system is not compatible with the code for the FPGA (field-programmable gate array).

To troubleshoot

Contact Thermo Fisher Scientific Technical Support for assistance.

Note Service on internal electronics of the Dionex Inuvion IC System and accessories must be performed by Thermo Fisher Scientific field service engineers.

CR-TC memory reset to defaults

This error occurs when there is a Dionex CR-TC memory read/write failure. As a result, all parameters are reset to their default values.

To troubleshoot

Contact Thermo Fisher Scientific Technical Support for assistance.

Note Service on internal electronics of the Dionex Inuvion IC System and accessories must be performed by Thermo Fisher Scientific field service engineers.

CR-TC not installed

This error occurs when a command is issued to control a Dionex CR-TC that has not been installed (or when a Dionex CR-TC is installed but has not yet been configured).

❖ To troubleshoot

1. Verify that the Dionex CR-TC is installed and connected.
2. In the Chromeleon Instrument Configuration Manager, configure the Dionex CR-TC in the same instrument as the Dionex Inuvion IC System.

CR-TC over current—hardware detected

This error occurs when the current applied to the Dionex CR-TC exceeds the maximum current (120 mA) allowed. (The current will be automatically turned off to prevent damage to the Dionex CR-TC.)

❖ To troubleshoot

1. Verify that the Dionex CR-TC cable is securely plugged in to the **CR-TC/EPM** connector on the Dionex Inuvion IC System top cover (see [Figure 13](#)).
2. If the error persists, it indicates a possible malfunction in the Dionex CR-TC control electronics. Contact Thermo Fisher Scientific Technical Support for assistance.

Note Service on internal electronics of the Dionex Inuvion IC System and accessories must be performed by Thermo Fisher Scientific field service engineers.

CR-TC over power

This error occurs when, to maintain the selected current, the system must apply a higher voltage than the Dionex CR-TC can support.

❖ To troubleshoot

1. Reduce the flow rate.
2. Follow the instructions in the Dionex CR-TC manual to rehydrate the Dionex CR-TC.
3. If the error persists, replace the Dionex CR-TC (see [“Installing or Replacing the Continuously Regenerated Trap Column \(Dionex CR-TC\)”](#) on page 96).

✘ CR-TC over voltage—firmware detected

✘ CR-TC over voltage—hardware detected

These errors occur when the Dionex CR-TC voltage exceeds the commanded voltage from the user.

❖ To troubleshoot

This error may be caused by an open circuit in the Dionex CR-TC control electronics. Contact Thermo Fisher Scientific Technical Support for assistance.

Note Service on internal electronics of the Dionex Inuvion IC System and accessories must be performed by Thermo Fisher Scientific field service engineers.

✘ CR-TC short circuit

This error occurs when the current applied to the Dionex CR-TC exceeds the maximum value allowed (250 mA). The Dionex CR-TC is automatically turned off to prevent damage.

❖ To troubleshoot

1. Verify that the Dionex CR-TC is securely plugged in.
2. If the error message appears again, the Dionex CR-TC may be faulty. Replace the column (see [“Installing or Replacing the Continuously Regenerated Trap Column \(Dionex CR-TC\)”](#) on page 96).

✘ CR-TC status not ready

This error occurs when the FPGA (field-programmable gate array) attempts to access the Dionex CR-TC EEPROM or consumable monitoring (1-wire) chip while the Dionex CR-TC is still busy with a previous command.

❖ To troubleshoot

1. Turn off the Dionex CR-TC briefly and then turn it on again.
2. If the error occurs again, the Dionex CR-TC EPS board must be replaced. Contact Thermo Fisher Scientific Technical Support for assistance.

Note Service on internal electronics of the Dionex Inuvion IC System and accessories must be performed by Thermo Fisher Scientific field service engineers.

CR-TC stops because EGC is off

This error occurs if you turn off the pump flow while the Dionex EGC current (and Dionex CR-TC) are on.

When the pump flow rate is 0.00 mL/min, the Dionex EGC is automatically turned off. When the Dionex EGC is off, the Dionex CR-TC is automatically turned off to prevent damage.

❖ To troubleshoot

To resume operation, turn on the pump and select a flow rate above 0.00 mL/min.

CR-TC stops for zero flow

This error occurs when the pump stops unexpectedly.

❖ To troubleshoot

Follow the troubleshooting steps in “[No Flow](#)” on [page 148](#)”.

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.

Degasser is in fault status

This error indicates a problem in the Dionex Inuvion RFIC Degasser electronics.

❖ To troubleshoot

Contact Thermo Fisher Scientific Technical Support for assistance.

Note Service on internal electronics of the Dionex Inuvion IC System and accessories must be performed by Thermo Fisher Scientific field service engineers.

Detector memory reset to defaults

This error occurs when there is a conductivity detector memory read/write failure. As a result, all parameters are reset to their default values.

❖ To troubleshoot

Contact Thermo Fisher Scientific Technical Support for assistance.

Note Service on internal electronics of the Dionex Inuvion IC System and accessories must be performed by Thermo Fisher Scientific field service engineers.

The device is busy—please retry after 1 minute

This error occurs if you attempt to send a pump command while the pump is still busy with a previous action (for example, docking or undocking).

To troubleshoot

After waiting briefly, send the command again.

EG board hardware revision does not match the FPGA

This error indicates that the eluent generator board installed in the system is not compatible with the code for the FPGA (field-programmable gate array).

To troubleshoot

Contact Thermo Fisher Scientific Technical Support for assistance.

Note Service on internal electronics of the Dionex Inuvion IC System and accessories must be performed by Thermo Fisher Scientific field service engineers.

EG status not ready

This error occurs when the eluent generator is not plugged in, or when the installed device is the wrong product type.

To troubleshoot

1. Verify that the eluent generator is plugged in.
2. In the Chromeleon Instrument Configuration Manager, verify that this device is configured in the instrument for the Dionex Inuvion IC System.
3. If the error persists, replace the eluent generator. For more information, see [“Installing an Eluent Generator Cartridge \(Dionex EGC\)”](#) on page 92.

EGC cartridge disconnected

This error occurs when the Dionex EGC is disconnected from the eluent generator electronics.

To troubleshoot

1. Verify that the Dionex EGC cable is securely plugged in.
2. If the error message appears again, contact Thermo Fisher Scientific Technical Support for assistance. The Dionex EGC control electronics may have malfunctioned.

Note Service on internal electronics of the Dionex Inuvion IC System and accessories must be performed by Thermo Fisher Scientific field service engineers.

EGC cartridge not installed

This error occurs when a command is issued to control a Dionex EGC that has not been installed yet (or has been installed, but not yet configured in Chromeleon CDS).

To troubleshoot

1. Verify that the Dionex EGC is installed.
2. In the Chromeleon Instrument Configuration Manager, configure the Dionex EGC in the same instrument as the Dionex Inuvion IC System.

EGC invalid activation date

This error occurs if the activation date for the Dionex EGC is invalid. This may indicate a problem with the memory chip in the Dionex EGC.

To troubleshoot

1. Verify that the Dionex EGC cable is securely plugged in.
2. If the error message appears again, contact Thermo Fisher Scientific Technical Support for assistance.

EGC invalid concentration

This error occurs when the eluent concentration is outside the range allowed by the Dionex EGC.

To troubleshoot

Set the eluent concentration to a value within the allowed range (see [“Specifications” on page 155](#)).

EGC invalid ion count

This error occurs when the ion count reported by the Dionex EGC is invalid. This may indicate a problem with the memory chip in the Dionex EGC.

To troubleshoot

1. Verify that the Dionex EGC is securely plugged in.
2. If the error message appears again, contact Thermo Fisher Scientific Technical Support for assistance.

EGC invalid serial number

This error occurs when the serial number reported by the Dionex EGC is invalid. This may indicate a problem with the memory chip in the Dionex EGC.

❖ To troubleshoot

1. Verify that the Dionex EGC is securely plugged in.
2. If the error message appears again, it may indicate a malfunction in the Dionex EGC control electronics. Contact Thermo Fisher Scientific Technical Support for assistance.

Note Service on internal electronics of the Dionex Inuvion IC System and accessories must be performed by Thermo Fisher Scientific field service engineers.

EGC memory reset to defaults

This error occurs when no valid data can be read from Dionex EGC memory after system power-up. As a result, all parameters are reset to their defaults.

❖ To troubleshoot

1. Verify that the Dionex EGC is securely plugged in.
2. In the Chromeleon Instrument Configuration Manager, configure the Dionex EGC in the same instrument as the Dionex Inuvion IC System.

EGC over current—firmware detected

EGC over current—hardware detected

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 or blocked.

❖ To troubleshoot

1. If there is no flow from the pump, follow the troubleshooting steps in “No Flow” on [page 148](#).
2. If the error message appears again, it may indicate a malfunction in the Dionex EGC control electronics or the cartridge itself. Contact Thermo Fisher Scientific Technical Support for assistance.

Note Service on internal electronics of the Dionex Inuvion IC System and accessories must be performed by Thermo Fisher Scientific field service engineers.

EGC over power

This error occurs when, in order to maintain the selected current, the power supply must supply a higher voltage than the Dionex EGC can support.

❖ To troubleshoot

Replace the Dionex EGC (see [“Installing an Eluent Generator Cartridge \(Dionex EGC\)”](#) on [page 92](#)).

EGC over voltage—firmware detected

EGC over voltage—hardware detected

This error occurs when the voltage applied to the Dionex EGC exceeds the maximum recommended level. (Under this condition, 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 148](#).
2. If the error message appears again, it may indicate a malfunction in the Dionex EGC control electronics or in the cartridge itself. Contact Thermo Fisher Scientific Technical Support for assistance.

Note Service on internal electronics of the Dionex Inuvion IC System and accessories must be performed by Thermo Fisher Scientific field service engineers.

EGC stops for zero flow

This error occurs when the pump flow stops.

❖ To troubleshoot

If the pump stopped unexpectedly, see [“No Flow”](#) on [page 148](#) for pump troubleshooting information.

EGC wrong cartridge error

This error occurs when a Dionex EGC that is not supported by the Dionex Inuvion IC System is plugged in.

❖ To troubleshoot

See [Table 6](#) for a list of the Dionex EGC types that can be installed in the Dionex Inuvion IC System.

The eluent bottle is empty

This error occurs if there is no eluent in the eluent bottle.

❖ To troubleshoot

Fill the eluent bottle with ASTM filtered, Type I (18.2 megohm-cm) deionized water that meets the specifications listed in [“Deionized Water Requirements for IC”](#) on [page xvi](#).

The eluent generator cartridge has expired

This error indicates that the Dionex EGC is expended. (The Dionex EGC expiration date is 2 years from the date of manufacture.)

❖ To troubleshoot

Replace the Dionex EGC (see [“Installing an Eluent Generator Cartridge \(Dionex EGC\)”](#) on [page 92](#)).

The eluent generator cartridge has expired. Will abort the sequence after current injection.

This error indicates that the Dionex EGC is expended. (The Dionex EGC expiration date is 2 years from the date of manufacture.) Chromeleon CDS will complete the current injection and then abort the sequence.

❖ To troubleshoot

Replace the Dionex EGC (see [“Installing an Eluent Generator Cartridge \(Dionex EGC\)”](#) on [page 92](#)).

The eluent generator cartridge's expiration date is approaching

This error occurs when the Dionex EGC is nearing its expiration date. (The Dionex EGC expiration date is 2 years from the date of manufacture.) Although it is possible to continue operation with the Dionex EGC after the expiration date, performance may be impaired until a new cartridge is installed.

❖ **To troubleshoot**

Replace the Dionex EGC (see “[Installing an Eluent Generator Cartridge \(Dionex EGC\)](#)” on [page 92](#)).

Eluent generator cartridge ion count is low

This error occurs when the Dionex EGC ion count is nearing depletion.

❖ **To troubleshoot**

Replace the Dionex EGC (see “[Installing an Eluent Generator Cartridge \(Dionex EGC\)](#)” on [page 92](#)).

Entry fan tachometer timeout

The entry fan on the rear panel of the Dionex Inuvion IC System improves air convection inside the system. This error occurs when the tachometer that measures the speed of the entry fan times out. This indicates that either the fan is stalled or the fan motor drive is faulty.

❖ **To troubleshoot**

Contact Thermo Fisher Scientific Technical Support for assistance.

Note Service on internal electronics of the Dionex Inuvion IC System and accessories must be performed by Thermo Fisher Scientific field service engineers.

Flash memory reset to defaults

This error indicates a malfunction in the system electronics.

❖ **To troubleshoot**

Contact Thermo Fisher Scientific Technical Support for assistance.

Note Service on internal electronics of the Dionex Inuvion IC System and accessories must be performed by Thermo Fisher Scientific field service engineers.

Flow is on—cannot undock piston

This error occurs if you select the Pistons_Undock check box in the Chromeleon CDS Command window while the analytical pump is running.

❖ To troubleshoot

Wait until the pump has stopped running (or stop the pump), and then undock the piston.

FPGA flash memory erase failed

This error occurs when an erase operation fails to delete all data from the FPGA (field-programmable gate array) flash memory.

❖ To troubleshoot

Contact Thermo Fisher Scientific Technical Support for assistance.

Note Service on internal electronics of the Dionex Inuvion IC System and accessories must be performed by Thermo Fisher Scientific field service engineers.

FPGA flash memory write failed

This error occurs when a write operation fails to copy all data to the FPGA (field-programmable gate array) flash memory.

❖ To troubleshoot

Contact Thermo Fisher Scientific Technical Support for assistance.

Note Service on internal electronics of the Dionex Inuvion IC System and accessories must be performed by Thermo Fisher Scientific field service engineers.

FPGA Main is not configured

This error occurs when the FPGA (field-programmable gate array) on the Main board has not been configured yet. When this occurs, the board is unable to accept code.

❖ To troubleshoot

Contact Thermo Fisher Scientific Technical Support for assistance.

Note Service on internal electronics of the Dionex Inuvion IC System and accessories must be performed by Thermo Fisher Scientific field service engineers.

The Hall sensor did not signal the zero position over more than 5 revolutions

This error occurs if the Hall sensor fails to signal the zero position of the CAM of the pump motor for more than five revolutions. The zero position is the home position of the pump (i.e., the reference point as it rotates around a fixed axis).

❖ **To troubleshoot**

Contact Thermo Fisher Scientific Technical Support for assistance.

Note Service on internal electronics of the Dionex Inuvion IC System and accessories must be performed by Thermo Fisher Scientific field service engineers.

The Hall sensor reported an impossible zero position

This error occurs if the Hall sensor reports a mismatch between the pump motor rotational counts and the CAM rotations. The zero position is the home position of the pump (i.e., the reference point as it rotates around a fixed axis).

This may indicate a calibration error in the CAM position or physical damage to the encoder on the pump mechanism.

❖ **To troubleshoot**

Contact Thermo Fisher Scientific Technical Support for assistance.

Note Service on internal electronics of the Dionex Inuvion IC System and accessories must be performed by Thermo Fisher Scientific field service engineers.

High pressure valve busy

This error occurs when the high-pressure valve is unable to complete the required action.

❖ **To troubleshoot**

Wait until the previous action has been completed, and then retry.

High pressure valve failed to reach commanded position

This error occurs when the high-pressure valve fails to switch position within 1 second of being toggled.

❖ **To troubleshoot**

1. If a sequence is running, select **Stop** on the Inuvion ePanel to cancel the current injection and stop the sequence.
2. Try to toggle the valve from **LoadPosition** to **InjectPosition** by selecting the down arrow next to **Inject** on the **Home** ePanel.

3. Turn off the Dionex Inuvion IC System power briefly, and then restart the system.
4. If the problem persists, repeat [Step 2](#).
5. If the problem persists, contact Thermo Fisher Scientific Technical Support for assistance.

Inject valve busy

This error occurs when the injection valve is unable to complete the required action.

❖ **To troubleshoot**

Wait until the previous action has been completed, and then retry.

Inject valve failed to reach commanded position

If the injection valve fails to switch position within 1 second of being toggled, the instrument control firmware reports an error to Chromeleon CDS and this error message appears.

❖ **To troubleshoot**

1. If a sequence is running, select **Stop** on the Chromeleon CDS ePanel to cancel the current injection and stop the sequence.
2. Try to toggle the valve from **LoadPosition** to **InjectPosition** by selecting the down arrow next to **Inject** on the **Home** ePanel.
3. Turn off the Dionex Inuvion IC System power briefly, and then restart the system.
4. If the problem persists, repeat [Step 2](#).
5. If the problem persists, contact Thermo Fisher Scientific Technical Support for assistance.

Inject valve is disconnected

This error occurs when the injection valve cannot be detected.

❖ **To troubleshoot**

1. If a sequence is running, select **Stop** on the Chromeleon CDS ePanel to cancel the current injection and stop the sequence.
2. Try to toggle the valve from **LoadPosition** to **InjectPosition** by selecting the down arrow next to **Inject** on the **Home**.

The leak sensor is wet

The leak sensor is installed in the drip tray located near the bottom of the component panel. This error occurs when liquid accumulates in the drip tray.

❖ **To troubleshoot**

1. Locate the source of the leak by visually inspecting the tubing, fittings, and components on the component panel. Also check for pressure changes; an increase or decrease in pressure may indicate a leak. For detailed troubleshooting of various types of leaks, see “Liquid Leaks” on page 144.
2. Tighten fittings, or replace tubing and fittings as required.
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 CDS.

The low-pressure valve 1 is disconnected

The low-pressure valve 2 is disconnected

This error occurs when the low-pressure valve cannot be detected.

❖ **To troubleshoot**

1. If a sequence is running, select **Stop** on the Chromeleon CDS ePanel to cancel the current injection and stop the sequence.
2. Plug in the valve.

Motor power failure detected

This error occurs when the pump motor fails.

This typically occurs when the system power is turned off while the pump is running. You may also notice a significant pressure transducer offset.

❖ **To troubleshoot**

1. While the pump is off, open the purge knob and select the Pressure Autozero command.
2. If this does not resolve the issue, contact Thermo Fisher Scientific Technical Support for assistance.

Note Service on internal electronics of the Dionex Inuvion IC System and accessories must be performed by Thermo Fisher Scientific field service engineers.

Pressure exceeds upper limit

If the system pressure exceeds the set limit, this error occurs and the pump stops.

❖ To troubleshoot

1. Check the flow path for any loose connections between components.
2. Check the column or backpressure tubing for a potential blockage.
 - a. Bypass each element in the flow path, one at a time, while monitoring the pump pressure baseline to identify which component is the source of the high backpressure.
 - b. When you identify the source of the pressure blockage, invert the connections to it and flush the system until the blockage is dislodged.

Pressure fallen below lower limit

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

Pressure limits can be set in the Chromeleon Instrument Configuration Manager or in the instrument method.

❖ To troubleshoot

1. Verify that the eluent bottle is filled with ASTM filtered, Type I (18.2 megohm-cm) deionized water that meets the specifications listed in “[Deionized Water Requirements for IC](#)” on [page xvi](#).
2. Check for liquid leaks (see “[Liquid Leaks](#)” on [page 144](#)).
3. Verify that the waste valve is closed.
4. Prime the pump (see “[Priming the Analytical Pump](#)” on [page 46](#)).
5. Restart the pump.

The pressure sensor is malfunction

This error occurs when the pressure sensor fails to detect a rise in pressure while the pump is turned on. This will cause the pump to shut down.

The error may also occur if the pressure remains at a fixed value while the pump is off.

❖ To troubleshoot

Contact Thermo Fisher Scientific Technical Support for assistance.

Note Service on internal electronics of the Dionex Inuvion IC System and accessories must be performed by Thermo Fisher Scientific field service engineers.

Pressure slope calibration error

This error occurs when the user attempts to calibrate the pressure slope when the pressure is less than 3 MPa (500 psi).

To troubleshoot

1. Verify that the backpressure is above 3 MPa (500 psi) and then try again to calibrate the pressure slope.
2. If the error occurs again, contact Thermo Fisher Scientific Technical Support for assistance.

Note Service on internal electronics of the Dionex Inuvion IC System and accessories must be performed by Thermo Fisher Scientific field service engineers.

Pressure was larger than 725 psi in maintenance mode

This error occurs if you undock the pump head (to perform maintenance) when the purge valve is closed,

To troubleshoot

Always verify that the purge valve is open before undocking the pump head.

Preventive maintenance interval is approaching

This error occurs 21 days before the 1-year anniversary of the last annual preventive maintenance procedure for the Dionex Inuvion IC System.

To troubleshoot

Contact Thermo Fisher Scientific Technical Support to schedule a preventive maintenance visit.

Pump board memory reset to defaults

This error occurs when there is a diagnostic failure.

To troubleshoot

Contact Thermo Fisher Scientific Technical Support for assistance.

Note Service on internal electronics of the Dionex Inuvion IC System and accessories must be performed by Thermo Fisher Scientific field service engineers.

Pump flow limit exceeded

This error occurs when you attempt to select a flow rate that is outside the flow rate range.

❖ To troubleshoot

Select a flow rate from 0.0 to 5.00 mL/min in increments of 0.01 mL/min.

Pump FPGA hardware over pressure. The pressure limiter circuit detected an overpressure condition

This error indicates a problem in the pump controller electronics.

❖ To troubleshoot

Contact Thermo Fisher Scientific Technical Support for assistance.

Note Service on internal electronics of the Dionex Inuvion IC System and accessories must be performed by Thermo Fisher Scientific field service engineers.

Pump FPGA motor encoder error

This error indicates a problem in the pump controller electronics.

❖ To troubleshoot

Contact Thermo Fisher Scientific Technical Support for assistance.

Note Service on internal electronics of the Dionex Inuvion IC System and accessories must be performed by Thermo Fisher Scientific field service engineers.

The pump is not ready because it was switched into standby mode

This error occurs when the pump is off while in standby mode.

❖ To troubleshoot

Turn on the Dionex Inuvion IC System power and connect to Chromeleon CDS.

The pump is not ready because the self-test did not finish successfully

This error occurs when the pump self-test is not able to finish.

During the self-test, which starts automatically each time the system is powered up, the pump moves forward and backward slightly to verify that it works properly.

To troubleshoot

1. Turn off the Dionex Inuvion IC System power briefly, and then restart the system.
2. If the error occurs again, contact Thermo Fisher Scientific Technical Support for assistance.

Pump is still in undock position

This error occurs if you try to turn on the pump while the piston is undocked.

To troubleshoot

In Chromeleon CDS, select the Pistons_Dock check box in the Command window (see [Figure 54](#)).

Pump motor over current

This error indicates a problem in the pump controller electronics.

To troubleshoot

Contact Thermo Fisher Scientific Technical Support for assistance.

Note Service on internal electronics of the Dionex Inuvion IC System and accessories must be performed by Thermo Fisher Scientific field service engineers.

Pump motor position error. The motor control was not able to move the motor to the correct position.

This error indicates a problem in the pump controller electronics.

To troubleshoot

Contact Thermo Fisher Scientific Technical Support for assistance.

Note Service on internal electronics of the Dionex Inuvion IC System and accessories must be performed by Thermo Fisher Scientific field service engineers.

Pump Off for lost USB communication

This error occurs when the Dionex Inuvion IC System is unable to communicate with Chromeleon CDS.

❖ To troubleshoot

1. Verify that the USB cable is connected correctly from the Dionex Inuvion IC System rear panel to the computer on which Chromeleon CDS is installed.
2. If this doesn't resolve the error, contact Thermo Fisher Scientific Technical Support for assistance.

Pump pressure hardware error

This error indicates a problem in the pump controller electronics.

❖ To troubleshoot

Contact Thermo Fisher Scientific Technical Support for assistance.

Note Service on internal electronics of the Dionex Inuvion IC System and accessories must be performed by Thermo Fisher Scientific field service engineers.

Pump pressure sensor calibration failed

This error indicates a problem in the pump controller electronics.

❖ To troubleshoot

Contact Thermo Fisher Scientific Technical Support for assistance.

Note Service on internal electronics of the Dionex Inuvion IC System and accessories must be performed by Thermo Fisher Scientific field service engineers.

Pump priming cannot start—system pressure too high

This error occurs if the user attempts to prime the pump while the priming valve is closed.

❖ To troubleshoot

1. Open the valve knob. If the pump pressure remains significantly higher than 0 psi, stop the pump.
2. In Chromeleon CDS, select the Inuvion.Pump.Pressure_Autozero command to reset the pressure transducer offset. Try to prime the pump again.
3. If you are still unable to prime the pump, contact Thermo Fisher Scientific Technical Support for assistance.

Pump seal wash stopped because it is switched to standby

This error occurs when you try to turn on the seal wash pump while the piston is undocked.

To troubleshoot

In Chromeleon CDS, select the Pistons_Dock check box in the Command window (see [Figure 54](#)).

Pump stopped due to lost USB communication error

This error occurs when the Dionex Inuvion IC System is unable to communicate with Chromeleon CDS.

To troubleshoot

1. Verify that the USB cable is connected correctly from the Dionex Inuvion IC System rear panel to the computer on which Chromeleon CDS is installed.
2. Verify that the green LED for the Dionex Inuvion USB connector to host is lighted (see [Figure 8](#)).
3. If this doesn't resolve the error, contact Thermo Fisher Scientific Technical Support for assistance.

Purge pressure limit exceeded

This error occurs when you try to purge the pump when the purge knob is closed or when there is a blockage in the purge waste tubing.

This error may also indicate a problem in the pump controller electronics.

To troubleshoot

Contact Thermo Fisher Scientific Technical Support for assistance.

Note Service on internal electronics of the Dionex Inuvion IC System and accessories must be performed by Thermo Fisher Scientific field service engineers.

Suppressor board hardware revision does not match the FPGA code version

This error indicates that the suppressor board installed in the system is not compatible with the code for the FPGA (field-programmable gate array).

To troubleshoot

Contact Thermo Fisher Scientific Technical Support for assistance.

Note Service on internal electronics of the Dionex Inuvion IC System and accessories must be performed by Thermo Fisher Scientific field service engineers.

Suppressor memory reset to defaults

This error occurs when the suppressor type is invalid, or when the local calibration memory is blank.

To troubleshoot

1. Verify that a suitable suppressor is installed.
2. Select the default suppressor settings.

Suppressor not installed

This error occurs when the suppressor is on, but no suppressor is detected.

To troubleshoot

Verify that the suppressor is installed correctly.

Suppressor over current—firmware detected

Suppressor over current—hardware detected

This error indicates that the suppressor is depleted or dirty, or that there is a malfunction in the suppressor controller electronics.

To troubleshoot

1. Regenerate the suppressor. For instructions, refer to the suppressor manual.
2. Clean the suppressor. For instructions, refer to the suppressor manual.
3. If the error persists, it may indicate a malfunction in the suppressor controller electronics. Contact Thermo Fisher Scientific Technical Support for assistance.

Note Service on internal electronics of the Dionex Inuvion IC System and accessories must be performed by Thermo Fisher Scientific field service engineers.

Suppressor over power

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

To troubleshoot

1. Reduce the flow rate.
2. Rehydrate the suppressor. For instructions, refer to the suppressor manual.
3. If the error persists, replace the suppressor. For instructions, refer to the suppressor manual.

Suppressor over voltage—firmware detected

Suppressor over voltage—hardware detected

These errors occur if you turn on the system and it is unable to establish a connection with the suppressor.

To troubleshoot

1. Check the suppressor cable connection. For more information, refer to the suppressor manual.
2. If the error persists, replace the suppressor. For more information, refer to the suppressor manual.

Suppressor status not ready

This error occurs if no suppressor is installed, or if the installed suppressor is the wrong type.

To troubleshoot

1. Check that a suppressor is installed.
2. Verify that the installed suppressor is the correct type. For guidelines for selecting a suppressor for an application, refer to the suppressor manual.

Suppressor stops for zero flow

This error message appears after selecting the **Shutdown** button on the Inuvion ePanel. It also appears if the pump flow stops unexpectedly while the suppressor is on. To prevent suppressor damage, the suppressor automatically turns off when there is no flow.

To troubleshoot

If the pump unexpectedly stops, see “[No Flow](#)” on [page 148](#) for pump troubleshooting information.

Suppressor type has changed

This error occurs when the selected suppressor type is not appropriate for the Dionex EGC.

To troubleshoot

For the Dionex EGC KOH, use the Dionex AERS or Dionex ADRS suppressor. For the Dionex EGC MSA, use the Dionex CERS or Dionex CDRS suppressor.

For the Dionex EGC K₂CO₃ (potassium carbonate), use the Dionex AERS 500 carbonate suppressor.

There is not enough pressure data

This error occurs when there is an internal communication error.

To troubleshoot

Contact Thermo Fisher Scientific Technical Support for assistance.

Note Service on internal electronics of the Dionex Inuvion IC System and accessories must be performed by Thermo Fisher Scientific field service engineers.

The waste bottle is full

This error occurs when the waste container is full.

To troubleshoot

Check the waste container daily and empty as needed.

Wrong hardware configuration

This error occurs when there is a mismatch between the configuration in Chromeleon CDS and the hardware that is installed.

To troubleshoot

1. In the Chromeleon Instrument Configuration Manager, check the components in the instrument with the Dionex Inuvion IC System.
2. Add and/or remove configured components until the configuration accurately reflects the installed system.

Troubleshooting System Component Symptoms

Table 16 lists issues related to system components that may occur during routine operation. These issues may not trigger an error message Chromeleon CDS.

Table 16. System component symptoms

System category	Symptom	See
Leaks	Liquid Leaks	page 144
Pump	Pump Difficult to Prime or Loses Prime	page 146
	Pump Does Not Start	page 147
Pressure	No Flow	page 148
	Erratic Flow and/or Pressure Reading	page 148
	Excessive System Backpressure	page 149
Ghosting	Peak Ghosting	page 150
Timing	Insufficient Time Between Sample Injections	page 150
	Nonreproducible Peak Height or Retention Time	page 150
	Abnormal Retention Time or Selectivity	page 151
Cell	No Cell Response	page 151
	High Cell Output	page 152
Baseline noise or drift	Baseline Noise or Drift	page 152
Sensor	The leak sensor is wet	page 134
Degas assembly	Vacuum Degas Assembly Does Not Run	page 153

Liquid Leaks

Possible cause	Solution
Leaking fitting	Locate the source of the leak. Tighten any tubing fittings or connections and replace them as needed (see “Replacing Tubing and Fittings” on page 62).
Broken liquid line	When replacing tubing and fittings, the replacements must be of the same length and internal diameter (see “Replacing Tubing and Fittings” on page 62).
Blocked or improperly installed line	Make sure that no tubing is crimped or blocked. For blocked waste tubing, verify that it is not elevated at any point after it exits the Dionex Inuvion IC System. Waste tubing lines use gravity to drain into the waste container. Replace any blocked tubing. For more information, refer to the suppressor manual.

Possible cause	Solution
Loose pump check valve	<ol style="list-style-type: none"> 1. Verify that the check valves are firmly seated in the pump head. If necessary, tighten the check valves 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 69).
Leaking seal wash port	Leaking from the seal wash port indicates a leaking piston seal. Replace the seal (see “To remove and replace the pistons, analytical pump seals, and O-rings” on page 80).
Damaged pump piston seal	<ol style="list-style-type: none"> 1. Replace the piston seal (see “To remove and replace the pistons, analytical pump seals, and O-rings” on page 80). 2. If the leak persists, replace the piston (see “To remove and replace the pistons, analytical pump seals, and O-rings” on page 80).
Pump head not tight against casing	Carefully tighten the pump head mounting nuts just until the leak stops. Do not overtighten!
Leaking pressure transducer	<ol style="list-style-type: none"> 1. Verify that the pressure transducer tubing and fitting connections are tight. For tightening requirements, see “Replacing Tubing and Fittings” on page 62. Replace any damaged tubing or fittings. 2. If the pressure transducer continues to leak, contact Thermo Fisher Scientific Technical Support for assistance.
<p>Note Service on internal electronics of the Dionex Inuvion IC System and accessories must be performed by Thermo Fisher Scientific field service engineers.</p>	
Leaking pump head priming valve	<ol style="list-style-type: none"> 1. Verify that the priming 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 priming valve O-ring (see “To remove and replace the pistons, analytical pump seals, and O-rings” on page 80).
Leaking suppressor	Refer to the suppressor manual for troubleshooting procedures.

Possible cause	Solution
Leaking injection valve or auxiliary valve	<ol style="list-style-type: none"> 1. Verify that the liquid line connections to the transducer are tight. For tightening requirements, see “Replacing Tubing and Fittings” on page 62. Replace any damaged fittings. 2. If the leak is from behind the valve stator, the rotor seal may be scratched. Rebuild the valve (see “To rebuild the injection valve or auxiliary valve” on page 64).
Leaking detector cell	<ol style="list-style-type: none"> 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 problem persists, contact Thermo Fisher Scientific Technical Support for assistance.
<p>Note Service on internal electronics of the Dionex Inuvion IC System and accessories must be performed by Thermo Fisher Scientific field service engineers.</p>	

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 bottle and/or no eluent connected	Fill the bottle. Verify that all connections are secure and then tighten as required.
Eluent improperly or insufficiently degassed	<ol style="list-style-type: none"> 1. If the vacuum degas assembly is not installed: Manually degas the eluent (see “Vacuum Degas Assembly Does Not Run” on page 153). 2. If the vacuum degas assembly is installed: Check the Command window in Chromeleon CDS. If a problem is reported, the vacuum degas assembly may need to be replaced. Contact Thermo Fisher Scientific Technical Support for assistance.

Possible cause	Solution
End-line filter is dirty or clogged	<p>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 (usually an amber or orange color). Replace the filter more often if bacterial buildup is visible or if the eluent does not contain solvent.</p> <p>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.</p>
Blockages 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 62).
Dirty pump check valve	Clean or replace the pump check valve (see “ Cleaning and Replacing the Pump Check Valves ” on page 69).
Liquid leaks at junction between pump head and pump casing	<ol style="list-style-type: none"> Using the open-end wrench (P/N 014605) provided in the Dionex Inuvion IC System Ship Kit (P/N 057905), tighten the two nuts that attach the pump head to the pump housing. Tighten the nuts evenly (12 in-lb torque). If the leak persists, replace the piston seal (see “To remove and replace the pistons, analytical pump seals, and O-rings” on page 80).
Liquid leaks from seal wash port	Replace the piston seal (see “ To remove and replace the pistons, analytical pump seals, and O-rings ” on page 80).
Scratched pump piston	Inspect the pump pistons. If a piston is scratched, replace it (see “ To remove and replace the pistons, analytical pump seals, and O-rings ” on page 80).

Pump Does Not Start

Possible cause	Solution
No power (front Power LED indicator unlit)	<ol style="list-style-type: none"> Verify that the power cord is plugged in. Replace the main power fuses, if necessary (see “Changing the Main Power Fuses” on page 108).
No communication between Dionex Inuvion IC System and Chromeleon CDS	Verify that the USB cable is connected correctly.

5 Troubleshooting

Troubleshooting System Component Symptoms

Possible cause	Solution
Pump is turned off	Turn on the pump from the Inuvion ePanel.
Flow rate is set to 0	Set the flow rate from the Inuvion ePanel.

No Flow

Possible cause	Solution
Leak in the system	Follow the troubleshooting steps in “Liquid Leaks” on page 144.
Pump waste or priming valve open	Close the valve by turning the valve knob clockwise until finger-tight. Do not overtighten! Overtightening may damage the valve and the pump head.
Flow rate is set to 0	Set the flow rate from the Inuvion ePanel.
Eluent valve is closed	Turn on the pump from the Inuvion ePanel.
Pump not primed	Prime the pump (see “Priming the Analytical Pump” on page 46).
Broken pump piston	Replace the piston (see “To remove and replace the pistons, analytical pump seals, and O-rings” on page 80).

Erratic Flow and/or Pressure Reading

Possible cause	Solution
Pump not primed	Prime the pump (see “Priming the Analytical Pump” on page 46).
Damaged piston seal	Replace the piston seal (see “To remove and replace the pistons, analytical pump seals, and O-rings” on page 80).
Dirty pump check valve	Clean or replace the check valve (see “Cleaning and Replacing the Pump Check Valves” on page 69).
Leaking liquid line or fitting	Check for small leaks in the tubing and fittings. Tighten the fittings and replace any tubing or fittings as required (see “Replacing Tubing and Fittings” on page 62).

Excessive System Backpressure

Possible cause	Solution
Restriction in the system plumbing	<ol style="list-style-type: none"> 1. Check all liquid lines for crimping or blockage. Make sure the ferrule fittings are not overtightened onto tubing. For details, see “Replacing Tubing and Fittings” on page 62. 2. If you have trouble isolating the restriction, see “Isolating a Restriction in the Tubing” on page 61.
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 62).
Flow rate through the columns too high	Set the correct flow rate for your application.
Clogged column bed supports	Refer to the instructions in 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 63).

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.

Insufficient Time Between Sample Injections

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 sample injections.
Incorrect or contaminated standards	Remake standards.
Incorrect or contaminated eluent	<ul style="list-style-type: none"> • Remake the eluent. For instructions, refer to the column manual. • Install the end-line filter on the end of the deionized water line, or replace the existing filter.
<p>Note Dirty end-line filters are usually an amber or orange color, while new filters are white. Regularly replace end-line filters when using aqueous eluents, which may contaminate the filter with bacteria or algae. The bacterial buildup may not be visible.</p>	
Contaminated suppressor	Replace the suppressor. For instructions, refer to the column manual.
Malfunctioning injection valve or auxiliary valve	If the valve leak persists after troubleshooting, contact Thermo Fisher Scientific Technical Support for assistance.

Nonreproducible Peak Height or Retention Time

Possible cause	Solution
Column overloading	Dilute the sample (see “ Diluting Samples ” on page 51).
Liquid leaks	Locate and eliminate any leaks (see “ Liquid Leaks ” on page 144).

Possible cause	Solution
Incomplete or imprecise filling of sample loop	<ol style="list-style-type: none"> 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 Analytical Pump” on page 46).

Abnormal Retention Time or Selectivity

Possible cause	Solution
Incorrect or contaminated eluent	Remake the eluent, using concentrated eluent and ASTM filtered, Type I (18.2 megohm-cm) deionized water that meets the specifications listed in “Deionized Water Requirements for IC” on page xvi.
Contaminated or degraded sample	Take appropriate precautions when preparing and storing samples to prevent contamination and degradation (see “Preparing Samples” on page 50).
Contaminated column	<ol style="list-style-type: none"> 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 not properly installed	<p>Verify that the cell front cover is flush against the component panel. If necessary, tighten the two mounting screws.</p> <p>When the cell is correctly installed and the screws tightened, an electronics connector on the cell plugs into a receptacle inside the Dionex Inuvion IC System.</p>
No flow from pump	This condition has several possible causes (see “Pump Does Not Start” on page 147 and “No Flow” on page 148).

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 51).
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	<ol style="list-style-type: none"> Before making an injection, allow the background conductivity to equilibrate. Then, select Autozero on the Inuvion ePanel. If the problem persists, it may indicate a leak in the conductivity detector. Contact Thermo Fisher Scientific Technical Support for assistance.

Baseline Noise or Drift

Possible cause	Solution
Flow system leak; erratic baseline	Check for leaks in all tubing and fittings. Tighten all tubing connections and replace them as necessary. For tightening requirements, see “Replacing Tubing and Fittings” on page 62.
Trapped gases	<ol style="list-style-type: none"> 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 Analytical Pump” on page 46).
Contaminated or incorrect eluent	Remake the eluent, using concentrated eluent and ASTM filtered, Type I (18.2-megohm-cm) deionized water that meets the specifications listed in “Deionized Water Requirements for IC” on page xvi.
Rapid changes in ambient temperature	<ol style="list-style-type: none"> Verify that the ambient temperature is between 4 and 40 °C (40 and 104 °F). Make sure that air conditioning and heating vents are directed away from the Dionex Inuvion IC System. Check that the front door of the system is closed.

Possible cause	Solution
Insufficient system equilibration following 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 information.
Cell above or below temperature	Contact Thermo Fisher Scientific Technical Support for assistance.
Damaged piston seal	Replace the piston seal (see “To remove and replace the pistons, analytical pump seals, and O-rings” on page 80).

Vacuum Degas Assembly Does Not Run

This error occurs when the vacuum degas option is not operating as expected.

❖ To troubleshoot

1. If the vacuum degas assembly is not installed, manually degas the eluent.
2. If the vacuum degas assembly is installed, check the Command window in Chromeleon CDS. If a problem is reported, the vacuum degas assembly may need to be replaced. Contact Thermo Fisher Scientific Technical Support for assistance.

5 Troubleshooting

Troubleshooting System Component Symptoms

Specifications

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
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
Flow precision	<0.1%, typically
Flow accuracy	<0.1%, typically, at 13.8 MPa (2000 psi) and 1.0 mL/min
Pressure ripple	<1%
Eluent on/off valve	Standard
Leak sensor	Optical, standard
Piston seal wash (optional)	Seal wash pump can be operated in continuous or intermittent mode when connected to rinse solution supply
Pressure alarm limits	Upper and lower limit pressure alarms can be set
Vacuum degas	Dionex Inuvion IC System: Standard user-adjustable vacuum level
Eluent bottles	Polypropylene bottles, 2 L and 4 L
Eluent bottle pressure (optional)	Supported by a digital controlled regulator with display; available for Dionex Core IC System and Dionex Inuvion IC System
Injection valve	6-port, 2-position Rheodyne valve, electronically activated
Columns supported	2-, 3-, 4-, and 5-mm ID; maximum length 250 mm analytical column with 5 mm guard column

Dionex eluent generation (Dionex Inuvion IC System)	
Eluent types	KOH, MSA, or K ₂ CO ₃
Eluent concentration range	KOH, MSA: Up to 100 mM K ₂ CO ₃ : Up to 15 mM
Flow rate range	0.10 to 3.00 mL/min
Maximum operating pressure	35 MPa (5000 psi)
Gradient profile	One-step linear
Column heater (optional)	
Operating temperature range	10 to 60 °C (50 to 140 °F); settable within the software; minimum working range is 5 °C above ambient temperature
Temperature accuracy	±0.5 °C at sensor, at calibration points (30, 50 °C)
Suppressors and control (Dionex Inuvion Core IC System)	
Chemical suppression	4 mm and 2 mm anion and cation suppressor types
Carbonic acid removal for anions	For use with hydroxide eluents: Dionex CRD 200 For use with carbonate eluents: Dionex CRD 300
Nonsuppressed chromatography	Yes, supported
Suppressor wear parts	Optional regenerant pump for chemical suppressor
Dynamic suppression capacity	Anions: Dionex ACRS 500 (4 mm): 150 µeq/min Dionex ACRS 500 (2 mm): 75 µeq/min Cations: Dionex CCRS 500 (4 mm): 75 µeq/min Dionex CCRS 500 (2 mm): 37.5 µeq/min
Void volume	Dionex CRS 500 (4 mm): <50 µL Dionex CRS 500 (2 mm): <15 µL
Chemical and electrolytic suppression	Anion and cation suppressor types, 4 mm and 2 mm
Suppressor regeneration mode	Electrolytic Suppressor: Recycle or external water mode Chemical Suppressor: External regenerant

Suppressors and control (Dionex Inuvion Core IC System)

Current control range	Dionex DRS 600: 0 to 500 mA (4 mm) and 0 to 150 mA (2 mm) in 1 mA increments Dionex ERD 500 Electrolytically Regenerated Desalter: 0 to 500 mA (4 mm) and 0 to 150 mA (2 mm) in 1 mA increments
Salt converter	Dionex SC-CERS 500 available in 4 mm and 2 mm versions
Carbonic acid removal for anions	For hydroxide eluents: Dionex CRD 200 For carbonate eluents: Dionex CRD 300
Nonsuppressed chromatography	Yes, supported
Suppressor wear parts	Chemical Suppression: Optional regenerant pump Electrolytic Suppression: None

Suppressors and control (Dionex Inuvion IC System)

Chemical suppression	4 mm and 2 mm anion and cation suppressor types
Carbonic acid removal for anions	For use with hydroxide eluents: Dionex CRD 200 For use with carbonate eluents: Dionex CRD 300
Nonsuppressed chromatography	Yes, supported
Suppressor wear parts	Optional regenerant pump for chemical suppressor

Suppressors and control (Dionex Inuvion IC System)	
Dynamic suppression capacity	<p>Anions:</p> <p>Dionex ACRS 500 (4 mm): 150 µeq/min Dionex ACRS 500 (2 mm): 75 µeq/min</p> <p>Dionex ADRS 600 (4 mm): 200 µeq/min Dionex ADRS 600 (2 mm): 50 µeq/min</p> <p>Dionex AERS 500e (4 mm): 200 µeq/min Dionex AERS 500e (2 mm): 50 µeq/min</p> <p>Dionex AERS 500 Carbonate (4 mm): 30 µeq/min Dionex AERS 500 Carbonate (2 mm): 7.5 µeq/min</p> <p>Cations:</p> <p>Dionex CCRS 500 (4 mm): 75 µeq/min Dionex CCRS 500 (2 mm): 37.5 µeq/min</p> <p>Dionex CDRS 600 (4 mm): 100 µeq/min Dionex CDRS 600 (2 mm): 35 µeq/min</p> <p>Dionex CERS 500e (4 mm): 100 µeq/min Dionex CERS 500e (2 mm): 35 µeq/min</p>
Void volume	<p><50 µL for 4 mm Dionex DRS 600, Dionex ERS 500e, Dionex 500 Carbonate, and Dionex CRS 500 suppressors</p> <p><15 µL for 2 mm Dionex DRS 600, Dionex ERS 500e, Dionex ERS 500 Carbonate, and Dionex CRS 500 suppressors</p>
Chemical and electrolytic suppression	Anion and cation suppressor types, 4 mm and 2 mm
Suppressor regeneration mode	<p>Electrolytic Suppressor: Recycle or external water mode</p> <p>Chemical Suppressor: External regenerant</p>
Current control range	<p>Dionex DRS 600: 0 to 500 mA (4 mm) and 0 to 150 mA (2 mm) in 1 mA increments</p> <p>Dionex ERD 500 Electrolytically Regenerated Desalter: 0 to 500 mA (4 mm) and 0 to 150 mA (2 mm) in 1 mA increments</p>
Salt converter	Dionex SC-CERS 500 available in 4 mm and 2 mm versions

Suppressors and control (Dionex Inuvion IC System)

Carbonic acid removal for anions	For hydroxide eluents: Dionex CRD 200 For carbonate eluents: Dionex CRD 300
Nonsuppressed chromatography	Yes, supported
Suppressor wear parts	Chemical Suppression: Optional regenerant pump Electrolytic Suppression: None

Conductivity detector and flow cell

Type	Microprocessor-controlled digital signal processor
Cell drive	128 kHz square wave
Linearity	$r^2 \geq 0.999\%$
Resolution	0.002 nS/cm
Full-scale output ranges	Digital input signal range: 0 to 18,000 $\mu\text{S}/\text{cm}$, with autoranging Analog output signal range: 0 to 18,000 $\mu\text{S}/\text{cm}$
Temperature compensation	Fixed at 1.7% per 1 °C at cell temperature
Temperature range	Ambient +7 °C; 30 to 60 °C (86 to 122 °F)
Cell electrodes	Passivated 316 stainless steel; compatible with methanesulfonic acid
Cell body	Chemically inert polymeric material
Cell volume	<1 μL
Heat exchanger	Inert, tortuous path for low axial dispersion
Maximum cell operating pressure	10 MPa (1500 psi)
Data filter	Rise times from 0 to 10 s; user-selectable
Data collection rate	1 to 100 Hz, user-selectable

Autosampler

Automation using autosampler	Dionex AS-AP, Dionex AS-DV, Dionex AS-HV, or third-party autosampler
Sequential or simultaneous injection	Yes, depending on autosampler capabilities
Automated dilution	Yes, available with Dionex AS-AP
Dilution factor, Dionex AS-AP	1:1 to 1:1000
Dilution time, Dionex AS-AP	15 s with sample overlap

Autosampler	
Inline sample degassing	Yes, optional with Dionex CRD 300 or Dionex CRD 200
Inline filtration	Yes, with Dionex AS-DV or inline filter
High automation flexibility	Conditionals using Chromeleon CDS and post-run features

Software	
<p>Chromeleon CDS supported on the following operating systems:</p> <ul style="list-style-type: none"> • Windows 10 Enterprise and Pro • Windows 11 Enterprise and Pro 	<ul style="list-style-type: none"> • Autoconfiguration • Automated procedure wizard • System wellness and predictive performance • Data trending (numerical device parameters) • Virtual column simulator: (evaluation mode standard; isocratic and gradient optional) • Multi-vendor automation support of proprietary and third-party instruments (fully controls over 550 modules from more than 25 manufacturers, including GC, CE, HPLC, and MS) • Customizable system control panels • System trigger commands and conditionals • Data audit trail, system audit trail, and instrument audit trail • Multiple network control and network failure protection (optional) • System calibration storage (factory, present, and previous; completely user-selectable) • Automated system qualification (detailed, comprehensive qualification reports) • Dual sequence view in the studio

Physical	
Use environment	Indoor, dry location
Operating temperature	4 to 40 °C (40 to 104 °F)
Operating humidity range	20% to 80% relative humidity, noncondensing
Altitude	< 2000 m (6,562 ft) AMSL
Pollution degree	II
Power requirements	100 to 240 Vac, 50 or 60 Hz autoranging, 5 A
Control modes	Full control through Chromeleon CDS; alternative control through TTL or relay closures (one relay output, two TTL outputs, two assignable TTL inputs)

Physical

USB communication protocol	One USB input; three USB outputs
Shipping dimensions (h × w × d)	66.1 × 29.2 × 43.3 cm (26.0 × 11.5 × 17.0 in)
Weight	Dionex Inuvion Core IC System: 15.3 kg (33.7 lbs) Dionex Inuvion IC System: 16.2 kg (36 lbs)

TTL and Relay Control













Contents

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- [Controlling TTL and Relay Outputs](#)

TTL and Relay Connections

The 12-pin connector strip on the Dionex Inuvion IC System rear panel provides two relay outputs, two TTL outputs, and two TTL inputs (see [Figure 98](#)).

Figure 98. TTL and relay connector on rear panel

PIN Function	Connector Position	Description
GND		1 Ground - I/O interface voltage level for external lab device (logic 0)
TTL IN 0		2 TTL Input 0 (+5V logic) - Inject/Load
TTL IN 1		3 TTL Input 1 (+5V logic) - Autozero
TTL OUT 0		4 TTL Output 0 (330 Ohm pull up to +5V, open drain)
TTL OUT 1		5 TTL Output 1 (330 Ohm pull up to +5V, open drain)
Ana +1		6 +1V full-scale, analog out (high side) for lab data acquisition system (chromatograph Out)
Ana -1		7 +1V full-scale, analog out (low side) for lab data acquisition system (chromatograph Out)
RLY-NO		8 Electromechanical relay Normally Open (NO) contact
RLY-COM		9 Electromechanical relay Common (COM) contact
RLY-NC		10 Electromechanical relay Normally Closed (NC) contact
+5V		11 +5V - I/O interface voltage level for external lab device (logic 1)
GND		12 Ground - I/O interface voltage level for external lab device (logic 1)

IMPORTANT Relay loads exceeding 200 mA, or with included power supplies over 60 V, may damage CPU relay drivers.

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

The TTL outputs can be used to control functions in any installed external devices, such as an autosampler or another Dionex module. When connected to a peripheral device, the inputs can be programmed to perform the following Dionex Inuvion IC System 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 also turns the suppressor on and off. If the pump is turned off while the Dionex CR-TC (and the Dionex EGC current) are on, the Dionex CR-TC will automatically turn off to prevent damage.

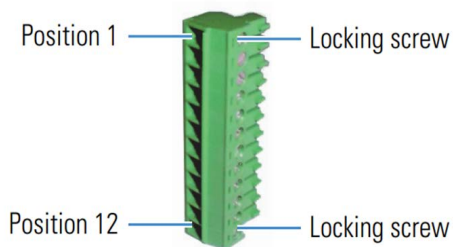
- Send a chart mark signal to the analog output (for example, to indicate the injection). The mark is 10% of the full-scale voltage and the duration is 0.5 second.

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 99](#)) provided in the Dionex Inuvion IC System Ship Kit (P/N 064375).

Figure 99. 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 98](#) or the label on the Dionex Inuvion IC System rear panel.

- b. 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.

- c. Plug the connector into the 12-pin connector on the Dionex Inuvion IC System rear panel.
- d. Connect the wires from the Dionex Inuvion IC System connector plug to the TTL or relay connector pins on the other module(s). Additional connector plugs are provided with other Thermo Scientific modules.

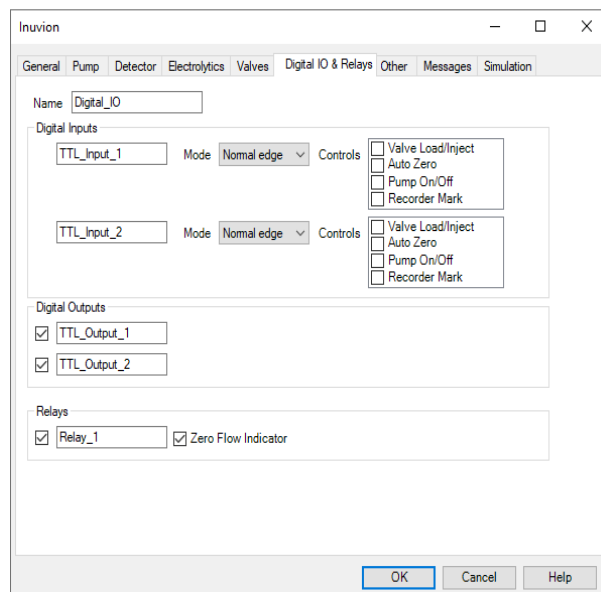
Note Verify the polarity of each connection. Connect signal wires to signal (+) pins and ground wires to ground (-) pins.

3. If you connected a peripheral device to a TTL input, confirm 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 CDS (see “[To select TTL input functions and control types](#)” on page 165).

❖ **To select TTL input functions and control types**

1. Open the Chromeleon Instrument Configuration Manager.
2. Double-click the Dionex Inuvion IC System icon under the instrument.
3. In the **Properties** dialog box, select the **Digital I/O & Relays** tab (see [Figure 100](#)).

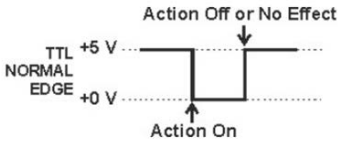
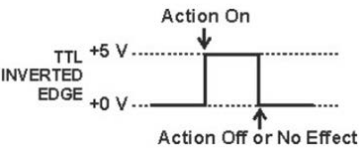
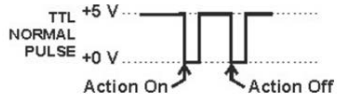
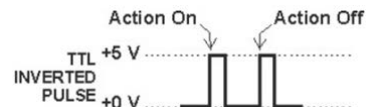
Figure 100. Properties dialog box: Digital I/O & Relays tab page



TTL Input Control Types

The Dionex Inuvion IC System 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 Inuvion IC System 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
<p>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.</p> <p>The action of the positive (rising) edge depends on the function:</p> <ul style="list-style-type: none"> • Load/Inject switches the injection valve to the Inject position. • Pump On turns off the pump (and suppressor). • Autozero and Mark have no effect. 	
<p>Inverted Edge: The inverted edge mode works identical to the Normal Edge mode, except that the positive and negative edges are reversed in function.</p>	
<p>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.</p> <ul style="list-style-type: none"> • 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 width between 4 ms and 50 ms is undefined. 	
<p>Inverted Pulse: The inverted pulse mode operates identical to the normal pulse mode, except that the positive and negative edges are reversed in function.</p>	

Controlling TTL and Relay Outputs

The Dionex Inuvion IC System 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 Inuvion ePanel in Chromeleon CDS or by including the commands in an instrument method.

B TTL and Relay Control

Controlling TTL and Relay Outputs

Reordering

Part number	Item
Eluent storage and delivery	
B51001953	Digital regulator display
B51001954	Digital regulator
22185-40210	Routing tubing clip
22185-62706	Dionex Inuvion Digital Regulator Kit
22185-62707	Eluent monitor for 2-liter eluent bottle
22185-62708	Eluent monitor for 4-liter eluent bottle
045987	Filter, end-line
062510	Eluent bottle (polypropylene), 2 L
063292	Eluent bottle (polypropylene), 4 L
074505	Filter, high-pressure inline
088467	Carbonate mixer, 2 mm
088468	Carbonate mixer, 4 mm
088471	Dionex EPM 500 Electrolytic pH Modifier
Pump head components	
B51000563	Piston seal (rear), 1/8-in
B51001290	Low-pressure valve, 3 ports
B51002398	Pump head assembly
B51002818	O-ring, 32-mm ID x 35-mm OD
B51002819	O-ring, 11-mm ID x 14 mm-OD
045994	Check valve cartridge
22185-20206	Outlet check valve holder
22185-20207	Inlet check valve holder
22185-20210	Pump head seal installation tool

Part number	Item
22185-60147	Pressure damper
22185-60206	Pressure transducer
22185-62701	Dionex Inuvion Seal Wash Kit
22185-63027	Shutoff valve
22185-98201	Duron seal, 1/8-in
048722	Piston rinse seal
22185-98202	Piston
055752	O-ring for waste valve or priming valve
Eluent generator consumables	
106-60001	Dionex Inuvion RFIC Degasser
22185-40701	Cradle for Dionex Carbonate Removal Device (CRD)
075778	Dionex EGC 500 KOH Potassium Hydroxide Eluent Generator Cartridge
075779	Dionex EGC 500 MSA Methanesulfonic Acid Eluent Generator Cartridge
088453	Dionex EGC 500 K ₂ CO ₃ Potassium Carbonate Eluent Generator Cartridge
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	
016388	Syringe, 1 mL (for manual injections)
024305	Luer adapter fitting, 1/4-28 (for manual injections)
030391	Sample loop, 100 µL
042857	Sample loop, 25 µL
042949	Sample loop, 10 µL
075973	Valve Rebuild Kit (for 6-port valve)
079054	Valve Rebuild Kit (for 10-port valve)
079803	Syringe, 10 mL (for priming eluent lines)
Auxiliary valve (not available for reorder)	
22185-62703	High Pressure Auxiliary Valve Kit (for 10-port valve)
22185-62704	High Pressure Auxiliary Valve Kit (for 6-port valve)
Suppressors, cell, and column heater	
B51001284	Regeneration pump tube

Part number	Item
B51002403	Conductivity detector cell
B51004248	Column heater heat exchanges, 1/16-in OD tubing
B51004249	Column heater heat exchanges, 1/32-in OD tubing
22153-40025	Column holder clip
22185-62400	Column oven
22185-62700	Trap column clip
22185-62702	Regenerant pump
085028	Dionex AERS 500 Carbonate Electrolytically Regenerated Suppressor (2 mm)
085029	Dionex AERS 500 Carbonate Electrolytically Regenerated Suppressor (4 mm)
085090	Dionex ACRS 500 Anion Dynamically Regenerated Suppressor (4 mm)
085091	Dionex ACRS 500 Anion Dynamically Regenerated Suppressor (2 mm)
085092	Dionex CCRS 500 Cation Dynamically Regenerated Suppressor (4 mm)
085093	Dionex CCRS 500 Cation Dynamically Regenerated Suppressor (2 mm)
088662	Dionex CR-ATC 600 Continuously Regenerated Trap Column
088663	Dionex CR-CTC 600 Continuously Regenerated Trap Column
088666	Dionex ADRS 600 Anion Dynamically Regenerated Suppressor (4 mm)
088667	Dionex ADRS 600 Anion Dynamically Regenerated Suppressor (2 mm)
088668	Dionex CDRS 600 Cation Dynamically Regenerated Suppressor (4 mm)
302661	Dionex AERS 500e Electrolytically Regenerated Suppressor (4 mm)
302662	Dionex AERS 500e Electrolytically Regenerated Suppressor (2 mm)
Fittings	
22000-9801	Fitting bolt, 10-32, for double-cone ferrule fitting
024305	Luer adapter fitting, 1/4-28
039056	Fitting coupler, 1/4-28

Part number	Item
042627	Fitting coupler, 10-32
042772	Fitting plug, 10-32
042806	Fitting coupler, 1/4-28 to 10-32
043276	Ferrule fitting, 10-32 double-cone
048949	Ferrule fitting, 1/8 in
052230	Fitting bolt, flangeless, 1/16 in
052276	Fitting nut, flangeless, 1/8 in
057934	Fitting bolt, flangeless, 1/8 in
062511	Ferrule fitting, flangeless, 2-piece, 1/16 in
IC PEEK Viper fittings and tubing assemblies	
B51000230	Viper assembly, 0.18-mm (0.007-in) ID, 140 mm (5.5 in) long
B51000232	Precision Viper Kit
B51000233	Viper assembly, 0.18-mm (0.007-in) ID, 76 mm (3 in) long
B51000237	Viper assembly, 0.18-mm (0.007-in) ID, 203 mm (8 in) long
Miscellaneous	
22185-60201	Optical leak sensor
960777	USB cable, 1.8 m (6 ft)
Preventive Maintenance Kit	
B51001547	Dionex Inuvion Preventive Maintenance Kit
062823	Next Due Date label

FAQ

How do I connect an autosampler to my Dionex Inuvion IC System?

For instructions on how to connect the system to a Dionex AS-AP, Dionex AS-DV, or Dionex AS-HV, refer to the autosampler operator's manual.

How do I print?

In the Chromeleon CDS Console, select Print from 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 148](#).
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 bottle with helium or nitrogen. For more information, see [“Setting Up the Eluent Bottle”](#) on [page 44](#).

How do I adjust retention times?

Retention times are calculated during calibration. The Use Recently Detected Retention Time parameter in the Chromeleon CDS 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 CDS Help.

When should I remake standards?

Standards are used only for calibration and should always be freshly made due to their limited lifetime of one week.

When should I replace the eluent generator cartridge?

The Dionex Inuvion RFIC monitors Dionex EGC use. When the cartridge needs replacement, a message is displayed in the Chromeleon CDS audit trail. To view the remaining cartridge life, select the EG Settings on the Inuvion ePanel.

How do I start Chromeleon CDS?

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

How do I delete data?

1. In the Chromeleon CDS Console, on the **Navigation Pane**, select 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” topics in the Chromeleon CDS Help.

How do I shut off the system?

Turn off the power switch on the Dionex Inuvion IC System rear panel (see [Figure 22](#)).

For longer shutdowns (over a week), Thermo Fisher Scientific recommends flushing the system with deionized water if the system was using manually prepared eluent.

To flush the system before an extended shutdown:

1. Connect the system to a bottle containing deionized water.
2. Bypassing all consumables, flush the system through the pump head and detector cell directly to waste.

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 Inuvion ePanel in Chromeleon CDS.
2. The suppressor needs regeneration. For troubleshooting guidance, refer to the suppressor manual.
3. For additional troubleshooting information, see [“High Cell Output”](#) on [page 152](#).

How do I configure and operate the auxiliary valve?

The auxiliary valve can be installed by users or by Thermo Fisher Scientific field service engineers.

For details about valve operation, see [“Auxiliary Valve \(Optional\)”](#) on [page 31](#). For maintenance details, see [User Maintenance](#).

Glossary

Analytical Column

Synonymous with **Separator Column**.

Auxiliary Valve

The auxiliary valve is a high-pressure valve used for in-line sample preparation. In Chromeleon CDS, the auxiliary valve may also be referred to as the HP_Valve.

Band Spreading

The broadening of the sample band as it travels through the column. Band spreading can also occur in the injection valve, detector 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 required as the 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.

Effluent

The stream flowing out of or exiting an analytical column.

Eluate

A mixture of solute and solvent exiting an analytical column. Similar to **Effluent**.

Eluent (Eluant)

The solution or mobile phase used as a solvent or ion extraction liquid in ion chromatography.

Eluite

The eluted species; also known as the sample or analyte.

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 contamination of the separator column by absorbing organic contaminants and removing particulates. It is filled with the same packing as the separator column. Synonymous with **Pre-Column**.

HETP (H)

Height Equivalent to a Theoretical Plate. A measure of column efficiency which allows comparison between columns of different lengths.

$$\text{HETP} = H = L/N$$

Where: L = the length of the column (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).

Isocratic

A chromatographic method with a constant and uniform mobile phase composition; a regular phase that runs continuously.

Liquid Lines

Another word for tubing carrying liquids; gas tubing is not considered a liquid line, but a gas line.

Packing

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

PEEK

An acronym for polyether ether ketone. This is a type of hydrophobic, chemically-resistant plastic commonly used for tubing and other mechanically demanding applications.

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 an electrolytically regenerated suppressor or chemically regenerated suppressor back to the form that suppresses the eluent conductivity.

Regenerant Pump

A peristaltic pump that performs several functions, including eluent regeneration, delivery of regenerant to a chemical suppressor, or delivery of water to an electrolytic suppressor being used in external water mode.

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_2 = 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.

Rotary Valve

A type of valve which regulates the flow of liquid or gas through a circular, rotating assembly. Also known as a rotary-motion valve.

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 °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. The components that are not retained are eluted in the void volume.