1 • Introduction ................................................................. 1
  1.1 Introduction to Ion Chromatography (IC) .................. 1
  1.2 Overview of the Dionex ICS-2100 ......................... 4
  1.3 About This Manual .................................................. 5
    1.3.1 Safety Messages and Notes ............................. 6
  1.4 Safety and Regulatory Information ....................... 8
    1.4.1 Safety Labels ................................................ 8
2 • Features .................................................................. 11
  2.1 Operating Features ................................................ 11
    2.1.1 Front Panel .................................................. 11
    2.1.2 Top Cover ................................................... 16
    2.1.3 Component Panel ......................................... 18
    2.1.4 Rear Panel .................................................. 21
  2.2 Flow Schematics ................................................... 23
  2.3 Chromeleon and Chromeleon Xpress ....................... 30
    2.3.1 The Panel Tabset ......................................... 30
    2.3.2 Software Control Modes ............................... 31
    2.3.3 System Wellness .......................................... 31
  2.4 System Component Details .................................. 32
    2.4.1 Vacuum Degas Assembly (Optional) ................. 32
Dionex ICS-2100 Ion Chromatography System

2.4.2 Eluent Valve ............................................. 34
2.4.3 Pump ....................................................... 34
2.4.4 Eluent Generator ........................................ 37
2.4.5 Auxiliary Power Supply (Optional) .................. 42
2.4.6 Injection Valve .......................................... 42
2.4.7 Auxiliary Valve (Optional) ............................ 44
2.4.8 Column Heater .......................................... 45
2.4.9 Suppressor .................................................. 46
2.4.10 DS6 Heated Conductivity Cell ....................... 46

3 • Operation and Maintenance .................................... 49

3.1 Operation Overview ........................................ 49
3.2 Turning On the System Power ............................... 51
3.3 Connecting to Chromeleon ................................ 52
3.4 Set Up the Eluent Reservoir ............................... 54
  3.4.1 Filter the Deionized Water .......................... 54
  3.4.2 Fill the Reservoir ..................................... 54
  3.4.3 Set the Eluent Level ................................ 54
  3.4.4 Connect the Reservoir ................................. 56
3.5 Check All Connections ..................................... 57
3.6 Prime the Pump ............................................. 57
3.7 Set System Operating Conditions ......................... 58
3.8 Equilibrate the System and Verify Operational Status 59
3.9 Prepare Samples .......................................................... 60
  3.9.1 Collecting and Storing Samples ................................. 60
  3.9.2 Pretreating Samples ............................................... 61
  3.9.3 Diluting Samples .................................................. 61
3.10 Loading and Injecting Samples ....................................... 62
  3.10.1 Loading Samples with a Syringe ............................... 63
  3.10.2 Loading Samples with a Vacuum Syringe .................... 64
  3.10.3 Loading Samples with an Autosampler ....................... 64
  3.10.4 Injecting Samples .............................................. 65
3.11 Processing Samples .................................................. 65
  3.11.1 Manual Sample Processing ..................................... 65
  3.11.2 Automatic (Batch) Sample Processing ....................... 66
3.12 Maintenance ........................................................... 68

4 • Troubleshooting .......................................................... 71
  4.1 Error Messages ....................................................... 71
  4.2 Troubleshooting Error Messages ................................... 74
  4.3 Liquid Leaks ........................................................... 86
  4.4 Pump Difficult to Prime or Loses Prime ............................ 88
  4.5 Pump Does Not Start ................................................ 90
  4.6 No Flow ............................................................... 90
  4.7 Erratic Flow/Pressure Reading ..................................... 91
  4.8 Excessive System Backpressure ................................... 92
  4.9 Peak “Ghosting” ..................................................... 93
Dionex ICS-2100 Ion Chromatography System

4.10 Nonreproducible Peak Height or Retention Time ......................... 94
4.11 Abnormal Retention Time or Selectivity ............................. 94
4.12 No Cell Response .................................................. 94
4.13 High Cell Output ...................................................... 95
4.14 Baseline Noise or Drift .............................................. 96
4.15 Vacuum Degas Assembly Does Not Run ............................. 97

5 • Service ................................................................................. 99

5.1 Diagnostic and Calibration Procedures ................................. 99
  5.1.1 Chromeleon Wellness Panel Overview ............................ 100
  5.1.2 Diagnostic and Calibration Touch Screen Overview .......... 102
  5.1.3 Calibrating the Conductivity Cell ................................. 103
  5.1.4 Calibrating the Flow Rate ......................................... 106
  5.1.5 Calibrating the Vacuum Degas Assembly .................. 108

5.2 Isolating a Restriction in the Liquid Lines ......................... 109

5.3 Replacing Tubing and Fittings ........................................... 113
5.4 Rebuilding the Injection Valve or Auxiliary Valve ............... 114
5.5 Replacing an Auxiliary Valve Pod .................................... 115
5.6 Cleaning and Replacing the Pump Check Valves .................. 118
5.7 Replacing a Pump Piston Seal and Piston Rinse Seal ............. 120
5.8 Replacing a Pump Piston ................................................. 124
5.9 Replacing the Waste Valve or Priming Valve O-Ring .......... 125
5.10 Replacing the Conductivity Cell ...................................... 127
5.11 Replacing the Suppressor ............................................... 130
5.12 Replacing the Column Heater .................................................. 131
5.13 Replacing the Column Heater Heat Exchanger ......................... 134
5.14 Replacing the Eluent Valve ..................................................... 135
5.15 Replacing the Leak Sensor ..................................................... 137
5.16 Priming the Pump ............................................................... 138
  5.16.1 Priming the Eluent Lines with a Syringe ............................. 138
  5.16.2 Priming with the Prime Button .......................................... 140
5.17 Priming the Pump with Isopropyl Alcohol ............................... 141
5.18 Changing Main Power Fuses .................................................. 142
5.19 Replacing a Dionex EluGen Cartridge ....................................... 143
  5.19.1 Replacing a KOH, LiOH, MSA, or NaOH Dionex EluGen Cartridge .................................................. 143
  5.19.2 Replacing a K2CO3 Cartridge ............................................. 151
5.20 Replacing the CR-TC ............................................................ 165
5.21 Replacing the EPM Electrolytic pH Modifier .............................. 169
  5.21.1 Recording the EPM Serial Number in Chromeleon ............... 170
  5.21.2 Plumbing the EPM for Hydrating and Conditioning ............... 171
  5.21.3 Hydrating and Conditioning the EPM ................................. 173
5.22 Replacing the EGC CO3 Mixer ................................................. 174
  5.22.1 Installing the New EGC CO3 Mixer ..................................... 174
  5.22.2 Filling the EGC CO3 Mixer with Deionized Water ................. 175
  5.22.3 Filling the EGC CO3 Mixer with Eluent ............................... 178
5.23 Replacing the EGC Holder and Degas Assembly ........................ 185
  5.23.1 Disconnecting and Removing the Dionex EluGen Cartridge ........ 185
5.23.2 Removing the CR-TC and Reinstalling it in the New EGC Holder ............................................. 188
5.23.3 Removing the EPM and Reinstalling it in the New EGC Holder .................................................. 190
5.23.4 Installing the New EGC Holder Without a CR-TC or EPM ....................................................... 192
5.23.5 Reinstalling the Dionex EluGen Cartridge .......................................................... 193

A • Specifications .................................................. 195

A.1 Electrical .......................................................... 195
A.2 Physical ............................................................ 195
A.3 Environmental ...................................................... 196
A.4 Front Panel .......................................................... 196
A.5 Analytical Pump and Fluidics .................................................. 196
A.6 Eluent Generation ...................................................... 198
A.7 Detector Electronics .................................................. 200
A.8 Conductivity Cell with Heat Exchanger .................................................. 200
A.9 Injection Valve ...................................................... 201
A.10 Auxiliary Valve (Optional) ........................................... 201
A.11 Vacuum Degas Assembly ............................................. 201
A.12 Column Heater ...................................................... 201
A.13 Auxiliary Power Supply (Optional) .................................... 202
A.14 Suppressors .......................................................... 202
A.15 Autosampler .......................................................... 203
A.16 System Software ...................................................... 204
B • Touch Screen Operation

B.1 Using the Touch Screen

B.2 Using the Touch Screen with Chromeleon

B.3 Overview of Dionex ICS-2100 Touch Screen Pages

B.4 Home Page

B.4.1 Home Page Pump Controls

B.4.2 Home Page EGC Controls

B.4.3 Home Page Column Heater

B.4.4 Home Page Injection Valve Controls

B.4.5 Home Page Detector Controls

B.4.6 Other Home Page Controls

B.5 Plot Page

B.6 Status Page

B.6.1 Viewing Other Status Parameters

B.6.2 Status Parameter Details

B.7 Pump Page

B.7.1 Setting Pump Pressure Limits and Selecting the Pressure Unit

B.7.2 Setting Degas Operating Parameters (Optional)

B.7.3 Controlling the Eluent Valve

B.8 Eluent Generator Page

B.8.1 EGC Serial Number

B.8.2 Setting the Eluent Concentration

B.8.3 Controlling the Eluent Generator Power
B.8.4 Monitoring the EluGen Cartridge Life ........................... 228
B.8.5 Controlling the CR-TC Power ................................. 229
B.9 Suppressor Page .................................................. 230
B.10 Detector Page .................................................... 231
   B.10.1 Setting the Data Rise Time ............................... 232
   B.10.2 Selecting the Conductivity Polarity ...................... 232
   B.10.3 Setting Analog Out Options ............................... 233
B.11 Information Page ................................................ 234
B.12 Module Setup Page .............................................. 235
B.13 Input/Output Page ................................................ 236
B.14 Diagnostic and Calibration Pages .............................. 236

C • TTL and Relay Control ........................................... 239
   C.1 TTL and Relay Connections .................................. 239
       C.1.1 Selecting TTL Input Functions and Control Types ...... 242
   C.2 Controlling TTL and Relay Outputs ......................... 245
   C.3 Example Setup for Stand-Alone Operation ................... 246

D • Reordering Information ........................................... 251

E • FAQ ................................................................. 255
   E.1 How do I hook up an autosampler? ......................... 255
   E.2 How do I print? ................................................. 255
   E.3 Why are the retention times moving? ....................... 255
Contents

E.4 How do I adjust retention times? ........................................ 255
E.5 When should I remake standards? ................................. 255
E.6 When should I replace the eluent generator cartridge? .... 256
E.7 How do I start Chromeleon? ........................................... 256
E.8 How do I delete data? .................................................... 256
E.9 How do I back up data? .................................................. 256
E.10 How do I shut off the system? ...................................... 256
E.11 How do I store columns? .............................................. 256
E.12 How do I know when a column is dirty? ....................... 257
E.13 How do I clean a column? ........................................... 257
E.14 Why is the conductivity high? ..................................... 257
E.15 How do I configure and operate the auxiliary valve? .... 257

F • Glossary ........................................................................... 259

Index
1 • Introduction

1.1 Introduction to Ion Chromatography (IC)

The Thermo Scientific Dionex™ ICS-2100 Ion Chromatography System (Dionex ICS-2100) performs ion analyses using suppressed or non-suppressed conductivity detection. An ion chromatography system typically consists of a liquid eluent, a high-pressure pump, a sample injector, a guard and separator column, a chemical suppressor, a conductivity cell, and a data collection system.

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

1. Eluent Delivery
   - Eluent, a liquid that helps to separate the sample ions, carries the sample through the ion chromatography system. The Dionex ICS-2100 includes an eluent generator, which generates eluent online from deionized water.
   - When the Dionex ICS-2100 is controlled from the front panel, only isocratic eluent delivery is possible. This means that the eluent composition and concentration remain constant throughout the run. Gradient delivery (a change in concentration over time) is possible when the Dionex ICS-2100 is controlled by Chromeleon™ Chromatography Management System (the data collection system for the Dionex ICS-2100).
2. Sample Injection
   - The liquid sample is loaded into a sample loop either manually or automatically (if an automated sampler is installed). When triggered, the Dionex ICS-2100 injects the sample into the eluent stream.
   - The pump pushes the eluent and sample through the guard and separator columns (chemically-inert tubes packed with a polymeric resin). The guard column removes contaminants that might poison the separator column.

3. Separation
   - As the eluent and sample are pumped through the separator column, the sample ions are separated. In the Dionex ICS-2100, the mode of separation is called ion exchange. This is based on the premise that different sample ions migrate through the IC column at different rates, depending upon their interactions with the ion exchange sites.

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

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

6. Data Analysis
   - The conductivity cell transmits the signal to a data collection system.
   - The data collection system (for the Dionex ICS-2100, this is the Chromeleon™ Chromatography Management System) identifies the ions based on retention time, and quantifies each analyte by integrating the peak area or peak height. The data is quantitated by comparing the sample peaks in a chromatogram to those produced from a standard solution. The results are displayed as a chromatogram and the concentrations of ionic analytes can be automatically determined and tabulated.
1.2 Overview of the Dionex ICS-2100

The Dionex ICS-2100 is an integrated ion chromatography system containing an eluent generator, pump, injection valve, column heater, and conductivity detector. Other system components, including a guard column, separator column, and suppressor vary, depending on the analyses to be performed.

The Dionex ICS-2100 can be configured with a vacuum degas assembly for online eluent degassing. If desired, the second eluent generator power supply can be configured to power an auxiliary electrolytic device, such as a water purifier.

An optional second high-pressure valve (6-port or 10-port) can be installed for sample preparation applications.

Dionex ICS-2100 operation can be controlled in one of two ways:

- **Remotely**, with a personal computer running Microsoft® Windows® Vista or Windows XP and Chromeleon software (version 6.80 SR6a or later). Chromeleon also provides data acquisition and data processing functions.

- **Locally**, with the front panel LCD touch screen. The touch screen is used for instrument control only. It does not provide data acquisition or data processing functions. An analog output on the rear panel can be connected to a separate data acquisition device.

For communication between the Dionex ICS-2100 and Chromeleon, the Dionex ICS-2100 is connected to a USB (Universal Serial Bus) port on the computer or a USB hub. For details, see the Dionex ICS-2100 installation instructions. Also refer to *Installing the Chromeleon Chromatography Management System with a Dionex Ion Chromatograph (IC)* (Document No. 031883).
1.3 About This Manual

The electronic version (i.e., PDF file) of this operator’s manual contains numerous hypertext links that can take you to other locations within the file. These links include:

- Table of contents entries
- Index entries
- Cross-references (underlined in blue) to sections, figures, tables, etc.

If you are not familiar with how to navigate PDF files, refer to the Help system for Adobe® Acrobat® or Adobe Reader® for assistance.

<table>
<thead>
<tr>
<th>Chapter 1</th>
<th>Introduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduces ion analysis and the Dionex ICS-2100; explains the conventions used in this manual, including safety-related information.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Chapter 2</th>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provides an overview of Dionex ICS-2100 operating features and system components; introduces the Chromeleon user interface.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Chapter 3</th>
<th>Operation and Maintenance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provides operating instructions and describes routine preventive maintenance procedures.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Chapter 4</th>
<th>Troubleshooting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lists problems, and presents step-by-step procedures for how to isolate and eliminate the cause of each problem.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Chapter 5</th>
<th>Service</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provides step-by-step instructions for routine service and parts replacement procedures that the user can perform.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Appendix A</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lists the Dionex ICS-2100 specifications and installation site requirements.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Appendix B</th>
<th>Touch Screen Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Describes the operating features available from the front panel touch screen.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Appendix C</th>
<th>TTL and Relay Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Describes the Dionex ICS-2100 TTL and relay control features.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Appendix D</th>
<th>Reordering Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lists spare parts for the Dionex ICS-2100.</td>
<td></td>
</tr>
</tbody>
</table>
1.3.1 Safety Messages and Notes

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

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

- **WARNING**
  Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

- **CAUTION**
  Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. Also used to identify a situation or practice that may seriously damage the instrument, but will not cause injury.

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

**Messages d'avertissement 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

ACHTUNG

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

WARNUNG

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

VORSICHT

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

Notes

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

NOTE NOTES call attention to certain information. They alert you to an unexpected result of an action, suggest how to optimize instrument performance, etc.
1.4 Safety and Regulatory Information

The Dionex ICS-2100 was manufactured by Thermo Fisher Scientific at the following location: 527 Lakeside Drive, Sunnyvale, CA 94088-3603 U.S.A. The Dionex ICS-2100 is designed for IC (ion chromatography) applications and should not be used for any other purpose. Operation of a Dionex ICS-2100 in a manner not specified by Thermo Fisher Scientific may result in personal injury. If there is a question regarding appropriate usage, contact Technical Support for Dionex products. In the U.S. and Canada, call 1-800-346-6390. Outside the U.S. and Canada, call the nearest Thermo Fisher Scientific office.

1.4.1 Safety Labels

The TUV T-Mark and cTUVus Mark safety labels and the CE Mark label on the system indicate that it is in compliance with the following standards:

**EMC Susceptibility and Emissions**

- EN 61326-1:2006

**Safety**

- CAN/CSA-C22.2 61010-1:2004
- UL 61010-1:2004
- EN 61010-1:2001

The symbols below appear on the Dionex ICS-2100 or on labels affixed to the Dionex ICS-2100.

Alternating current

Primary protective conductor terminal

Secondary protective conductor terminal
1 • Introduction

| Power supply is on |

| Power supply is off |

| Hot surface |

| Indicates a potential hazard. Refer to the operator’s manual for an explanation of the hazard and how to proceed. |
Dionex ICS-2100 Ion Chromatography System
This chapter describes key Dionex ICS-2100 features and introduces the Chromeleon user interface.

2.1 Operating Features

2.1.1 Front Panel

*Figure 2-1* illustrates the front panel of the Dionex ICS-2100.

**Injection Port**

The sample to be analyzed can be injected manually into the injection port, using a syringe. For automated sample injection, the Dionex ICS-2100 must be connected to an autosampler. For more information about sample injection, see *Section 3.10*.

**Touch Screen**

The LCD touch screen provides local control of most Dionex ICS-2100 functions. You can control many of these functions directly on the touch screen’s *HOME* page (see *Figure 2-2*). From the *HOME* page, you can also go to a series of pages that provide access to all other locally controlled Dionex ICS-2100 operating functions.
Summary of Touch Screen Operation

NOTE To adjust the screen contrast, open the front door and adjust the knurled knob under the screen (see Figure 2-8).

- Edit fields and command buttons have blue text on a shaded background. Fields that display status information are not shaded.
- Edit fields have square corners, while command buttons are rounded.
- To select a command button or edit a field, touch and release the command button or edit field with your fingertip.

NOTE When you touch a button or edit field, the action is taken when you lift your finger. If you unintentionally touch a button or field, you can cancel the action by sliding your finger away from the button or field before lifting.

- Touching a command button (for example, \(\text{Inject}\)) executes the command immediately.
• Selecting a command button changes the button’s appearance to white text on a dark background (for example, Injext).

• Touching an edit field (for example, Flow Rate 0.00 mL/min) opens a page with a number keypad (see Figure 2-3). Use the keypad to enter the desired numerical value for the field and then touch the ENTER button.

Figure 2-3. Number Keypad
• Touching the page name (for example, HOME) in the bottom right corner opens a menu of pages (see Figure 2-4).

Figure 2-4. Dionex ICS-2100 Touch Screen Menu of Pages

• Touching a page name on the menu of pages displays the selected page. For example, touching SUPPRESSOR displays the
SUPPRESSOR page (see Figure 2-5). See Appendix B for details about each touch screen page.

Figure 2-5. Suppressor Page

- Touching  returns you to the HOME page.
- Touching  opens a list of options (see Figure 2-6).

Figure 2-6. Suppressor Page: Selecting an Option
2.1.2 Top Cover

Figure 2-7 illustrates the top cover of the Dionex ICS-2100.

Figure 2-7. Dionex ICS-2100 (Top View)

Dionex EluGen Cartridge and Reservoir Storage
The top cover holds one or two Dionex EluGen cartridges and up to two 2-L plastic reservoirs (P/N 044129) or one 4-L plastic reservoir (P/N 039164).

Dionex EluGen Cartridges
The Dionex EluGen cartridges are installed in holders that fit into the two back reservoir areas. See Section 2.4.4 for details about the eluent generator.

Tubing Chase
The tubing chase under the EGC and CR-TC connectors routes tubing from the eluent reservoir and EGC holder to the front of the Dionex ICS-2100.

EGC, EPM, CR-TC, and Auxiliary Power Supply Connectors
The cable from the Thermo Scientific Dionex EluGen cartridge (EGC) connects to the EGC-1 connector. The cable from the Continuously Regenerated Trap Column (CR-TC) connects to the CR-TC connector. If a second Dionex EluGen cartridge is installed, it connects to the EGC-2 connector. If the second eluent generator power supply is configured to power an auxiliary electrolytic device, it connects to the EGC-2 connector. For details, refer to the Dionex ICS-2100 installation instructions.

When operating with an Dionex EGC II K₂CO₃ EluGen Cartridge and the EPM Electrolytic pH Modifier, the Dionex EluGen cartridge is typically connected to the EGC-1 connector. The pH modifier, which mounts on the
side of the Dionex EluGen cartridge holder, is connected to the **EGC-2** connector. However, the connections can be reversed, if desired.

**EGC Service Area**

The EGC service area holds the cartridge during installation and replacement. For details, refer to the Dionex ICS-2100 installation instructions.
2.1.3 Component Panel

Figure 2-8 shows the user-accessible components installed on the component panel behind the Dionex ICS-2100 front door.

**Figure 2-8. Dionex ICS-2100 Component Panel**

1. Pressure Transducer
2. Leak Sensor
3. Pump Heads
4. Injection Valve
5. Auxiliary Valve (Optional)
6. DS6 Conductivity Cell
7. Suppressor
8. Column Heater and Columns
9. Eluent Valve
10. Mounting Brackets for Second Suppressor
11. Screen Adjustment Knob (under display)
12. Tubing Chase (2)
Pressure Transducer

The pressure transducer measures the system backpressure.

Leak Sensor

The leak sensor is installed in the drip tray at the bottom of the component panel. If liquid accumulates in the tray, an error message is logged in the Chromeleon Audit Trail and displayed on the LCD touch screen.

Pump Heads

The Dionex ICS-2100 includes a dual-piston serial pump. The flow rate can be set to 0.00 mL/min or to between 0.05 and 5.00 mL/min. However, for optimum performance, set the flow rate to between 0.40 and 2.00 mL/min. Setting the flow rate to 0.00 mL/min turns off the pump. See Section 2.4.3 for details about the pump.

Injection Valve

The injection valve is a six-port, electrically-activated Rheodyne valve. A 25-μL sample loop (P/N 042857) is installed on the valve at the factory. See Section 2.4.6 for details about valve operation.

Auxiliary Valve (Optional)

The auxiliary valve is a two-position, electrically-activated Rheodyne valve (6-Port Valve Kit, P/N 069472; 10-Port Valve Kit, P/N 069473). See Section 2.4.6 for details about valve operation.

DS6 Heated Conductivity Cell

The flow-through conductivity cell measures the electrical conductance of analyte ions as they pass through the cell. A heat exchanger inside the cell regulates the temperature, which can be set to between 30 and 55 °C. For optimum performance, set the temperature to at least 7 °C above the ambient temperature and 5 °C above the column oven temperature. See Section 2.4.10 for details about the cell.
Supressor

The suppressor reduces the eluent conductivity and enhances the conductivity of the sample ions, thereby increasing detection sensitivity. Either a Dionex AES™ Atlas Electrolytic Suppressor, Dionex SRS™ Self-Regenerating Suppressor, or Dionex MMS™ MicroMembrane™ Suppressor can be used with the Dionex ICS-2100. See Section 2.4.9 for details about the suppressor.

Separator and Guard Columns

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

Column Heater

The column heater controls the temperature of the separator and guard columns. The temperature can be set to between 30 and 60 °C; however, it must be set to at least 5 °C above the ambient temperature. See Section 2.4.8 for details about the column heater.

Eluent Valve

The eluent valve controls the flow from the eluent reservoir. The eluent valve opens automatically when the pump is started and closes when the pump is turned off.

Screen Adjustment Knob

Use this knob to change the LCD touch screen contrast.

Tubing Chases

The upper tubing chase routes tubing from the top cover to the component panel. The lower tubing chase routes tubing from the component panel, through the interior of the Dionex ICS-2100, to the rear panel.
2.1.4 Rear Panel

Figure 2-9 illustrates the Dionex ICS-2100 rear panel.

![Diagram of Dionex ICS-2100 Rear Panel]

**Figure 2-9. Dionex ICS-2100 Rear Panel**

**Analog Output Connector**

The analog output connector outputs conductivity data (as a 0 to 1 V signal) to an integrator or recording device. For connection and setup information, refer to the Dionex ICS-2100 installation instructions.

**USB Connectors**

A USB receptacle is provided to allow connection to the Chromeleon computer. Two USB ports are provided for connecting to other USB devices. For connection instructions, refer to the Dionex ICS-2100 installation instructions.
TTL and Relay Connector

The TTL and Relay connector strip provides two TTL outputs, two relay outputs, and four TTL inputs. The outputs can be used to control functions in other TTL- or relay-controllable devices. The inputs can be used to switch the injection valve position, turn on the pump, perform an autozero command, and send an event mark to the analog output. See Section C.1 for connection instructions.

Tubing Chases

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

Tubing Clips

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

Power Switch

The power switch provides on/off control of power to the Dionex ICS-2100.

Main Power Receptacle

The power supply cord plugs into the AC power receptacle.

The power supply cord is used as the main disconnect device. Make sure the socket-outlet is located near the Dionex ICS-2100 and is easily accessible.

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.

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

- **Figure 2-10** illustrates the liquid flow path when the components required for producing KOH, LiOH, MSA, or NaOH eluent are installed. The required components include the corresponding type of Dionex EluGen cartridge and a CR-TC.

- **Figure 2-11** illustrates the liquid flow path when the components required for producing carbonate/bicarbonate eluent are installed. The required components include a Dionex EGC II K$_2$CO$_3$ EluGen Cartridge, a Dionex EPM Electrolytic pH Modifier, and a Dionex EGC CO$_3$ Mixer.

- **Figure 2-12** illustrates the liquid flow path when the components required for producing carbonate eluent are installed. The required components include a Dionex EGC II K$_2$CO$_3$ EluGen Cartridge and a Dionex EGC CO$_3$ Mixer.
Figure 2-10. Dionex ICS-2100 Flow: KOH, LiOH, MSA, or NaOH Eluent Generation
Flow Description for KOH, LiOH, MSA, or NaOH Eluent Generation

Refer to Figure 2-10 for the flow path number locations.

- Deionized water from the reservoir 1 flows first through the pump degas assembly and then through the eluent valve 2 to the pump 3. The water is then pushed through the pressure transducer 4, which measures the system pressure. From there, the water flows through a pulse damper 5, which smooths minor pressure variations from the pump to minimize baseline noise.

- Water then flows into the Dionex EluGen cartridge (EGC) 6, which generates the programmed concentration of eluent. Eluent exits the cartridge and flows through the CR-TC 7 (which traps ionic contaminants), through the EGC degas tubing assembly 8, and on to the injection valve 9.

- After sample is loaded into the sample loop 10 and the injection valve is toggled to the Inject position, eluent passes through the sample loop.

- The eluent/sample mixture is pumped through the heat exchanger 11, which heats the mixture to the column heater temperature. The mixture then goes to the guard and separator columns 12 and through the suppressor 13.

- From the suppressor, the mixture flows through the cell 14, where the analytes are detected. A digital signal is sent to Chromeleon software. Analog output can be collected simultaneously.

- The mixture flows out of the cell and is recycled back into the suppressor 15, where it is the water source for the regenerant chamber.

- Regenerant waste from the suppressor is directed back to the CR-TC 16, and then to the EGC degas tubing 17, where any released hydrogen or oxygen gas is removed before it is sent to the gas separator assembly and then to waste 18.
Figure 2-11. Dionex ICS-2100 Flow: Carbonate/Bicarbonate Eluent Generation
Flow Description for Carbonate/Bicarbonate Eluent Generation

Refer to Figure 2-11 for the flow path number locations.

- Deionized water from the reservoir flows first through the pump degas assembly and then through the eluent valve to the pump. The water is then pushed through the pressure transducer, which measures the system pressure. From there, the water flows through a pulse damper, which smooths minor pressure variations from the pump to minimize baseline noise.

- Water then flows into the Dionex EluGen cartridge (EGC), which generates the programmed concentration of carbonate eluent. Eluent exits the cartridge and flows through the EPM, which adjusts the eluent concentration to produce the carbonate/bicarbonate mixture. The mixture flows through the EGC degas tubing assembly to the EGC CO3 Mixer (to ensure a homogenous carbonate/bicarbonate mixture), and then on to the injection valve.

- After sample is loaded into the sample loop and the injection valve is toggled to the Inject position, eluent passes through the sample loop.

- The eluent/sample mixture is pumped through the heat exchanger, which heats the mixture to the column heater temperature. The mixture then goes to the guard and separator columns and through the suppressor.

- From the suppressor, the mixture flows through the cell, where the analytes are detected. A digital signal is sent to Chromeleon software. Analog output can be collected simultaneously.

- The mixture flows out of the cell and is recycled back into the suppressor, where it is the water source for the regenerant chamber.

- Regenerant waste from the suppressor is directed back to the EPM, and then to the EGC degas tubing, where any released hydrogen or oxygen gas is removed before it is sent to the gas separator assembly and then to waste.
Figure 2-12. Dionex ICS-2100 Flow Schematic: Carbonate Eluent Generation
Flow Description for Carbonate Eluent Generation

Refer to Figure 2-12 for the flow path number locations.

- Deionized water from the reservoir 1 flows first through the pump degas assembly and then through the eluent valve 2 to the pump 3. The water is then pushed through the pressure transducer 4, which measures the system pressure. From there, the water flows through a pulse damper 5, which smooths minor pressure variations from the pump to minimize baseline noise.

- Water then flows into the Dionex EluGen cartridge (EGC) 6, which generates the programmed concentration of carbonate eluent. Eluent exits the cartridge and flows through the EGC degas tubing assembly 7. Eluent then goes to the EGC CO3 Mixer 8 (to ensure a homogenous eluent concentration), and then on to the injection valve 9.

- After sample is loaded into the sample loop 10 and the injection valve is toggled to the Inject position, eluent passes through the sample loop.

- The eluent/sample mixture is pumped through the heat exchanger 11, which heats the mixture to the column heater temperature. The mixture then goes to the guard and separator columns 12 and through the suppressor 13.

- From the suppressor, the mixture flows through the cell 14, where the analytes are detected. A digital signal is sent to Chromeleon software. Analog output can be collected simultaneously.

- The mixture flows out of the cell and is recycled back into the suppressor 15, where it is the water source for the regenerant chamber.

- Regenerant waste from the suppressor is directed back to the EGC degas tubing 16, where any released hydrogen or oxygen gas is removed before it is sent to the gas separator assembly and then to waste 17.
2.3 Chromeleon and Chromeleon Xpress

The Dionex ICS-2100 is controlled by a PC configured with Chromeleon Chromatography Management System or Chromeleon Xpress. Chromeleon Chromatography Management System provides complete instrument control, data acquisition, and data management. Chromeleon Xpress provides real-time control and monitoring of instruments, but does not include data management capabilities.

2.3.1 The Panel Tabset

The Chromeleon and Chromeleon Xpress panel tabset provides a centralized location for controlling system functions. A panel tabset for a Dionex ICS-2100 system typically includes the following Control panels:

- A Dionex ICS-2100 Control panel (see Figure 2-13) provides access to Dionex ICS-2100 functions. The label on the tab for this panel is the name of the timebase in which the Dionex ICS-2100 is configured.

![Figure 2-13. Dionex ICS-2100 Control Panel on the Panel Tabset](image-url)
- A **Sequence Control** panel lets you define and run *sequences* (groups of sample injections to be analyzed in the order in which they are listed).

- A **Status** panel shows the overall system status.

- An **Autosampler** panel (included if the Dionex ICS-2100 is connected to a Dionex AS, Dionex AS-AP, Dionex AS-DV, or Dionex AS-HV Autosampler) provides access to autosampler functions.

To open the panel tabset, use one of the methods below:

- If Chromeleon is installed, start Chromeleon and click the **Default Panel Tabset** toolbar button, or select **View > Default Panel Tabset**.

- If Chromeleon Xpress is installed, start the application; this automatically displays the Dionex ICS-2100 panel tabset.

### 2.3.2 Software Control Modes

Two modes of software control are available: direct control and programmed control.

- With *direct* control, you select operating parameters and commands from the Control panels. Direct control commands are executed as soon as they are entered.

- With *programmed* control, you create a list of control commands to be executed in chronological order. Programs can be created automatically (with the help of a software wizard).

### 2.3.3 System Wellness

System Wellness monitors the overall “health” of a chromatographic system. It provides built-in diagnostic and calibration features that help prevent unscheduled system shutdowns and assure reliable operation of system devices. For details about System Wellness, see Section 5.1.
2.4 System Component Details

This section provides details about Dionex ICS-2100 system components, including the vacuum degas assembly, pump, eluent generator, injection valve, column heater, suppressor, auxiliary power supply, and conductivity cell.

2.4.1 Vacuum Degas Assembly (Optional)

The vacuum degas assembly provides online eluent degassing at the time and duration specified by the user. The assembly, which must be installed in the Dionex ICS-2100 at the factory, consists of:

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

By default, the Dionex ICS-2100 monitors the degas pressure reading and turns the degas pump on and off as needed. Different degas operating modes can be selected from the touch screen PUMP page (see Section B.7) or from Chromeleon.

To select the degas operating options, open the Chromeleon Server Configuration program, right-click the Dionex ICS-2100 device in the timebase, and select Properties.
Select the **Options** tab (see Figure 2-14).

![Figure 2-14. Server Configuration Properties: Degas Options](image)

**Degas Options**

- **Always Off**: The degas pump is always off.
- **Always On**: The degas pump is always on. This setting is for test purposes by a Thermo Fisher Scientific Service Representative. Do not use this setting for routine operation.
- **Cycle**: The degas pump cycles on and off according to the times specified in the **Cycle On** and **Off** fields. **Cycle On** specifies for how long the degas pump runs during a cycle. **Cycle Off** specifies the time between cycles.
- **Monitor**: (default mode) The Dionex ICS-2100 monitors the degas pressure reading and turns the degas pump on and off as required.
2.4.2 Eluent Valve

The eluent valve controls the flow from the eluent reservoir. The valve opens automatically when the pump is started and closes when the pump is turned off. The valve can also be opened and closed manually from the Chromeleon Control panel (see Section 2.3.1) or the touch screen PUMP page (see Section B.7). This lets you perform service procedures on pump components without eluent leaks occurring.

![Figure 2-15. Eluent Valve](image)

2.4.3 Pump

The Dionex ICS-2100 pump is a microprocessor-based isocratic eluent delivery system. Its variable speed, dual-piston series design ensures pulse-free pumping for the most demanding applications.

**Primary Pump Head**

The primary pump head pumps eluent into the secondary head (see Figure 2-16). The check valves, which prevent reverse flow through the pump, are located on the bottom (inlet) and top (outlet) of the primary pump head. The priming valve is on the front of the pump head.

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

**NOTE** The priming valve must be open when the pump is being primed with a syringe or with isopropyl alcohol. For detailed priming instructions, see Section 5.16.
Secondary Pump Head

The secondary pump head delivers eluent to the remainder of the chromatography system (the injection valve, column, and detector). The waste valve is located on the front of the secondary pump head (see Figure 2-16).

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

**NOTE** The waste valve must be open when the pump is being primed using the Prime button. For detailed priming instructions, see Section 5.16.
**Dionex ICS-2100 Ion Chromatography System**

**Pressure Transducer**

Flow exiting the secondary pump head is directed to the pressure transducer (see Figure 2-16), which measures the system pressure.

Pressure readings indicate that the pumping system is delivering smooth, accurate flow. Pressure readings can be monitored from the Chromleon Control panel or the touch screen HOME page.

The system pressure should remain consistent (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. The pressure limits can be set from Chromleon (in the Server Configuration or in the control program) or from the touch screen PUMP page (see Section B.7). See Section 4.2 for troubleshooting information if a pressure limit is exceeded.

**Pulse Damper**

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

**Piston Seal Wash**

The pump includes a piston seal wash assembly that can be set up to continuously rinse the back of the piston seals to remove salt crystals and prolong the life of the seals. To use this feature, an external water source must be connected. For connection instructions, refer to the Dionex ICS-2100 installation instructions.

For continued protection of the pump, replace the piston rinse seals (see Section 5.7) and O-rings in the seal wash assembly every 6 months, or whenever you replace the main piston seals for the Dionex ICS-2100 pump.
2.4.4 Eluent Generator

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

**NOTE** A gas separator waste tube (P/N 045460) should be connected to the system waste line during installation (see Section B.10.1).

Several types of Dionex EluGen cartridges are available for use with the Dionex ICS-2100 (see Table 2-1). Each cartridge contains 900 mL of the appropriate electrolyte concentrate solution for eluent generation.

<table>
<thead>
<tr>
<th>Dionex EluGen Cartridge</th>
<th>Part Number</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>EGC II K₂CO₃</td>
<td>058904</td>
<td>Generates carbonate eluent for anion exchange separations. <strong>Note:</strong> Produces a carbonate/bicarbonate mixture when installed with the EPM Electrolytic pH Modifier (P/N 063175) and EGC CO₃ Mixer (P/N 061686).</td>
</tr>
<tr>
<td>EGC II KOH</td>
<td>058900</td>
<td>Generates hydroxide eluent for anion exchange separations.</td>
</tr>
<tr>
<td>EGC II LiOH</td>
<td>058906</td>
<td>Generates lithium hydroxide eluent for anion exchange separations.</td>
</tr>
<tr>
<td>EGC II MSA</td>
<td>058902</td>
<td>Generates methanesulfonic acid eluent for cation exchange separations.</td>
</tr>
<tr>
<td>EGC II NaOH</td>
<td>058908</td>
<td>Generates sodium hydroxide eluent for anion exchange separations.</td>
</tr>
</tbody>
</table>

*Table 2-1. Dionex EluGen Cartridge Types for the Dionex ICS-2100*
For more information, refer to the Dionex EluGen cartridge manual. The manual is included on the Thermo Scientific Reference Library DVD (P/N 053891).

You can select the concentration of eluent to be generated from either the Chromeleon Control panel or from the touch screen HOME page (see Section B.4).

The allowable eluent concentration depends on several factors: the flow rate, suppressor type, Dionex EluGen cartridge type, and cartridge configuration. For details, refer to Table 2-2 and Table 2-3.

### Single-Cartridge Configuration

In the single-cartridge configuration, the Dionex ICS-2100 contains one Dionex EluGen cartridge.

<table>
<thead>
<tr>
<th>Dionex EluGen Cartridge</th>
<th>Eluent Concentration Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>K$_2$CO$_3$</td>
<td>0.1 to 15 mM at 0.1 to 1.0 mL/min flow</td>
</tr>
<tr>
<td></td>
<td>0.1 to X mM at 1.0 to 2.0 mL/min flow where X = 15/flow in mL/min</td>
</tr>
<tr>
<td>KOH</td>
<td>0.1 to 100 mM at 0.1 to 1.0 mL/min flow</td>
</tr>
<tr>
<td></td>
<td>0.1 to X mM at 1.0 to 3.0 mL/min flow where X = 100/flow in mL/min</td>
</tr>
<tr>
<td>LiOH</td>
<td>0.1 to 80 mM at 0.1 to 1.0 mL/min flow</td>
</tr>
<tr>
<td></td>
<td>0.1 to X mM at 1.0 to 3.0 mL/min flow where X = 80/flow in mL/min</td>
</tr>
<tr>
<td>MSA</td>
<td>0.1 to 100 mM at 0.1 to 1.0 mL/min flow</td>
</tr>
<tr>
<td></td>
<td>0.1 to X mM at 1.0 to 3.0 mL/min flow where X = 100/flow in mL/min</td>
</tr>
<tr>
<td>NaOH</td>
<td>0.1 to 100 mM at 0.1 to 1.0 mL/min flow</td>
</tr>
<tr>
<td></td>
<td>0.1 to X mM at 1.0 to 3.0 mL/min flow where X = 100/flow mL/min</td>
</tr>
</tbody>
</table>

*Table 2-2. Eluent Concentration Ranges for Single-Cartridge Configurations*

### Linked Dual-Cartridge Configuration

In the linked dual-cartridge configuration, the Dionex ICS-2100 contains two Dionex EluGen cartridges (or one Dionex EluGen cartridge and an EPM) that perform as one cartridge. Note that the allowable eluent
concentration for a linked cartridge is less than when the cartridge is defined as independent. For details, refer to the Dionex EluGen cartridge manual. Cartridge manuals are included on the Thermo Scientific Reference Library DVD (P/N 053891).

<table>
<thead>
<tr>
<th>Dionex Elu-Gen Cartridges</th>
<th>Eluent Concentration Range</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>K₂CO₃/EPM Electrolytic pH Modifier</td>
<td>0.1 to 15 mM at 0.1 to 1.0 mL/min flow 0.1 to X mM at 1.0 to 2.0 mL/min flow X = 15/flow</td>
<td>The total of the eluent concentrations from both the Dionex EluGen cartridge and the EPM must not exceed the specified range. The EPM concentration must not exceed 10 mM. See “Generating Carbonate/Bicarbonate Eluent” on page 41 for details.</td>
</tr>
<tr>
<td>KOH/KOH KOH/MSA KOH/NaOH MSA/MSA MSA/NaOH NaOH/NaOH</td>
<td>0.1 to 50 mM at 0.1 to 1.0 mL/min flow 0.1 to X mM at 1.0 to 3.0 mL/min flow X = 50/flow</td>
<td>The eluent concentration range for each cartridge is cut by 50%.</td>
</tr>
<tr>
<td>LiOH/LiOH</td>
<td>0.1 to 40 mM at 0.1 to 1.0 mL/min flow 0.1 to X mM at 1.0 to 3.0 mL/min flow X = 40/flow</td>
<td>The eluent concentration range for each cartridge is cut by 50%.</td>
</tr>
</tbody>
</table>

Table 2-3. Eluent Concentration Ranges for Linked Dual-Cartridge Configurations

Dionex EluGen Cartridge Holder

The Dionex EluGen cartridge is installed in a cartridge holder, which mounts on the Dionex ICS-2100 top cover (see Figure 2-7). The cartridge holder also houses the high-pressure degas tubing assembly.
The Dionex ICS-2100 can control up to two Dionex EluGen cartridges. However, when operating with a Dionex EGC II K$_2$CO$_3$ EluGen Cartridge and the pH Modifier, only one cartridge can be installed, because the pH Modifier must be connected to the other EGC power supply (EGC-1 or EGC-2).

Tubing and fittings for plumbing the cartridge, degas assembly, CR-TC, and EPM are included with the holder. For connection instructions, refer to the Dionex ICS-2100 installation instructions.

**Backpressure Coil (Optional)**

The Dionex EluGen cartridge requires at least 14 MPa (2000 psi) of system backpressure for removal of electrolysis gas from the eluent produced by the cartridge. A system backpressure of 16 MPa (2300 psi) is ideal.

If necessary, increase the system backpressure by installing a backpressure coil between the injection valve and the Dionex EluGen cartridge OUTLET port. For details, refer to the Dionex ICS-2100 installation instructions.

**Continuously Regenerated Trap Column (CR-TC)**

The CR-TC is a high pressure electrolytically-regenerated trap column. The CR-TC is designed to remove anionic or cationic contaminants in the eluent or deionized water and to reduce drift during gradient separations. Two versions of the CR-TC can be used with the Dionex ICS-2100:

- CR-ATC (Continuously Regenerated Anion Trap Column, P/N 060477)
- CR-CTC (Continuously Regenerated Cation Trap Column, P/N 060478)

For more information, refer to the CR-TC manual. The manual is included on the Thermo Scientific Reference Library DVD (P/N 053891).

**NOTE** The IonPac™ ATC-HC Trap Column (P/N 059604) or IonPac CTC-I Trap Column (P/N 040192) can be used with the Dionex ICS-2100. However, both IonPac trap columns require off-line chemical regeneration. Contact Thermo Fisher Scientific for more information.
EPM Electrolytic pH Modifier and EGC CO₃ Mixer

The Dionex EGC II K₂CO₃ EluGen Cartridge can be used with an EPM Electrolytic pH Modifier (P/N 063175) (see Figure 2-17) and an EGC CO₃ Mixer (P/N 079943) to produce a carbonate/bicarbonate mixture. The carbonate/bicarbonate mixture is used with carbonate-based IonPac columns for anion exchange separations.

Figure 2-17. Dionex ICS-2100 with an Dionex EluGen Cartridge and EPM Installed

After the cartridge generates carbonate eluent, the pH Modifier adjusts the eluent concentration to produce the carbonate/bicarbonate mixture. The EGC CO₃ Mixer provides enough mixing to produce a homogenous solution of electrolytically-generated K₂CO₃ and KHCO₃ eluent.

For more information about these products, refer to the Dionex EluGen cartridge manual. Cartridge manuals are included on the Thermo Scientific Reference Library DVD (P/N 053891).

Generating Carbonate/Bicarbonate Eluent

If a K₂CO₃ EGC and an EPM Electrolytic pH Modifier are installed (connected to EGC-1 and EGC-2, respectively), set EGC-1 to the concentration of K₂CO₃ required for your application and set EGC-2 to the concentration of KHCO₃ required. In order to achieve the desired K₂CO₃/KHCO₃ eluent mixture, the K₂CO₃ cartridge must generate the total of the two setpoint concentrations.

For example, for a 3.50 mM K₂CO₃/1.00 mM KHCO₃ eluent, set EGC-1 to 3.50 mM and EGC-2 to 1.00 mM. When the eluent is generated, the K₂CO₃ cartridge generates 4.50 mM K₂CO₃, which is then modified by
the EPM to achieve the desired 3.50 mM K$_2$CO$_3$/1.00 mM KHCO$_3$ mixture.

2.4.5 **Auxiliary Power Supply (Optional)**

The EGC-2 power supply can be configured as an auxiliary power supply for the operation of an electrolytic device such as a water purifier. The power supply operates in constant current mode and can be configured from 0 to 200 mA, with a maximum voltage of 35 V.

2.4.6 **Injection Valve**

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

The valve has two operating positions: Load and Inject (see **Figure 2-18**).

![Figure 2-18. Injection Valve Flow Schematics](image)

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

- In the 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.

- In the 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. Section 3.10 describes how to inject samples.

Figure 2-19 shows the injection valve connections. The injection valve is plumbed at the factory with all tubing and fittings for connection to the pump, injection port, column, and waste. A 25-μL PEEK™ 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, the pre-installed 25-μL loop can be replaced with a loop that has a different sample injection volume.

![Figure 2-19. Injection Valve Plumbing](image)

NOTE The Dionex EluGen cartridge requires at least 14 MPa (2000 psi) of system back pressure for removal of electrolysis gas from the eluent produced by the cartridge. A system back pressure of 16 MPa (2300 psi) is ideal.

If the system back pressure is too low, install a back pressure coil. Connect one end of the back pressure coil to port P (2) on the injection valve; connect the other end to the TO INJ VALVE - P line. For details, refer to the Dionex ICS-2100 installation instructions.
2.4.7 Auxiliary Valve (Optional)

The auxiliary valve is a high-pressure Rheodyne valve. The electrically-activated, 2-position PEEK valve is offered in both 6-port and 10-port models (6-Port Valve Kit, P/N 069472; 10-Port Valve Kit, P/N 069473). The auxiliary valve enables a variety of sample preparation activities, including:

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

For more information, refer to Installing the ICS-1100/ICS-1600/ICS-2100 Auxiliary Valve (Document No. 065288). The manual is provided in the Auxiliary Valve Kit.
2.4.8 Column Heater

The column heater provides temperature control for the separator and guard column.

The heater temperature can be set to between 30 °C and 60 °C. However, the set temperature must be at least 5 °C above the ambient temperature. A thermistor mounted in the heater block monitors the temperature. Setting the temperature to 0 °C turns off the column heater.

If the temperature exceeds 65 °C, the column heater is shut off and the error message “Column heater exceeds safe temperature.” is displayed on the touch screen and in the Chromeleon Audit Trail. See Section 4.2 for troubleshooting information.

For best results with 2-mm columns, a microbore heat exchanger (P/N 060943) should be installed in the column heater (see Section 5.13). The tubing connections between the injection valve and column heat exchanger, guard column and separator column, and separator column to detector cell should all use red 0.125-mm, 0.005-in ID PEEK tubing (P/N 044221), rather than the standard black tubing.

Figure 2-20. Column Heater
2.4.9 **Suppressor**

The suppressor reduces the eluent conductivity and enhances the conductivity of the sample ions, thereby increasing detection sensitivity. Either a Dionex Atlas Electrolytic Suppressor, Dionex Self-Regenerating Suppressor, or Dionex MicroMembrane Suppressor can be used with the Dionex ICS-2100.

For details about any of the suppressors or for information about selecting a suppressor for your application, refer to the suppressor manuals. The manuals are on the Thermo Scientific Reference Library DVD (P/N 053891).

2.4.10 **DS6 Heated Conductivity Cell**

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

**Temperature Control**

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

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

**Temperature Compensation**

Built-in preset temperature compensation of 1.7% per °C helps minimize changes in the baseline or in peak heights when the operating temperature is different from the temperature at which the cell was calibrated.
DS6 Heated Conductivity Cell Components

The cell front cover provides **CELL IN** and **CELL OUT** fittings for connecting the cell to the suppressor (see Figure 2-8). The remaining cell components are mounted behind the component panel. To replace, the cell remove the screws on the cell front cover and pull the entire cell assembly out through the component panel. See Section 5.10 for cell replacement instructions.
This chapter describes routine operating and maintenance procedures for the Dionex ICS-2100.

The Dionex ICS-2100 is designed for IC (ion chromatography) applications and should not be used for any other purpose. Operation of the Dionex ICS-2100 in a manner not specified by Thermo Fisher Scientific may result in personal injury.

### 3.1 Operation Overview

Figure 3-1 illustrates the basic steps for routine operation of the Dionex ICS-2100.

![Figure 3-1. Operation Flow Chart]
Sample Processing Overview

Samples can be run manually (one at a time), or they can be grouped and run automatically in batches. Figure 3-2 shows the typical steps for manual and batch sample processing.

Figure 3-2. Sample Processing Overview
3.2 Turning On the System Power

Press the power switch on the Dionex ICS-2100 rear panel (see Figure 3-3) to turn on the system power. Table 3-4 shows the Dionex ICS-2100 conditions at power-up.

Also turn on the power to the computer and the autosampler (if used).

<table>
<thead>
<tr>
<th>Feature</th>
<th>Power-Up Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pump</td>
<td>Off</td>
</tr>
<tr>
<td>Injection valve</td>
<td>Load position</td>
</tr>
<tr>
<td>Cell</td>
<td>Reading current value</td>
</tr>
<tr>
<td>Suppressor</td>
<td>Off*</td>
</tr>
<tr>
<td>Cell heater</td>
<td>Set to the last value used. The default when the Dionex ICS-2100 is turned on for the first time is 35 °C.</td>
</tr>
<tr>
<td>Column oven temperature</td>
<td>Set to the last value used. The default when the Dionex ICS-2100 is turned on for the first time is 30 °C.</td>
</tr>
<tr>
<td>Eluent generator</td>
<td>Off*</td>
</tr>
<tr>
<td>CR-TC</td>
<td>Off</td>
</tr>
<tr>
<td>EPM</td>
<td>Off*</td>
</tr>
</tbody>
</table>

* When you start the suppressor, eluent generator, or EPM, the value used last is restored.

Table 3-4. Dionex ICS-2100 Power-Up Conditions
3.3 Connecting to Chromeleon

NOTE If you are beginning operation of a Dionex ICS-2100 that has not been configured in a timebase, refer to the Dionex ICS-2100 installation instructions for Chromeleon setup instructions.

1. Turn on the PC.
2. Start the Chromeleon Server, if it is not already running.
   a. Check the Chromeleon Server Monitor icon on the Windows taskbar.
      • When the server is running, the icon is gray.
      • When the Server is not running, the icon is crossed out in red.
      To start the server, right-click the icon and select Start Server.
   b. If the Server Monitor icon is not on the Windows taskbar, click Start > All Programs > Chromeleon > Server Monitor. The Server Monitor opens. Click Start to start the server.
3. To start the Chromeleon client, click Start and select All Programs > Chromeleon > Chromeleon.
4. If Chromeleon is installed, the main window and Browser appear. Display the panel tabset by selecting View > Default Panel Tabset or by clicking the Default Panel Tabset toolbar button.
   
   If Chromeleon Xpress is installed, starting the application automatically displays the panel tabset.
5. To display the Dionex ICS-2100 Control panel, click the tab labeled with the Dionex ICS-2100 timebase name (see Figure 3-4).
Figure 3-4. Dionex ICS-2100 Control Panel on the Chromeleon Panel Tabset
3.4 Set Up the Eluent Reservoir

The Dionex ICS-2100 does not require pressurized reservoirs. However, if eluent is manually degassed or is sensitive to contamination, Thermo Fisher Scientific recommends pressurizing the reservoir with helium or nitrogen.

The air regulator accessory bracket and other items needed for pressurizing the eluent reservoir must be ordered separately (P/N 060054). For more information, refer to the Dionex ICS-2100 installation instructions.

3.4.1 Filter the Deionized Water

Filtering removes small particulates in the deionized water that may contaminate the pump check valves and cause erratic flow rates or loss of prime. An end-line filter (P/N 045987) is provided in the Dionex ICS-2100 Ship Kit (P/N 064375) for this purpose.

Install the end-line filter on the end of the deionized water line, inside the reservoir. Verify that the end of the filter extends to the bottom of the reservoir and that the filter is submerged in deionized water. This prevents air from being drawn through the lines.

3.4.2 Fill the Reservoir

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

3.4.3 Set the Eluent Level

After filling the reservoir, enter the volume of liquid in the reservoir in one of the following locations:

- On the HOME page in the Eluent Level field (see Figure 3-5)
- In the Eluent Bottle field in the Pump Settings window (accessed from the Dionex ICS-2100 Control panel on the Chromeleon panel tabset (see Figure 3-4)

The Dionex ICS-2100 determines the eluent usage by monitoring the flow rate and the length of time the pump is on, and updates the Eluent Bottle volume as the eluent is depleted. A warning appears if the level falls below 200 mL. Warnings are repeated at 100 mL and 0 mL.
In order for the level displayed in the Eluent Bottle box and gauge to be accurate, you must enter the level when the reservoir is filled. The Dionex ICS-2100 does not automatically detect when the reservoir is filled, nor when it is empty.

**IMPORTANT**

Enter the volume of liquid in the reservoir

Note: The Eluent Level field is updated as the liquid is depleted.

*Figure 3-5. Home Page: Setting the Eluent Level*

Enter the volume of liquid in the reservoir (in liters)

Note: The Eluent Bottle field and slider gauge are updated as the liquid is depleted.

*Figure 3-6. Pump Settings Windows: Setting the Eluent Level*

The **STATUS** page (see *Figure 3-7*) also displays the amount of liquid remaining in the reservoir and an estimate of how many hours remain before the eluent reservoir is empty.
See Section B.6 for details about the STATUS PAGE.

3.4.4 **Connect the Reservoir**

If it is not already connected, connect the ELUENT BOTTLE OUT line from the reservoir cap to the ELUENT IN line, which extends from the plumbing and cable chase on the top of the Dionex ICS-2100 (see Figure 3-8).
3.5 Check All Connections

1. Make sure the eluent reservoir is filled and the tubing connecting the reservoir to the Dionex ICS-2100 tubing is securely connected (see Figure 3-8).

2. Make sure the eluent generator electrical cable (blue) is connected to the EGC-1 connector.

3. Make sure the CR-TC electrical cable (black) is connected to the CR-TC connector.

3.6 Prime the Pump

**IMPORTANT** If you changed eluent or if the eluent lines are dry, prime the lines first with a syringe before following the procedure below to prime the pump. See Section 5.16.1 for instructions on priming the lines with a syringe.

1. Verify that the priming valve on the primary pump head (see Figure 3-9) is closed (turned all the way clockwise).

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

3. Press Prime on the Chromeleon Control panel or the Dionex ICS-2100 touch screen HOME page. Confirm that the waste valve is open by pressing OK when
the reminder message appears. The pump will begin pumping at approximately 3 mL/min.

4. Continue priming the Dionex ICS-2100 until all air and previous eluent are purged and no air bubbles are exiting the waste line.

5. Press **Pump Off**.

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

### 3.7 Set System Operating Conditions

**NOTE** This section is an overview of the steps needed to start up the system and begin running samples. Actual operating parameters (flow rate, cell heater temperature, suppressor current, etc.) depend on the application to be run. Refer to the column manual for the required parameters for your application.

Set or verify system operating parameters from either the Chromeleon Control panel or from the touch screen **HOME** page. Operating parameters can also be set automatically by loading a Chromeleon sequence.

**NOTE** Clicking the System Startup button on the Chromeleon Control panel starts the pump and suppressor. The flow rate and suppressor current settings that were in effect when the system was shut down are restored.

**NOTE** Clicking the System Startup button on the Chromeleon Control panel starts the pump, suppressor, eluent generator, and CR-TC. The flow rate, suppressor current, and eluent concentration settings that were in effect when the system was shut down are restored.

1. Verify that the pump is on and set to the correct flow rate.
2. Verify that the suppressor current is on and that the setting is correct.
3. Verify that the eluent generator is turned on and the correct concentration is set. Verify that the CR-TC is turned on.
4. Verify that the cell heater is set to the correct value.
5. Verify that the column heater is set to the correct value.

**Automatically Turning on the Suppressor and Eluent Generator**

You can set up the Dionex ICS-2100 to turn on the suppressor, eluent generator, and CR-TC automatically when the pump is turned on. To do this:

- For the suppressor, select the **Automatically turn on with pump** option from the **SUPPRESSOR** page.
- For the eluent generator and CR-TC, select the option from the **ELUENT GENERATOR** page.

**NOTE** The suppressor, eluent generator, and CR-TC are always turned off automatically when the pump is turned off.

### 3.8 Equilibrate the System and Verify Operational Status

**NOTE** You can monitor system functions (conductivity, pressure, cell temperature, etc.) from the Chromeleon Control panel or from the touch screen HOME page.

1. Allow the system to equilibrate. During equilibration, the Chromeleon Control panel displays the background conductivity (the conductivity of the eluent before sample injection) and the system backpressure.

2. Monitor the background conductivity. Refer to the column manual for the appropriate background conductivity for your application.

3. Offset the background and zero the reading by clicking the **Autozero** button on the Chromeleon Control panel (see **Figure 3-4**).

4. Monitor the system pressure from the Control panel to make sure it is at the expected pressure for the installed column (refer to the column manual for details) and is stable.
   - If the pressure is less than the expected amount, gas may be trapped in the system. To release the gas, remove the pump fitting on the injection valve port, labeled P (2). 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 **Section 4.4** for additional troubleshooting information.
If the pressure is too high, there may be a restriction in the system plumbing. See Section 4.8 for troubleshooting information.

5. Verify that the baseline conductivity is at the expected reading for your application and is stable. In general, it should be <30 μS for a system set up for anion analyses and <2 μS for a system set up for cation analyses. See Section 4.13 for troubleshooting information if the conductivity is too high. See Section 4.14 if the baseline is drifting or has excessive “noise” (large fluctuations in readings).

6. Verify that the cell heater is at the set point and is stable. The temperature is at equilibrium when the Set Temperature and the Current Temperature readings on the Control panel are the same, or when the “=” symbol is displayed next to the Column Heater temperature on the HOME page.

7. Verify that the column heater temperature is at the set point and stable. The temperature is at equilibrium when the Set Temperature and the Current Temperature readings on the Control panel are the same, or when the “=” symbol is displayed next to the Column Heater temperature on the HOME page.

The system is now ready for sample processing.

3.9 Prepare Samples

NOTE Sample preparation can be performed while the system is equilibrating.

3.9.1 Collecting and Storing Samples

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

If samples will not be analyzed on the day they are collected, filter them through clean 0.45 μm filters immediately after collection; otherwise, bacteria in the samples may cause the ionic concentrations to change over time. Refrigerating the samples at 4°C (39°F) will reduce, but not eliminate, bacterial growth.
Analyze samples containing nitrite or sulfite as soon as possible. Nitrite oxidizes to nitrate, and sulfite to sulfate, thus increasing the measured concentrations of these ions in the sample. In general, samples that do not contain nitrite or sulfite can be refrigerated for at least one week with no significant changes in anion concentrations.

### 3.9.2 Pretreating Samples

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

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

Before injection, pretreat samples that may contain high concentrations of interfering substances by putting them through Dionex OnGuard™ cartridges. Refer to *Installation and Troubleshooting Guide for OnGuard Cartridges* (Document No. 032943) for instructions.

### 3.9.3 Diluting Samples

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

Use eluent or ASTM filtered, Type I (18-megohm) deionized water to dilute the sample. 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.
3.10 Loading and Injecting Samples

NOTE Samples can be injected using either the standard injection valve or the optional auxiliary valve, if installed. For more information, see the Chromeleon Help or user’s manual.

The two techniques for loading samples into the sample loop are: (1) with an autosampler or (2) with a syringe or vacuum syringe through the injection port on the Dionex ICS-2100 front door.

For autosampler injections, the injection port tubing is disconnected from the Dionex ICS-2100 injection valve and replaced by the autosampler outlet tubing. Other setup requirements depend upon the model of autosampler.

Setup for a Dionex AS Autosampler

To use a Dionex AS Autosampler with the Dionex ICS-2100, the following requirements must be met:

- The Dionex ICS-2100 injection valve (or the auxiliary valve, if installed) must be specified as the injection valve and must be linked to the Dionex AS in the Chromeleon timebase.
- An injection valve should not be installed in the AS.

See the Dionex ICS-2100 installation instructions for Dionex AS connection instructions.

NOTE The Dionex ICS-2100 and the Dionex AS can be set up for stand-alone (front panel) operation. This requires a TTL cable connection between the Dionex ICS-2100 and the AS. See Section C.3 for stand-alone setup instructions.

Setup for a Dionex AS-DV Autosampler

To use a Dionex AS-DV Autosampler with the Dionex ICS-2100, the following requirements must be met:

- The Dionex ICS-2100 injection valve must be linked to the Dionex AS-DV in the Chromeleon timebase.
Setup for a Dionex AS-HV Autosampler

For setup information for the AS-HV Autosampler, see the AS-HV Autosampler Operator’s Manual (Document No. 065125). The manual is provided on the Thermo Scientific Reference Library DVD (P/N 053891).

3.10.1 Loading Samples with a Syringe

1. Make sure the injection port on the Dionex ICS-2100 front door (see Figure 2-1) is connected to sample port S (5) on the injection valve (see Figure 3-10).

![Figure 3-10. Injection Valve Connections](image)

2. Fill the 1 cc syringe (P/N 016388) provided in the Dionex ICS-2100 Ship Kit (P/N 064375) with a calibration standard or sample.

3. Insert the syringe into the injection port on the Dionex ICS-2100 front door (see Figure 2-1).

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.

7. Switch the injection valve to the Inject position (see Section 3.10.4).
3.10.2 Loading Samples with a Vacuum Syringe

1. Disconnect the waste line from port W (6) of the injection valve (see Figure 3-10) and attach a shorter line: 25 to 30 cm (10 to 12 inches) of PEEK or PTFE (polytetrafluoroethylene) tubing.

2. Place the free end of the line into the sample.

3. Verify that the injection valve is in the Load position.

4. Insert the 1 cc syringe (P/N 016388) provided in the Dionex ICS-2100 Ship Kit (P/N 064375) into the injection port on the Dionex ICS-2100 front door (see Figure 2-1) and pull out the plunger to draw the sample into the injection valve.

5. Switch the injection valve to the Inject position (see Section 3.10.4).

3.10.3 Loading Samples with an Autosampler

1. Verify that the autosampler output line is connected to port S (5) of the Dionex ICS-2100 injection valve.

2. Prepare and fill the sample vials and place them in the autosampler tray or cassette. Refer to the autosampler manual for detailed instructions.

3. The sample loading process depends on the autosampler. Refer to the autosampler manual for detailed instructions. In general, use one of the following methods:

   • Include the commands for controlling sample loading in a Chromeleon program. (If necessary, refer to the Chromeleon Help or user manual for assistance.)

   • Enter the commands for loading the sample on the autosampler front panel.

4. Switch the injection valve to the Inject position (see Section 3.10.4).
3.10.4 Injecting Samples
After loading the sample in the sample loop, use one of the following methods to switch the injection valve to the Inject position:

- Manually: Click the Inject button on the Chromeleon Control panel (see Figure 3-4) or touch the Inject button on the HOME page.
- Automatically: Include the Inject command in a Chromeleon program. (If necessary, refer to the Chromeleon Help or user manual for assistance.)

3.11 Processing Samples
Samples can be run manually (one at a time) or else they can be grouped and run automatically in batches.

3.11.1 Manual Sample Processing
To process samples manually, select operating parameters and commands from the touch screen pages, or from the Chromeleon menu bar, toolbars, and Control panel. Commands are executed as soon as they are entered.

NOTE When you run samples manually from the front panel (without using Chromeleon), the data is saved only temporarily in the Dionex ICS-2100 memory. For a permanent record of the data, connect a recording device (chart recorder, integrator, etc.) to the analog output. For output connection instructions, refer to the Dionex ICS-2100 installation instructions.

1. Complete the instructions in Section 3.2 through Section 3.8 to prepare the Dionex ICS-2100 for operation and to prepare the sample for processing.
2. Load the sample, using a syringe, vacuum syringe, or autosampler (see Section 3.10).
3. In Chromeleon, select Control > Acquisition On. Chromeleon records the signal supplied by the detector and displays the signal plot on the Control panel.
4. Click the **Autozero** button on the Control panel or the touch screen **HOME** page.

5. Inject the sample (see Section 3.10.4).

6. In Chromeleon, monitor the chromatogram on the Control panel and select **Control > Acquisition Off** when sample data is collected.

   **NOTE** Data from Chromeleon manual processing is saved in the MANUAL sequence folder under the local datasource. This data is overwritten each time a new manual sample is processed. To save the data from a manual run, select the MANUAL folder, select File > Save As, and enter a new name for the sequence.

7. If you are controlling the Dionex ICS-2100 from the touch screens, select the **PLOT** button on the **HOME** page to view a plot of the conductivity data.

### 3.11.2 Automatic (Batch) Sample Processing

You can use Chromeleon or Chromeleon Xpress to create a list of samples (a sequence) to be processed automatically. For each sample, the sequence includes the following:

- A program with commands and parameters for controlling the Dionex ICS-2100 and autosampler (if used), and for acquiring sample data.
- A quantification method for peak identification and area determination.
- Additional sample processing parameters (sample name, sample type, injection volume, etc.).

After creating the sequence, you can start batch processing.
Summary of Automatic Sample Processing

1. Complete the instructions in Section 3.2 through Section 3.8 to prepare the Dionex ICS-2100 for operation and to prepare the sample for processing.

2. If an autosampler is installed, prepare and fill the sample vials and place them in the autosampler tray or cassette. Refer to the autosampler manual for detailed instructions. Autosampler manuals are provided on the Thermo Scientific Reference Library DVD (P/N 053891).

3. If an autosampler is not installed, load the sample into the injection valve sample loop through the sample port on the Dionex ICS-2100 front door (see Section 3.10.1).

4. Use the Application Wizard to specify a program and quantitation method, and create a sequence:
   a. On the Sequence Control panel, click Application Wizard.
   b. Select an application template from the list (see Figure 3-11).

![Figure 3-11. Application Wizard](image)
c. Click Next > and select the in a new sequence via Sequence Wizard option.

d. Click Next > to go to the Sequence Wizard.

e. Complete the steps in the Sequence Wizard, adding the desired number of samples and standards to the list. For help, click the Help button on the Sequence Wizard page.

After you click Finish, a sequence is created and a program appropriate for the selected application is copied to the sequence. If you are using Chromeleon, a quantification method is also copied to the sequence.

5. Load the sequence and start batch processing:

a. On the Sequence Control panel, click Load Sequence.

b. Select the sequence created in Step 4 and click Open.

c. Click Start Batch.

3.12 Maintenance

This section describes routine maintenance procedures that users may perform. All other maintenance procedures must be performed by Thermo Fisher Scientific personnel.

As Needed

• Regularly check the eluent reservoir and refill when needed.

Daily

• Check the Dionex ICS-2100 component panel (see Figure 2-8) for leaks or spills. Wipe up spills. Isolate and repair leaks (see Section 4.3). Rinse off any dried eluent with deionized water.

• Check the waste container daily and empty when needed.

Weekly

• Once a week, check fluid lines for crimping or discoloration. Replace any pinched lines. Replace damaged lines.

• Check the junctions between the pump heads and the pump casting for evidence of liquid leaks. If the piston seal wash tubing is not connected, check
the drain tubes at the rear of the pump heads for evidence of moisture. Normal friction and wear may gradually result in small liquid leaks around the piston seal. If unchecked, these leaks can gradually contaminate the piston housing, causing the pump to operate poorly. If leaks occur, replace the piston seals (see Section 5.7).

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

**NOTE** It is especially important to 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.

**Every Six Months**
- Calibrate the cell (see Section 5.1.3).
- Calibrate the vacuum degas assembly (see Section 5.1.5).
- Replace the pump piston rinse seals and piston seals (see Section 5.7).

**Yearly**
- Thermo Fisher Scientific recommends performing preventive maintenance annually, as well as before scheduled Performance Qualification tests. A Dionex ICS-2100 Preventive Maintenance Kit (P/N 057954) is available for this purpose.
- Rebuild the auxiliary valve, if installed (see Section 5.4).
- If a Dionex AS Autosampler is installed, perform the preventive maintenance procedure. The Dionex AS Preventive Maintenance Kit (P/N 060581) is available for this purpose.
- If a Dionex AS-DV Autosampler is installed, replace the tip and tubing. The Dionex AS-DV Preventive Maintenance Kit (P/N 055647) contains all of the components required to replace the sampling tip and the tubing between the tip and the injection valve. Instructions are included with the kit.
This chapter is a guide to troubleshooting minor issues that may arise during operation of the Dionex ICS-2100. Turn to the section of this chapter that best describes the operating problem or symptom that has been observed. Each section lists possible causes of the problem or symptom in order of probability. A systematic troubleshooting approach is the most effective way to determine the root cause.

If you are unable to resolve a problem by following the instructions here, contact Technical Support for Dionex products. In the U.S. and Canada, call 1-800-346-6390. Outside the U.S. and Canada, call the nearest Thermo Fisher Scientific office. Please have this chapter at hand when talking with Technical Support personnel.

4.1 Error Messages

The Moduleware (the instrument control firmware installed in each Dionex ICS-2100 module) periodically checks the status of certain parameters. If a problem is detected, it is displayed on the touch screen.

Error messages are also reported to Chromeleon and logged in the Audit Trail. Each error message is preceded by an icon that identifies the seriousness of the underlying problem (see the table below). You can change the severity level assigned to a problem whenever appropriate.

<table>
<thead>
<tr>
<th>Icon</th>
<th>Severity Level</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>!</td>
<td>Warning</td>
<td>A message is displayed in the Audit Trail, but the current run is not interrupted.</td>
</tr>
<tr>
<td>!</td>
<td>Error</td>
<td>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 analysis will not be started.</td>
</tr>
<tr>
<td>✅</td>
<td>Abort</td>
<td>A message is displayed in the Audit Trail, and the running batch is aborted.</td>
</tr>
</tbody>
</table>
The table below lists the most frequently observed Dionex ICS-2100 error messages. For troubleshooting assistance, refer to the page indicated in the table.

<table>
<thead>
<tr>
<th>Alarms and Error Conditions</th>
<th>See</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auxiliary power supply disconnected</td>
<td>page 74</td>
</tr>
<tr>
<td>Auxiliary power supply over current</td>
<td>page 74</td>
</tr>
<tr>
<td>Auxiliary power supply over voltage</td>
<td>page 75</td>
</tr>
<tr>
<td>Auxiliary power supply stopped for zero flow</td>
<td>page 75</td>
</tr>
<tr>
<td>Column heater exceeds safe temperature</td>
<td>page 75</td>
</tr>
<tr>
<td>Column heater open circuit</td>
<td>page 76</td>
</tr>
<tr>
<td>Column heater short circuit</td>
<td>page 76</td>
</tr>
<tr>
<td>CR-TC over current</td>
<td>page 76</td>
</tr>
<tr>
<td>CR-TC stopped for zero flow rate</td>
<td>page 76</td>
</tr>
<tr>
<td>Degas calibration failed</td>
<td>page 77</td>
</tr>
<tr>
<td>EGC board not present</td>
<td>page 77</td>
</tr>
<tr>
<td>EGC-1 calibration error</td>
<td>page 78</td>
</tr>
<tr>
<td>EGC-1 disconnected error</td>
<td>page 78</td>
</tr>
<tr>
<td>EGC-1 invalid concentration</td>
<td>page 79</td>
</tr>
<tr>
<td>EGC-1 invalid concentration vs. flow rate</td>
<td>page 79</td>
</tr>
<tr>
<td>EGC-1 invalid flow rate</td>
<td>page 79</td>
</tr>
<tr>
<td>EGC-1 over current</td>
<td>page 79</td>
</tr>
<tr>
<td>EGC-1 over voltage</td>
<td>page 79</td>
</tr>
<tr>
<td>EGC-2 calibration error</td>
<td>page 78</td>
</tr>
<tr>
<td>EGC-2 disconnected error</td>
<td>page 78</td>
</tr>
<tr>
<td>EGC-2 invalid concentration</td>
<td>page 79</td>
</tr>
<tr>
<td>EGC-2 invalid concentration vs. flow rate</td>
<td>page 79</td>
</tr>
<tr>
<td>EGC-2 invalid flow rate</td>
<td>page 79</td>
</tr>
<tr>
<td>EGC-2 over current</td>
<td>page 79</td>
</tr>
<tr>
<td>EGC-2 over voltage</td>
<td>page 79</td>
</tr>
<tr>
<td>Hardware not present</td>
<td>page 80</td>
</tr>
<tr>
<td>Leak sensor wet</td>
<td>page 80</td>
</tr>
<tr>
<td>Load/Inject valve error</td>
<td>page 81</td>
</tr>
<tr>
<td>Option not installed</td>
<td>page 81</td>
</tr>
</tbody>
</table>

*Table 4-5. Alarms and Error Messages Summary*
### 4 • Troubleshooting

<table>
<thead>
<tr>
<th>Alarms and Error Conditions</th>
<th>See</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pressure slope calibration error</td>
<td>page 81</td>
</tr>
<tr>
<td>Pump motor lost control</td>
<td>page 82</td>
</tr>
<tr>
<td>Pump over pressure</td>
<td>page 82</td>
</tr>
<tr>
<td>Pump pressure hardware error</td>
<td>page 82</td>
</tr>
<tr>
<td>Pump stopped due to lost USB communication error</td>
<td>page 83</td>
</tr>
<tr>
<td>Pump under pressure</td>
<td>page 83</td>
</tr>
<tr>
<td>Second valve error</td>
<td>page 83</td>
</tr>
<tr>
<td>Suppressor not connected</td>
<td>page 84</td>
</tr>
<tr>
<td>Suppressor over current</td>
<td>page 84</td>
</tr>
<tr>
<td>Suppressor over power</td>
<td>page 85</td>
</tr>
<tr>
<td>Suppressor over voltage</td>
<td>page 85</td>
</tr>
<tr>
<td>Suppressor stopped for zero flow rate</td>
<td>page 85</td>
</tr>
</tbody>
</table>

*Table 4-5. Alarms and Error Messages Summary (Continued)*
4.2 Troubleshooting Error Messages

**AUXILIARY POWER SUPPLY DISCONNECTED**

This error occurs when the auxiliary power supply is configured as active, but no device is connected.

To troubleshoot:

1. Connect the cable for the auxiliary device to the **EGC-2** power supply connector.
2. If there is no auxiliary device, open the Chromeleon Server Configuration program and remove this option from the Dionex ICS-2100 timebase.

**AUXILIARY POWER SUPPLY OVER CURRENT**

This error occurs when the device connected to the auxiliary power supply is attempting to draw more current than is allowed (200 mA) or is 20% higher than the set current.

To troubleshoot:

1. Check the cable connecting the device to the power supply for damage or a faulty connection.
2. If the error persists, refer to the manual provided by the device vendor for assistance.
This error occurs when the device connected to the auxiliary power supply is attempting to operate at a higher voltage than is allowed (35 V).

To troubleshoot:

1. Check the cable connecting the device to the power supply for damage or a faulty connection.
2. If the error persists, refer to the manual provided by the device vendor for assistance.

When the pump flow stops, the auxiliary power supply automatically turns off (to prevent damage to the electrolytic device) and this error occurs.

To troubleshoot:

If the pump stopped unexpectedly, see Section 4.6 for pump troubleshooting information.

This error occurs when the column heater temperature is higher than the maximum allowed. This error may occur if the Dionex ICS-2100 is operating in an extreme environment (greater than 40 °C (104 °F)).

To troubleshoot:

Refer to Section A.3 for environmental specifications.
**COLUMN HEATER OPEN CIRCUIT**

This error occurs when the column heater is unplugged from the component panel.

**To troubleshoot:**

1. Check 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 Section 5.12).

**COLUMN HEATER SHORT CIRCUIT**

This error occurs when there is a short circuit on the thermistor input used to measure the column heater temperature. This error indicates a faulty column heater.

**To troubleshoot:**

Replace the column heater (see Section 5.12).

**CR-TC OVER CURRENT ERROR**

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

**To troubleshoot:**

1. Check the CR-TC cable connection.
2. If the error persists, contact Thermo Fisher Scientific for assistance. There may be a malfunction in the CR-TC control electronics.
CR-TC STOPPED FOR ZERO FLOW RATE

This message appears when you click the Shutdown button on the Chromeleon Control panel. The message also appears when you turn off the pump flow while the EGC current (and CR-TC) are on. The CR-TC is automatically turned off.

To troubleshoot:

If the pump stopped unexpectedly, see Section 4.6 for pump troubleshooting information.

DEGAS CALIBRATION FAILED

This error occurs when the degas vacuum does not reach the expected level during calibration.

To troubleshoot:

1. Retry the calibration.
2. If calibration still fails, the vacuum degas assembly may need to be replaced. Contact Thermo Fisher Scientific for assistance.

EGC BOARD NOT PRESENT

This error occurs if Chromeleon sends a command to the IC related to the eluent generator, but the eluent generator controller board is either not installed or the Dionex ICS-2100 does not recognize the installed board.

To troubleshoot:

Contact Thermo Fisher Scientific for assistance. The electronics components cannot be serviced by the user.
EGC-1 CALIBRATION ERROR
EGC-2 CALIBRATION ERROR

This error occurs if the measured current is outside the expected range when running the eluent generator calibration procedure.

To troubleshoot:

1. Review the procedure to verify that you set up the Dionex ICS-2100 correctly and then rerun the calibration.
2. If the error message reappears, contact Thermo Fisher Scientific for assistance.

EGC-1 DISCONNECTED ERROR
EGC-2 DISCONNECTED ERROR

This error occurs when Chromeleon sends a command to set an eluent generator parameter when the EGC is disconnected. The error also can occur if you attempt to run the EGC verification test when the EGC is disconnected.

To troubleshoot:

1. Verify that the Dionex EluGen cartridge cable is connected to the EGC-1 connector on the Dionex ICS-2100 top cover (see Figure 2-7).
2. If the error persists, contact Thermo Fisher Scientific for assistance. There may be a malfunction in the EGC control electronics.
EGC-1 INVALID CONCENTRATION VS. FLOW RATE ERROR
EGC-2 INVALID CONCENTRATION VS. FLOW RATE ERROR

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

To troubleshoot:

Refer to the column manual, which is included on the Thermo Scientific Reference Library DVD (P/N 053891), for the concentration of eluent to use with your application. Reset the eluent concentration and/or the flow rate to the recommended values.

EGC-1 INVALID FLOW RATE ERROR
EGC-2 INVALID FLOW RATE ERROR

This error occurs if the flow rate is set to a value not supported by the eluent generator. The Dionex ICS-2100 allows a flow rate range of 0.00 to 5.00 mL/min without an eluent generator. With an eluent generator, the allowed range is 0.10 to 3.00 mL/min. The recommended operating range is 0.40 to 2.00 mL/min.

To troubleshoot:

Set the flow rate to a value within the allowed range.

EGC-1 OVER CURRENT
EGC-2 OVER CURRENT

This error occurs when the current applied to the Dionex EluGen cartridge exceeds the maximum current allowed. Under these conditions, the EGC current is turned off to prevent damage to the EGC. This error may occur if the liquid flow to the cartridge is interrupted.

To troubleshoot:

See Section 4.6 for troubleshooting when there is no flow from the pump.
**EGC-1 OVER VOLTAGE**

**EGC-2 OVER VOLTAGE**

This error occurs when the current applied to the Dionex EluGen cartridge exceeds the maximum current allowed. The EGC current is turned off to prevent damage to the EGC. This error may occur if the liquid flow to the cartridge is interrupted.

**To troubleshoot:**

See Section 4.6 for troubleshooting when there is no flow from the pump.

---

**HARDWARE NOT PRESENT**

This error indicates a problem in the Dionex ICS-2100 electronics.

**To troubleshoot:**

Contact Thermo Fisher Scientific for assistance. The Dionex ICS-2100 electronics components cannot be serviced by the user.

---

**LEAK SENSOR WET**

The leak sensor is installed in the drip tray at the bottom of the component panel (see Figure 2-8). If liquid accumulates in the tray, the sensor signals the problem and this error message appears.

**To troubleshoot:**

1. Locate the source of the leak by visually inspecting the tubing, fittings, and components on the component panel. Refer to Section 4.3.
2. Tighten fittings or replace tubing and fittings as required. Refer to Section 4.3 for detailed troubleshooting of various types of leaks.
3. After fixing the leak, dry the drip tray thoroughly to prevent the leak sensor from triggering additional error messages.
LOAD/INJECT VALVE ERROR

If the injection valve fails to switch position within 1 second of being toggled, the Dionex ICS-2100 Moduleware reports an error to Chromeleon and this error message appears.

To troubleshoot:

1. If a sequence is being executed, terminate the sequence by selecting **Batch > Stop** in Chromeleon.

2. Try to toggle the valve from Load to Inject by clicking the **Load** and **Inject** buttons on the Dionex ICS-2100 Control panel in Chromeleon or on the touch screen **HOME** page.

3. Turn off the Dionex ICS-2100 power briefly and then restart.

4. If the problem persists, repeat **Step 2**.

5. If the problem persists, contact Thermo Fisher Scientific for assistance.

OPTION NOT INSTALLED

This error occurs if a command is issued to control an option that is not installed.

To troubleshoot:

Check the Chromeleon Server Configuration program to verify that the option is enabled.

PRESSURE SLOPE CALIBRATION ERROR

This error occurs if you try to calibrate the pressure slope when the pressure is less than 3 MPa (500 psi).

To troubleshoot:

Contact Thermo Fisher Scientific for assistance.
PUMP MOTOR LOST CONTROL

This error indicates a problem in the pump controller electronics.

To troubleshoot:

Contact Thermo Fisher Scientific for assistance. The Dionex ICS-2100 electronics components cannot be serviced by the user.

PUMP PRESSURE HARDWARE ERROR

This error indicates a problem in the pump controller electronics.

To troubleshoot:

Contact Thermo Fisher Scientific for assistance. The Dionex ICS-2100 electronics components cannot be serviced by the user.

PUMP OVER PRESSURE

If the system pressure exceeds the set limit for at least 0.5 second, this error message appears and the pump stops. Pressure limits can be set in the Chromeleon Server Configuration or in the control program. The limits can also be set on the touch screen PUMP page (see Section B.7.1).

To troubleshoot:

1. Check for blockages in the liquid lines by working your way backward from the cell to the pump. See Section 2.2 for the system flow schematics.
2. Check that the flow rate is set to the correct value.
3. Check that the high pressure limit is set to the correct value.
4. Restart the pump.
PUMP STOPPED DUE TO LOST USB COMMUNICATION ERROR

This error occurs if the Dionex ICS-2100 loses communication with Chromeleon.

To troubleshoot:
Verify that the USB cable is connected correctly from the Dionex ICS-2100 rear panel to the Chromeleon PC.

PUMP UNDER PRESSURE

If the system pressure falls below the low pressure limit, the pump stops and this error message appears. Pressure limits can be set in the Chromeleon Server Configuration or in the control program. The limits can also be set on the touch screen PUMP page (see Section B.7.1).

To troubleshoot:
1. Make sure the eluent reservoir is full.
2. Check for liquid leaks (see Section 4.3).
3. Check that the waste valve is closed.
4. Prime the pump (see Section 5.16).
5. Restart the pump.

SECOND VALVE ERROR

If the auxiliary valve fails to switch position within 1 second of being toggled, the Dionex ICS-2100 Moduleware reports an error to Chromeleon and this error message appears.

To troubleshoot:
1. If a sequence is being executed, terminate the sequence by selecting Batch > Stop in Chromeleon.
2. Try to toggle the valve from position A to position B by clicking the corresponding buttons on the Dionex ICS-2100 Control panel in Chromeleon (or by clicking the Valve_2 commands under Pump_ECD in the Commands dialog box).

3. Turn off the Dionex ICS-2100 power briefly and then restart.

4. If the problem persists, repeat Step 2.

5. If the problem persists, contact Thermo Fisher Scientific for assistance.

SUPPRESSOR NOT CONNECTED

This error occurs if you turn on the suppressor and the Dionex ICS-2100 cannot establish a connection with the suppressor.

To troubleshoot:

1. Check the suppressor cable connection (see Section 5.11).

2. If the error persists, contact Thermo Fisher Scientific for assistance. There may be a problem in the suppressor controller electronics. The Dionex ICS-2100 electronics components cannot be serviced by the user.

SUPPRESSOR OVER CURRENT

This error may be caused by an expended or dirty suppressor or by a malfunction in the suppressor controller electronics.

To troubleshoot:

1. Follow the instructions in the suppressor manual to regenerate the suppressor. Suppressor manuals are included on the Thermo Scientific Reference Library DVD (P/N 053891).

2. Follow the instructions in the suppressor manual to clean the suppressor.

3. If a malfunction in the suppressor controller is suspected, contact Thermo Fisher Scientific for assistance. The Dionex ICS-2100 electronics components cannot be serviced by the user.
SUPPRESSOR OVER POWER

This error occurs when, in order to maintain the selected current, the Dionex ICS-2100 is required to apply a higher voltage than the suppressor can support.

To troubleshoot:

1. Reduce the flow rate.
2. Rehydrate the suppressor. Refer to the suppressor manual for instructions. Suppressor manuals are included on the Thermo Scientific Reference Library DVD (P/N 053891).
3. If the error persists, replace the suppressor (see Section 5.11).

SUPPRESSOR OVER VOLTAGE

This error occurs if you turn on the suppressor but the Dionex ICS-2100 cannot establish a connection with the suppressor.

To troubleshoot:

1. Check the suppressor cable connection (see Section 5.11).
2. If the error persists, replace the suppressor (see Section 5.11).

SUPPRESSOR STOPPED FOR ZERO FLOW RATE

This error message appears when you click the Shutdown button on the Dionex ICS-2100 Control panel in Chromeleon. The message also appears anytime you turn off the pump flow while the suppressor is on. The suppressor is automatically turned off to prevent damage to the suppressor.

To troubleshoot:

• If the pump stopped unexpectedly, see Section 4.6 for pump troubleshooting information.
4.3 Liquid Leaks

- **Leaking fitting**
  Locate the source of the leak. Tighten or, if necessary, replace the liquid line connection (see Section 5.3). Refer to *Installation of Dionex Liquid Line Fittings* (Document No. 031432) for tightening requirements. The manual is included on the Thermo Scientific Reference Library DVD (P/N 053891).

- **Broken liquid line**
  Replace the line and fittings with the same length and internal diameter tubing (see Section 5.3).

- **Blocked or improperly installed line**
  Make sure the lines are not crimped or otherwise blocked. Also, if the blocked line is a waste line, make sure it is not elevated at any point after it exits the Dionex ICS-2100. If a line is blocked, replace it (see Section 5.2).

- **Loose pump check valve**
  1. Make sure the check valves are firmly seated in the pump head. If they are not, tighten them carefully with an open-end wrench just until the leak stops.
  2. If the leak persists, replace the check valve (see Section 5.6).

- **Leaking seal wash port**
  Leaking from the seal wash port indicates a leaking piston seal. Replace the seal (see Section 5.7).

- **Damaged pump piston seal**
  1. Replace the piston seal (see Section 5.7).
  2. If the leak persists, replace the piston (see Section 5.8).

- **Pump head not tight against casting**
  Carefully tighten the pump head mounting nuts just until the leak stops. **DO NOT OVERTIGHTEN!**
• **Leaking pressure transducer**
  1. Make sure the liquid line connections into the pressure transducer are tight. Refer to *Installation of Dionex Liquid Line Fittings* (Document No. 031432) for tightening requirements. The manual is included on the Thermo Scientific Reference Library DVD (P/N 053891). Replace any damaged fittings.
  2. If the pressure transducer continues to leak, contact Thermo Fisher Scientific for assistance. The pressure transducer cannot be serviced by the user.

• **Leaking pump head waste valve**
  Make sure the waste valve is closed. To close the valve, turn the knob clockwise, and tighten fingertight. **DO NOT OVERTIGHTEN!**
  **Overtightening may damage the valve and the pump head.**
  If the leak persists, replace the waste valve O-ring (see Section 5.9).

• **Leaking suppressor**
  Refer to the suppressor manual for troubleshooting procedures. Suppressor manuals are included on the Thermo Scientific Reference Library DVD (P/N 053891).

• **Leaking injection valve or auxiliary valve**
  1. Make sure the liquid line connections to the transducer are tight. Refer to *Installation of Dionex Liquid Line Fittings* (Document No. 031432) for tightening requirements. The manual is included on the Thermo Scientific Reference Library DVD (P/N 053891). Replace any damaged fittings.
  2. Liquid leaks from behind the valve stator may indicate a scratched rotor seal. Rebuild the valve (see Section 5.4).

• **Leaking detector cell**
  1. Check the waste lines for blockage; 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. Make sure the plumbing downstream from the cell is clear; a blockage may overpressurize the cell, causing it to leak. If the problem continues, contact Thermo Fisher Scientific for assistance.
4.4 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.

- **Empty eluent reservoir and/or no eluent connected**
  Fill the reservoir. Make sure all connections are secure.

- **Eluent improperly or insufficiently degassed**
  Check the vacuum degas settings:
  
  1. Open the Chromeleon Server Configuration program. Right-click the Dionex ICS-2100 device in the timebase and select **Properties**.
  2. Select the **Options** tab (see **Figure 4-1**).

  ![Figure 4-1. Dionex ICS-2100 Server Configuration Properties: Options](image)

  3. Verify that the **Degas** check box is selected.
4. Check the Degas settings. Select either the Monitor option or the Cycle option. If you select Cycle, set the time On to 30 seconds and the time Off to 600 seconds. If Cycle is already selected, try increasing the time on or decreasing the time off.

 NOTE Degas options can also be selected from the touch screen PUMP page (see Section B.7).

• End-line filter is dirty or clogged
  When new, end-line filters (P/N 045987) are pure white. If the system is in continuous operation, change the end-line filter weekly, or whenever it becomes discolored. Replace the filter more often if bacterial buildup is visible or if the eluent does not contain solvent.

 NOTE It is especially important to 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.

• Blockages in inlet tubing
  Kinked or clogged tubing causes the pump to be “starved” for eluent. Replace the tubing and fittings (see Section 5.3).

• Dirty check valve
  Clean or replace the pump check valve (see Section 5.6).

• Liquid leaks at junction between pump head and pump casting
  Use the open-end wrench (P/N 014605) provided in the Dionex ICS-2100 Ship Kit (P/N 064375) to tighten the two acorn nuts that attach the pump head to the pump housing (see Figure 5-13). Tighten the nuts evenly (12 in-lb torque).
  If the leak persists, replace the piston seal (see Section 5.7).

• Liquid leaks from the seal wash port
  Replace the piston seal (see Section 5.7).

• Scratched pump piston
  Check the pump pistons for scratches and replace if necessary (see Section 5.8).
### 4.5 Pump Does Not Start

- **No power (front Power LED indicator is not lit)**
  
  Check that the power cord is plugged in.
  
  Check the main power fuses and replace, if needed (see Section 5.18).

- **No communication between Dionex ICS-2100 and Chromeleon**
  
  Verify that the USB cable is connected correctly. For connection and setup information, refer to the Dionex ICS-2100 installation instructions.

- **Pump is turned off**
  
  Turn on the pump from either the Chromeleon Control panel or the Dionex ICS-2100 touch screen HOME page.

- **Flow rate is set to 0**
  
  Set the flow rate from either the Chromeleon Control panel or the Dionex ICS-2100 touch screen HOME page.

### 4.6 No Flow

- **Pump waste or priming valve open (see Figure 4-2)**
  
  Close the valves by turning the knobs clockwise until fingertight. **DO NOT OVERTIGHTEN!** Overtightening may damage the valve and the pump head.
4 • Troubleshooting

4.7 Erratic Flow/Pressure Reading

- **Flow rate is set to 0**
  Set the flow rate from the Dionex ICS-2100 Control panel in Chromeleon or from the touch screen HOME page.

- **Eluent valve is closed**
  Open the eluent valve from the Dionex ICS-2100 Control panel in Chromeleon or from the touch screen PUMP page.

- **Pump not primed**
  Prime the pump (see Section 5.17).

- **Broken pump piston**
  Replace the piston (see Section 5.8).

- **Eluent generator degas tubing assembly ruptured**
  Replace the Dionex EluGen cartridge holder (see Section 5.19).

---

**Figure 4-2. Waste and Priming Valves**

- Waste Valve
- Priming Valve

4.7 Erratic Flow/Pressure Reading

- **Pump needs priming**
  Prime the pump (see Section 5.17).
• **Damaged piston seal**
  Replace the piston seal (see Section 5.7).

• **Dirty pump check valve**
  Clean or replace the check valve (see Section 5.6).

• **Leaking liquid lines or fittings**
  Check the liquid lines and fittings for small leaks. Tighten or, if necessary, replace the liquid line connection (see Section 5.3). Refer to *Installation of Dionex Liquid Line Fittings* (Document No. 031432) for tightening requirements. The manual is included on the Thermo Scientific Reference Library DVD (P/N 053891).

### 4.8 Excessive System Backpressure

• **Restriction in the system plumbing**
  Check all liquid lines for crimping or blockage. Make sure the ferrule fittings are not overtightened onto tubing. Refer to *Installation of Dionex Liquid Line Fittings* (Document No. 031432) for details. The manual is included on the Thermo Scientific Reference Library DVD (P/N 053891).

  If you have trouble isolating the restriction, refer to Section 5.2.

• **Plugged or damaged fitting**
  Isolate the faulty fitting by loosening fittings, one by one, until the pressure returns to normal. Repair or replace the fitting (see Section 5.3).

• **Flow rate through the columns too high**
  Set the correct rate for your application. If an incorrect flow rate calibration is suspected, calibrate the flow (see Section 5.1.4).

• **Clogged column bed supports**
  Refer to the instructions in the column manual for troubleshooting guidance. Column manuals are included on the Thermo Scientific Reference Library DVD (P/N 053891).

• **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 [Section 5.4](#)).

### 4.9 Peak “Ghosting”

“Ghosting” is the appearance of extraneous peaks in a chromatogram. These may be late-eluting peaks from a previous injection. They may also be the result of a contaminated standard or eluent, or a malfunctioning injection valve. These peaks may co-elute with peaks of interest, resulting in nonreproducible peak heights/areas.

• **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**
  Remake the eluent. Refer to the instructions in the column manual. The manual is included on the Thermo Scientific Reference Library DVD (P/N 053891).

  Verify that the correct eluent concentration is selected.

  Install or replace the end-line filter on the end of the deionized water line (see [Section 3.4.1](#)).

• **Malfunctioning injection valve or auxiliary valve**
  1. Rebuild the valve (see [Section 5.4](#)).
  2. If the valve leak persists, contact Thermo Fisher Scientific for assistance.
4.10 Nonreproducible Peak Height or Retention Time

- **Column overloading**
  Dilute the sample (see Section 3.9.3).

- **Liquid leaks**
  Locate and eliminate the leaks (see Section 4.3).

- **Incomplete or imprecise filling of the sample loop**
  1. Fill the sample loop until excess sample exits the waste line.
  2. Inspect the 1-cc syringe (P/N 016388) and replace if damaged.

- **Pump not primed properly**
  Prime the pump (see Section 5.17).

4.11 Abnormal Retention Time or Selectivity

- **Incorrect eluent**
  Check the EGC concentration setting.

- **Contaminated or degraded sample**
  Take appropriate precautions when preparing and storing samples to prevent contamination and degradation (see Section 3.9).

- **Contaminated column**
  1. Clean the column as instructed in the column manual. Column manuals are included on the Thermo Scientific Reference Library DVD (P/N 053891).
  2. If cleaning is unsuccessful, replace the column.

4.12 No Cell Response

- **Cell not properly installed**
  Verify that the cell front cover is flush against the component panel. If necessary, tighten the two mounting screws. When the cell is correctly
installed and the screws tightened, an electronics connector on the cell plugs into a receptacle inside the Dionex ICS-2100.

- **No flow from pump**
  
  This condition has several possible causes; see Section 4.5 and Section 4.6 for details.

- **Cell electronics malfunctioning**
  
  Use the Chromeleon Wellness Panel diagnostics to test the electronics (see Section 5.1 and the Chromeleon Help for instructions). If the variance reading is outside the tolerance range (less than 1 μS), the electronics are malfunctioning. Contact Thermo Fisher Scientific for assistance. The Dionex ICS-2100 electronics cannot be serviced by the user.

### 4.13 High Cell Output

- **Background not suppressed by suppressor**
  
  Verify that the suppressor is turned on and the current is set to the correct value. Refer to the suppressor manual for additional troubleshooting guidance. Suppressor manuals are included on the Thermo Scientific Reference Library DVD (P/N 053891).

- **Sample concentration too high**
  
  Dilute the sample (see Section 3.9.3).

- **Wrong eluent**
  
  Check that you are using the correct eluent for your application.

- **Background conductivity not offset from conductivity reading**
  
  Before making an injection, allow the background conductivity to equilibrate, and then click **Autozero** on the Dionex ICS-2100Control panel in Chromeleon or the Dionex ICS-2100 touch screen **HOME** page.

- **Cell out of calibration**
  
  Recalibrate the cell (see Section 5.1.3).
4.14 Baseline Noise or Drift

- **Flow system leak; erratic baseline**
  Check all fittings and liquid lines for leaks. Tighten or, if necessary, replace all liquid line connections. Refer to *Installation of Dionex Liquid Line Fittings* (Document No. 031432) for tightening requirements. The manual is included on the Thermo Scientific Reference Library DVD (P/N 053891).

- **Trapped gases**
  Release any trapped gases in the cell by loosening the lines to and from the cell and then retightening them. Also loosen and retighten the fittings to and from the suppressor eluent ports.

- **Pump not properly primed**
  Prime the pump (see [Section 5.17](#)).

- **Incorrect eluent**
  Check the EGC concentration setting.

- **Inadequate system backpressure**
  Add backpressure tubing between the injection valve and the ELUENT OUT port on the EGC to maintain a pressure of 16 ± 0.7 MPa (2300 ± 100 psi). For details, refer to the Dionex ICS-2100 installation instructions.

- **Rapid changes in ambient temperature**
  Make sure the ambient temperature is between 4 and 40 °C (40 and 104 °F).
  Make sure air conditioning and heating vents are directed away from the Dionex ICS-2100 and the Dionex ICS-2100 front door is closed.

- **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.Suppressor manuals are included on the Thermo Scientific Reference Library DVD (P/N 053891).
4.15 Vacuum Degas Assembly Does Not Run

- **Degas option not enabled in Chromeleon**
  1. Open the Chromeleon Server Configuration program. Right-click the Dionex ICS-2100 device in the timebase and select **Properties**.
  2. Select the **Options** tab (see Figure 4-3).

  ![Figure 4-3. Dionex ICS-2100 Server Configuration Properties: Options](image)

  3. Verify that the **Degas** check box is selected.
4. Under **Degas**, verify that the **Always Off** option is *not* selected. If it is, select one of the following settings instead:

- **Cycle**; also select **On**: 30 seconds and **Off**: 10 minutes
- **Monitor**

5. If the **Degas** settings are correct, but the degas assembly still does not run, test the assembly by selecting the **Always On** option. The pump should turn on immediately. If it does not, the vacuum degas assembly may need to be replaced. Contact Thermo Fisher Scientific for assistance.

   **NOTE** Degas options can also be selected from the touch screen **PUMP** page (see **Section B.7**).

**IMPORTANT** Select the Degas, **Always On** option only when testing the vacuum degas assembly. Do not select the **Always On** option for routine use.

6. If the degas pump runs when you select **Always On**, but does not run when **Monitor** is selected, recalibrate the degas assembly (see **Section 5.1.5**).
This chapter describes Dionex ICS-2100 service and repair procedures that the user can perform. All procedures not included here, including electronics-related repair procedures, must be performed by Thermo Fisher Scientific personnel. For assistance, contact Technical Support for Dionex products. In the U.S. and Canada, call 1-800-346-6390. Outside the U.S. and Canada, call the nearest Thermo Fisher Scientific office.

Before replacing any part, refer to the troubleshooting information in Chapter 4 to isolate the cause of the problem.

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

### 5.1 Diagnostic and Calibration Procedures

Diagnostic and calibration procedures can be performed either from the touch screen or from the Chromeleon Wellness Panel (see Figure 5-1).

For an overview of the Wellness Panel features, see Section 5.1.1. For an overview of the diagnostic and calibration touch screen, see Section 5.1.2. For instructions on performing calibration and diagnostic procedures, see the following sections:

- Calibrating the Conductivity Cell (Section 5.1.3)
- Calibrating the Flow Rate (Section 5.1.4)
- Calibrating the Vacuum Degas Assembly (Section 5.1.5)
5.1.1 Chromeleon Wellness Panel Overview

NOTE Do not open a System Wellness Control panel if the name includes “Service.pan.” These Wellness panels are reserved for use by Thermo Fisher Scientific Service Representatives.

To Open the Wellness Panel

1. In the Chromeleon Browser, expand the Dionex Templates\Panels\Wellness folder.

2. Double-click ICS-1100_1600_2100_Wellness_user.pan.

The Wellness Panel opens (see Figure 5-1). If the controls on the Wellness panel are disabled, select Control > Connect to timebase and then select the Dionex ICS-2100 timebase.

![Figure 5-1. Chromeleon Wellness Panel](image-url)
Use the Wellness Panel to perform the following functions:

- Calibrate the pump flow rate
- Calibrate the vacuum degas assembly
- Calibrate the conductivity cell
- Test the conductivity cell electronics, using a dummy cell
- Upload calibration values from the Dionex ICS-2100 to the Chromeleon Wellness database

After completing a calibration procedure from the touch screen, always update the Chromeleon Wellness database by clicking the Upload button on the Chromeleon Wellness Panel (see Figure 5-1). This action ensures that the current calibration information is stored in Chromeleon as well as in the Dionex ICS-2100.
5.1.2 Diagnostic and Calibration Touch Screen Overview

Select **DIAGNOSTIC** from the touch screen menu of pages. The **DIAGNOSTIC** page opens (see **Figure 5-2**). From there, you can access individual diagnostic and calibration pages.

**NOTE** The Service button provides access to service functions that are performed only by Thermo Fisher Scientific personnel. A code is required to access the service pages.

![Figure 5-2. System Diagnostic Menu Page](image)

**NOTE** The Diagnostic touch pages, EGC1 and EGC2 RESISTIVE LOAD and EGC1 and EGC2 VERIFICATION, display the results of the Dionex EluGen cartridge validation procedure, which is normally performed by Thermo Fisher Scientific personnel. Contact Thermo Fisher Scientific for more information.
5.1.3 Calibrating the Conductivity Cell

When to Calibrate

- After every 6 months of use

**NOTE** Do not use this procedure to calibrate a new cell. If you are replacing a cell, see the instructions in Section 5.10 to install the new cell and calibrate it.

<table>
<thead>
<tr>
<th>Items Needed</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0 mM KCl solution</td>
<td>Prepare by dissolving 0.07456 g of reagent-grade KCl in 1 liter of 18-megohm DI water.</td>
</tr>
<tr>
<td>Backpressure tubing to provide at least 7 MPa (1000 psi)</td>
<td>Use 0.076-mm (0.003-in) ID yellow PEEK tubing (P/N 049715).</td>
</tr>
</tbody>
</table>

1. Open the Dionex ICS-2100 Wellness Panel in Chromeleon (see Section 5.1.1), or open the touch screen **ELECTRIC CONDUCTIVITY CALIBRATION** page (see Figure 5-3).

![Figure 5-3. Electric Conductivity Calibration Page](image)

3. When the offset calibration is complete, click **Slope Cal** on the Wellness Panel, or touch **Run Slope Cal** on the Dionex ICS-2100 touch screen.

4. If you are using the Wellness Panel, click **Log** to record the new calibration values in the Audit Trail.

5. Disconnect the pump output line from the injection valve.

6. Disconnect the line from the suppressor **ELUENT OUT** port to the cell inlet and connect the pump output line directly to the cell inlet.

7. Disconnect the line from the suppressor **REGEN IN** port to the cell outlet. Direct the cell outlet line to a waste container.

8. Verify that the backpressure is at least 7 MPa (1000 psi).

9. If you are using the touch screens to perform the calibration, open the **CONDUCTIVITY CELL** page (see Figure 5-4).

10. On the Wellness Panel under **Conductivity Cell Calibration**, click **Cell 35 °C**, or touch **35 C** on the Dionex ICS-2100 touch screen. Allow the cell to reach this temperature, and then wait an additional 5
minutes to let it stabilize. When the temperature has stabilized, “=” is displayed to the right of the temperature reading on the CONDUCTIVITY CELL page.

11. Select **1.00 mL/min** to begin pumping 1.00 mM KCl through the cell at 1.0 mL/min.

12. Wait until the total conductivity reading stabilizes (in about 15 minutes) and then select **Calibrate** on the Wellness Panel or the touch screen CONDUCTIVITY CELL page.

After calibration, the conductivity reading should be 147.00 ± 2 μS and the cell constant should be between 120 and 180. If this is not the case, contact Thermo Fisher Scientific for help.

13. If you are using the Wellness Panel, click **Log** to record the new calibration values in the Audit Trail.

14. If you are using the touch screen, record the new calibration values in the Chromleon Wellness database. To do this, open the Wellness Panel (see Section 5.1.1) and click **Upload** under Update Wellness Database.

15. Flush the KCl solution from the system by pumping deionized water through the cell. When the conductivity drops to less than 1 μS/cm, stop the pump.

16. Reconnect the pump to the injection valve and reconnect the line from the suppressor ELUENT OUT port to the cell inlet.

17. Reconnect the cell outlet to the suppressor REGEN IN port.
5.1.4 Calibrating the Flow Rate

When to Calibrate

If you run the Dionex ICS-2100 Operational Qualification or Performance Qualification and it fails.

Items Needed

- 0.076-mm (0.003-in) ID yellow PEEK tubing (P/N 049715) to create 14 ± 2 MPa (2000 ± 300 psi) of backpressure (if needed)
- High purity ASTM filtered, Type I (18 megohm-cm) deionized water
- Balance capable of weighing more than 10 g with 0.001 g readability
- Tared beaker

To Calibrate

1. Open the Dionex ICS-2100 Wellness Panel in Chromeleon (see Section 5.1.1), or open the Dionex ICS-2100 touch screen FLOW RATE page (see Figure 5-5).

![FLOW RATE Page](image)

**Figure 5-5. Flow Rate Page**

2. Verify that there is 14 ± 1.4 MPa (2000 ± 200 psi) of backpressure.
3. On the Chromeleon Wellness Panel under **Pump Flow Rate Calibration**, select **Reset Cal**, or touch **Reset Cal** on the touch screen.

4. Select **1 mL/min** to set the flow rate and begin pumping deionized water.

5. Allow the pump to stabilize for 20 minutes.

6. If you are using the Wellness Panel, click **5.00 min** to start the timer. If you are using the touch screen, start an external timer. Immediately start collecting water into the tared beaker.

7. Collect the water for exactly 5.00 minutes.

8. Enter the weight of the water (in grams).

9. If you are using the Wellness Panel, click **Calibrate** to download the value to the Dionex ICS-2100.

10. To recheck the value, wait at least 15 minutes, and then repeat the calibration.

11. If you are using the Wellness panel, click **Log** to record the new calibration value in the Audit Trail.

12. If you performed the calibration from the Dionex ICS-2100 touch screen, record the new calibration values in the Chromeleon Wellness database. To do this, open the Wellness Panel (see **Section 5.1.1**) and click **Upload**.
5.1.5 Calibrating the Vacuum Degas Assembly

When to Calibrate

- After every 6 months of use

1. Open the Dionex ICS-2100 Wellness Panel in Chromeleon (see Section 5.1.1), or open the Dionex ICS-2100 touch screen PUMP DEGAS page (see Figure 5-6).

2. On the Wellness Panel under Degas Calibration, select Calibrate, or touch Calibrate on the Dionex ICS-2100 touch screen. The degas pump runs for 90 seconds to allow a vacuum to be created. After 90 seconds, the vacuum degas pressure reading is recorded. When the vacuum degas assembly is running in monitor mode, this calibration value is used to determine when to turn on the degas pump.

3. If you are using the Wellness panel, click Log to record the new calibration value in the Audit Trail.

4. If you performed the calibration from the Dionex ICS-2100 touch screen, record the new calibration values in the Chromeleon Wellness database. To do this, open the Wellness Panel (see Section 5.1.1) and click Upload under Update Wellness Database.
5.2 Isolating a Restriction in the Liquid Lines

A restriction in the liquid plumbing will cause excessive system backpressure.

1. Begin pumping eluent through the system (including the columns).

2. Follow the flow schematics in Figure 5-7, Figure 5-8, or Figure 5-9 and work backward through the system, beginning at the suppressor Regen Out port. One at a time, loosen each fitting and observe the pressure. The connection at which the pressure drops abnormally indicates the point of restriction.

   **NOTE** The numbers on the flow schematics indicate the order in which liquid flows through the system components.

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

3. If the restriction is in the tubing or fitting, remove the restriction by back flushing or by replacing the tubing or fitting (see Section 5.3).
Figure 5-7. Dionex ICS-2100 Flow Schematic: KOH, LiOH, MSA, or NaOH
Eluent Generation

NOTE: The EGC Degas fittings cannot be serviced by the user.
Figure 5-8. Dionex ICS-2100 Flow Schematic: Carbonate/Bicarbonate Eluent Generation

NOTE: The EGC degas fittings cannot be serviced by the user.
Figure 5-9. Dionex ICS-2100 Flow Schematic: Carbonate Eluent Generation

NOTE: The EGC degas fittings cannot be serviced by the user.
5.3 Replacing Tubing and Fittings

The Dionex ICS-2100 is plumbed with the tubing and tubing assemblies listed below.

<table>
<thead>
<tr>
<th>Tubing Size and Type</th>
<th>Color</th>
<th>Used For</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.125-mm (0.005-in) ID PEEK (P/N 044221)</td>
<td>Red</td>
<td>Connection from pump pulse damper to pressure transducer</td>
</tr>
<tr>
<td>0.25-mm (0.010-in) ID PEEK (P/N 042690)</td>
<td>Black</td>
<td>Connections between other system components</td>
</tr>
<tr>
<td>0.50-mm (0.020-in) ID PEEK (P/N 042855)</td>
<td>Orange</td>
<td>Connection from injection port to injection valve</td>
</tr>
<tr>
<td>0.75-mm (0.030-in) ID PEEK (P/N 044777)</td>
<td>Green</td>
<td>Connection from injection valve to waste</td>
</tr>
<tr>
<td>1.58-mm (0.062-in) ID PTFE (P/N 014157)</td>
<td>Clear</td>
<td>Connection from pump to degas or eluent reservoir; pump waste</td>
</tr>
<tr>
<td>25 µL sample loop (P/N 042857)</td>
<td>Orange</td>
<td>Connection between ports L (1) and L (4) on the injection valve</td>
</tr>
</tbody>
</table>

- 10-32 fittings (P/N 043275) and ferrules (P/N 043276) are used for most tubing connections. For tightening requirements, refer to *Installation of Dionex Liquid Line Fittings* (Document No. 031432). The manual is included on the Thermo Scientific Reference Library DVD (P/N 053891).
- 1/8-in fittings (P/N 052267) and ferrules (P/N 048949) are used for connections to the suppressor REGEN OUT port and the eluent reservoir.
5.4 Rebuilding the Injection Valve or Auxiliary Valve

Thermo Fisher Scientific recommends rebuilding the injection valve and the auxiliary valve (if installed) annually. The Injection Valve Rebuild Kit (P/N 057896) contains all required replacement parts for one valve.

NOTE If you prefer, you can replace the auxiliary valve “pod,” instead of rebuilding the valve. Replacing the pod is easier and faster than rebuilding the auxiliary valve. For instructions, see Section 5.5.

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

1. Turn off the pump from the Dionex ICS-2100 Control panel in Chromeleon or from the touch screen HOME page.
2. Open the Dionex ICS-2100 front door.
3. Disconnect each liquid line connected to the valve.
4. Follow the instructions provided in the Rebuild Kit to replace the rotor seal, isolation seal, and stator face.
5. Reconnect all liquid lines to the injection valve (see Figure 5-10) or auxiliary valve.
6. Close the door.
7. Turn on the pump.
5.5 Replacing an Auxiliary Valve Pod

This procedure describes how to replace the mechanical part (the “pod”) of the optional auxiliary valve. This procedure is an alternative to rebuilding the valve (see Section 5.4).

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

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

1. Turn off the pump flow from the Dionex ICS-2100 Control panel in Chromelonor from the touch screen HOME page.
2. Open the Dionex ICS-2100 front door.
3. Disconnect each liquid line connected to the valve.
4. Unscrew the black locking ring on the front of the valve (see Figure 5-11) and remove the ring.

5. Grasp the front of the valve pod and pull firmly to remove it from the Dionex ICS-2100.

Figure 5-11. Unscrew the Valve Locking Ring

6. Check that the new pod (6-port, P/N 061947; 10-port, P/N 061948) has the correct number of ports for the valve being serviced.

7. Align the slots in the new pod with the runner in the valve holder on the Dionex ICS-2100 (see Figure 5-12). Valve pods are keyed to fit only one way (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 align with the matching splines inside the valve holder (see Figure 5-12). If necessary, twist the end of the pod to adjust the position of the splines.

Figure 5-12. Valve Pod and Pod Holder
9. Push the pod into the holder until it clicks into place. Replace the black locking ring.

10. Reconnect all liquid lines to the valve.

11. Turn on the pump flow. Check for leaks from the valve. Tighten fittings as required (see Section 5.1.1).

12. Close the door.
5.6 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 reprise. If possible, replace dirty check valves. If new check valves are not available, follow the instructions for cleaning.

Replacing Check Valves

1. Close the eluent valve from the Dionex ICS-2100 Control panel in Chromeleon or select **Eluent Valve Closed** on the touch screen **PUMP** page.

2. Turn off the main power switch, to ensure that you do not unintentionally start the Dionex ICS-2100.

3. To prevent contamination of pump parts, put on a pair of rubber gloves before disassembling the pump head.

4. Disconnect the tube fittings from the inlet and outlet check valve assemblies on the primary pump head (see **Figure 5-13**).

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

NOTE The **inlet** check valve assembly housing has a 1/4-28 port. The **outlet** check valve assembly housing has a 10-32 port.
6. If you are installing new cartridges (P/N 045994) in the existing check valve housings, place the cartridge in the *inlet* check valve housing with the double-hole end of the cartridge visible and place the cartridge in the *outlet* housing with the single-hole end visible.

**NOTE** The pump will not operate properly unless the cartridge is installed in the housing in the correct orientation. Liquid flows through the check valve in the large single hole and out the small double holes.

7. Install the inlet check valve assembly (P/N 045722) on the bottom of the primary pump head. Install the outlet check valve assembly (P/N 045721) on the top of the head. Tighten the check valves fingertight, 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.

8. Reconnect the liquid lines. Turn on the Dionex ICS-2100 main power.

9. Open the eluent valve from the Dionex ICS-2100 Control panel in Chromeleon or select *Eluent Valve Closed* on the touch screen **PUMP** page.

10. Prime the pump (see **Section 5.17**).

11. When the Dionex ICS-2100 is at operating pressure, check for leaks from the check valves. Tighten a check valve *a little more* only if it leaks.

**Cleaning 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 filtered deionized water.

4. To reinstall the check valves and complete the procedure, see **Step 6** through **Step 11** above.
5.7 Replacing a Pump Piston Seal and Piston Rinse Seal

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

Preparation

1. Rinse the pump flow path with deionized water. Direct the flow to waste by opening the waste valve on the secondary pump head (see Figure 5-16). To open the valve, turn the knob one-quarter to one-half turn counterclockwise.

2. After rinsing, close the waste valve.

3. Close the eluent valve from the Dionex ICS-2100 Control panel in Chromeleon or select **Eluent Valve Closed** on the touch screen PUMP page.

4. To prevent contamination of pump parts, put on a pair of rubber gloves before disassembling the pump head.

Removing the Head and Piston

1. Turn off the main power switch, to ensure that you do not unintentionally start the Dionex ICS-2100.

2. Disconnect all tubing connections to the pump head.

3. Locate the open-end wrench (P/N 014605) provided in the Dionex ICS-2100 Ship Kit (P/N 064375). Use the wrench to remove the two acorn nuts (see Figure 5-13) from the pump head.

4. Slowly pull the head and allow it to separate from the housing. Carefully disengage the head from the piston by pulling the head straight off and away from its mounting studs.

![CAUTION]

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

![MISE EN GARDE]

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

![VORSICHT]

5. Place the head (front end down) on a clean work surface and lift off the spacer to expose the piston seal (see Figure 5-14 or Figure 5-15).

![Figure 5-14. Primary Pump Head](image)

![Figure 5-15. Secondary Pump Head](image)
6. The piston does not come off as part of the pump head assembly because it is captured by a magnetic retention system. After removing the pump head, hold the shaft of the piston (near the base), tilt the piston slightly, and pull the piston away from the pump.

Installing the New Piston Rinse Seal
1. Remove the guide from the spacer to expose the piston rinse seal and O-ring. Remove the O-ring.
2. Remove the old piston rinse seal from the guide as follows:
   a. Hold the guide with the flat side facing up.
   b. To dislodge the piston rinse seal, gently insert the shaft of the piston through the small hole in the center of the guide (see photo).
   c. Pull the seal off the end of the piston shaft and remove the piston from the guide.
3. Hold the new piston rinse seal (P/N 048722) with the grooved side facing up.
4. Using your fingertip, gently press the piston rinse seal into the guide until the edge of the seal is below the surface of the guide.
5. Place the new O-ring (P/N 059283) into the groove in the guide.
6. Remove the O-ring from the groove in the flat side of the spacer and replace it with the new O-ring (P/N 014895).
7. In one hand, hold the guide with the O-ring and piston rinse seal facing up (this prevents the O-ring from falling out). In the other hand, hold the spacer with the cavity facing down.
8. Gently press the guide into the cavity in the spacer until it is fully seated.

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

1. Fill the head cavity with deionized water by injecting the liquid through either the piston opening or the inlet check valve.

2. Reinsert the piston approximately 3 mm (0.125) inch into the seal.

3. If this is the primary pump head, install a 10-32 fitting plug (P/N 042772) on the outlet check valve. Tighten the plug.

4. If this is the secondary pump head, install a 10-32 fitting plug (P/N 042772) in both the inlet and outlet ports. Tighten the plugs.

5. Push the piston into the head. (This should hydraulically unseat the seal from the head.) Remove the piston and pull off the seal.

   NOTE If the piston seal is not removed, make sure the 10-32 fitting plug(s) are tight and add more water. Make sure the head contains no air bubbles, and then repeat Step 2 and Step 5.

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

Installing the New Piston Seal

1. Open the priming valve knob (primary pump head) or waste valve knob (secondary pump head) by turning the knob one-quarter to one-half turn counterclockwise.

2. Push the piston through the spacer and then through the new seal. Insert the piston and seal into the pump head until the seal makes contact with the bottom of the counterbore.

   NOTE If necessary, lubricate the seal with a small amount of isopropyl alcohol to facilitate insertion.

3. To seat the seal, push down on the spacer until it is flush with the head. A clicking sound indicates that the seal is correctly seated.

4. Close the priming valve knob or waste valve knob.
Reinstalling the Head and Piston

Thermo Fisher Scientific recommends reinstalling the head and piston as a single assembly, so that the piston centers itself onto the magnetic follower.

1. Hold the assembled spacer and guide with the drain tubes aligned vertically and press the spacer into the head until it is flush with the indented surface of the head.

2. Insert the piston so that 1/4 inch of the shaft is exposed. This ensures that the magnet in the follower picks up the piston. (The follower is the cylinder that holds the piston in place as it moves in and out of the pump head assembly.)

3. Reinstall the head and piston assembly; use a wrench to tighten the nuts evenly (12 in-lb torque).

Completing the Procedure

1. Reconnect all liquid lines to the pump head.

2. Turn on the main power switch.

3. Open the eluent valve.

4. Prime the pump (see Section 5.17).

5.8 Replacing a Pump Piston

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

Follow the instructions in Section 5.7 to install a new piston (P/N 052840) and piston seal (P/N 055870).
5.9 Replacing the Waste Valve or Priming Valve O-Ring

A damaged O-ring causes leakage around the base of the waste valve or priming valve knob.

1. Close the eluent valve from the Dionex ICS-2100 Control panel in Chromeleon or select Eluent Valve Closed on the touch screen PUMP page.

2. Turn off the main power switch, to ensure that you do not unintentionally start the Dionex ICS-2100.

3. To remove the waste valve or priming valve from the pump head (see Figure 5-16), turn the knob counterclockwise until it is loose, and then pull the knob straight out of the cavity in the pump head.

![Figure 5-16. Waste and Priming Valves](image)
4. If the O-ring is removed with the valve knob in Step 3, pull the O-ring off the end of the knob (see Figure 5-17). If the O-ring is not removed with the valve knob, insert a thin object (for example, the bent end of a paper clip) into the cavity in the pump head and carefully pull out the O-ring. **Do not scratch the cavity.**

**IMPORTANT** Scratches in the cavity will cause leaks around the base of the knob while the pump is being primed.

5. Slide a new O-ring (P/N 055752) over the end of the valve.

6. To reinstall the valve containing the new O-ring, turn the knob clockwise and then tighten fingertight.

   **NOTE** It is normal to encounter resistance after several rotations of the knob; the O-ring is being pushed into the cavity of the pump head.

7. Turn on the main power switch.

8. Open the eluent valve.

9. Prime the pump (see **Section 5.17**).
5.10 Replacing the Conductivity Cell

1. Turn off the Dionex ICS-2100 power.

2. Open the front door and disconnect the tubing from the **CELL IN** and **CELL OUT** fittings (see **Figure 5-18**, View A). Loosen the two screws on the cell front cover. The screws remain attached (see **Figure 5-18**, View B).

3. Grip the two loosened screws and pull the cell cover toward you to remove it from the component panel. **Do not pull from the CELL IN and CELL OUT fittings.**

4. Continue pulling on the cover until the attached cell assembly slides out the front of the Dionex ICS-2100 (see **Figure 5-19**).
5. Slide the new cell assembly straight into the opening in the component panel until it stops and the cell cover is flush against the component panel. The cell’s electronic connector automatically plugs into a connector inside the Dionex ICS-2100 when you push the assembly into the opening.

6. Tighten the screws on the cell front cover fingertight.

7. Close the side panel door and tighten the two mounting screws.

8. Reconnect the inlet and outlet lines.

9. Turn on the Dionex ICS-2100 power.

10. Calibrate the new cell in Chromeleon or on the Dionex ICS-2100 touch screen DIAGNOSTIC page. Calibration of a new cell consists of three parts:

- Running the offset calibration, which measures the output of the cell electronics alone and determines an offset value to be applied to raw conductivity readings.

- Running the slope calibration, which measures the output of the cell electronics when a built-in dummy cell, which provides a constant conductivity reading of 21 μS, is automatically enabled. The slope value is applied to raw conductivity readings.

- Entering the cell constant measured at the factory. The Dionex ICS-2100 uses the cell constant to determine the measured conductivity.

**To calibrate the cell in Chromeleon:**

a. Open the Wellness Panel (see [Section 5.1.1](#))

b. Under **Electric Conductivity Cell Calibration**, click **Offset Cal**.

c. When the offset calibration is complete, click **Slope Cal**.

d. Click **Calibration Details**. Under **Conductivity Cell Cal Details**, enter the **Cell Constant** value printed on the front of the cell.

e. In the field next to the **Download** button, verify that **Current** is selected and then click **Download** to download the new value to the Dionex ICS-2100.

f. To ensure that the new values are recorded in the Dionex ICS-2100 memory, do not turn off the Dionex ICS-2100 power for at least 1 minute after downloading.
To calibrate the cell on the Dionex ICS-2100 touch screen DIAGNOSTIC page:

a. Go to the DIAGNOSTIC page and touch Electric Conductivity Cell.

b. On the ELECTRIC CONDUCTIVITY CALIBRATION page (see Figure 5-20), touch Run Offset Cal.

c. When the offset calibration is complete, touch Run Slope Cal.

d. Touch the Cell Constant field and enter the value printed on the front of the cell.

e. To ensure that the new calibration values are recorded in the Dionex ICS-2100 memory, do not turn off the Dionex ICS-2100 power for at least 1 minute.

f. Record the new calibration values in the Chromeleon Wellness database. To do this, open the Wellness Panel (see Section 5.1.1) and click Upload under Update Wellness Database.

Figure 5-20. Electric Conductivity Calibration Page
5.11 Replacing the Suppressor

Refer to the suppressor manual for guidance about when to replace a suppressor. Suppressor manuals are included on the Thermo Scientific Reference Library DVD (P/N 053891).

1. Refer to the suppressor quick start guide (shipped with the suppressor) for instructions on preparing the suppressor before initial use and for additional installation details.

2. Turn off the pump from the Dionex ICS-2100 Control panel in Chromeleon or from the touch screen HOME page.

3. Open the front door of the Dionex ICS-2100.

4. Disconnect the two eluent and the two regenerant lines from the suppressor.

5. To remove the suppressor from the component panel, slide it up to detach it from the mounting tabs on the panel and then pull it toward you.

6. Continue pulling the suppressor out until the yellow connector on the cable inside the Dionex ICS-2100 is outside the panel (see Figure 5-21).

7. Disconnect the suppressor cable (twist the ring on the yellow connector and pull the two connectors apart).

8. Connect the cable from the new suppressor to the Dionex ICS-2100 cable (align the pins on the two connectors and push them together).

9. Orient the suppressor with the REGEN OUT fitting on top and the cables to the right.
10. Push the cables into the opening in the component panel.

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

12. Press the suppressor onto the tabs and then slide it down until it locks into place. Pull slightly on the center of the suppressor to verify that it is securely fastened. **Note:** Some suppressors require more force to secure them onto the tabs.

13. Connect the two eluent and two regenerant lines to the new suppressor.


---

**Figure 5-22. Suppressor Guidelines and Mounting Tabs on Component Panel**

### 5.12 Replacing the Column Heater

1. Turn off the Dionex ICS-2100 power.
2. Open the front door of the Dionex ICS-2100.
3. Remove the existing column heater:
   a. Unscrew the two thumbscrews on the heater cover (they remain attached to the cover).
   b. Pull the heater cover straight out to remove it.
   c. Unscrew the six thumbscrews on the top metal plate (see Figure 5-23) and remove the plate.
d. Remove the columns from the column heater.

e. Pull the column heater straight toward you to remove it from the component panel.

4. Before installing the new column heater, write down the two calibration values (offset and slope) recorded on the back of the heater.

5. Align the connector on the back of the new column heater (P/N 069564) with the connector on the component panel and push the column heater onto the component panel.

6. Remove the heater cover and the metal plate on the new heater.

7. Install the columns in the new heater and replace the top metal plate and heater cover.

8. Turn on the Dionex ICS-2100 power.
9. Enter the column heater calibration values in Chromeleon or on the Dionex ICS-2100 touch screen DIAGNOSTIC page as follows.

To enter the calibration values in Chromeleon:

a. Open the Wellness Panel (see Section 5.1.1) and click Calibration Details.

b. Under Column Heater Calibration Values, enter the Column Heater Offset and Column Heater Slope values recorded in Step 4.

c. In the field next to the Download button, verify that Current is selected and then click Download to download the new calibration values to the Dionex ICS-2100.

d. To ensure the new calibration values are recorded in the Dionex ICS-2100 memory, do not turn off the Dionex ICS-2100 power for at least 1 minute after downloading the values.

To enter the calibration values on the Dionex ICS-2100 touch screen DIAGNOSTIC page:

a. Go to the DIAGNOSTIC page and touch Column Heater Cal Values.

b. On the COLUMN HEATER CAL VALUES page (see Figure 5-24), enter the Calibrated Offset and Calibrated Slope values recorded in Step 4.

---

Figure 5-24. Column Heater Cal Values Page
c. To ensure the calibration values are recorded in the Dionex ICS-2100 memory, do not turn off the Dionex ICS-2100 power for at least 1 minute after entering the values.

d. Record the calibration values in the Chromeleon Wellness database. To do this, open the Wellness Panel (see Section 5.1.1) and click Upload under Update Wellness Database.

5.13 Replacing the Column Heater Heat Exchanger

1. Turn off the Dionex ICS-2100 power.

2. Open the front door of the Dionex ICS-2100.

3. Unscrew the two thumbscrews on the column heater cover (they remain attached to the cover).

4. Pull the heater cover straight out to remove it.

5. Unscrew the six thumbscrews on the top metal plate (see Figure 5-25) and remove the plate.

6. Disconnect the heat exchanger inlet line from port C on the injection valve.

7. Disconnect the heat exchanger outlet line from the guard column inlet.

8. Use an Allen wrench to remove the three screws from the heat exchanger metal plate and remove the plate (with the tubing) from the heater.

Figure 5-25. Dionex ICS-2100 Column Heater Cover Removed
9. Remove the plastic backing from the new heat exchanger (P/N 059979, with 0.25-mm (0.010-in) ID tubing; P/N 060943, with 0.125-mm (0.005-in) ID tubing) and press the heat exchanger onto the heater. Replace the screws removed in Step 8.

10. Connect the new heat exchanger inlet line to port C on the injection valve and connect the outlet line to the guard column inlet.

11. Reinstall the top metal plate and the heater cover.

5.14 Replacing the Eluent Valve

1. Turn off the power to the Dionex ICS-2100.

2. Open the Dionex ICS-2100 front door.

3. To prevent an eluent leak during the valve replacement procedure, disconnect the eluent line from the reservoir cap or plug the line on the left side of the valve with a coupler (P/N 039056) and a plug (P/N 037268) after you disconnect the liquid line from the valve in Step 4.

4. Disconnect the two liquid lines connected to the eluent valve (see Figure 5-26).

5. Unscrew and remove the two screws that attach the valve to the component panel (see Figure 5-26). Save the screws.
6. Pull the valve straight out from the component panel and begin pulling the attached cable out of the opening in the panel.

7. The cable is connected to a matching cable inside the Dionex ICS-2100. Continue pulling until the connectors for the two cables are outside the panel (see Figure 5-27). Disconnect the cables.

8. Remove the mounting plate on the old valve by unscrewing and removing the two screws. Save the screws.

9. Thread the cable from the new eluent valve through the mounting plate.

10. Attach the mounting plate to the new valve using the screws removed in Step 8.

11. Connect the cable from the new valve (P/N 057945) to the Dionex ICS-2100 cable. Feed the cables back inside the Dionex ICS-2100.
12. Align the new valve on the component panel with the liquid ports facing up and attach it with the two screws removed in Step 5. Reconnect the liquid lines.

13. Turn on the power to the Dionex ICS-2100.

14. Prime the pump (see Section 5.17).

### 5.15 Replacing the Leak Sensor

1. Turn off the power to the Dionex ICS-2100.

2. Open the Dionex ICS-2100 front door.

3. Loosen the screw on the front of the leak sensor (see Figure 5-29). **Note:** The screw remains attached to the sensor.

4. Remove the leak sensor from the component panel and pull the cable out of the opening in the panel.

5. The cable attached to the leak sensor is connected to a matching cable inside the Dionex ICS-2100. Continue pulling the cable until the connectors for the two cables are outside of the panel (see Figure 5-30).

6. Disconnect the two cables.

---

**Figure 5-29. Leak Sensor**

**Figure 5-30. Leak Sensor Cable**
7. Connect the cable from the new leak sensor (P/N 058053) to the Dionex ICS-2100 cable.

8. Feed the cables back inside the Dionex ICS-2100. Align the leak sensor with the component panel opening and fingertighten the screw.

9. Make sure the leak sensor does not touch the bottom of the drip tray.

5.16 Priming the Pump

1. Verify that the eluent reservoir is filled, the reservoir cap is installed and hand tightened, and the liquid line from the Dionex ICS-2100 to the reservoir cap is connected.

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

3. The priming procedure consists of two parts:
   - Priming the eluent lines with a syringe (see Section 5.16.1). Perform this procedure at initial installation, after changing eluents, or when eluent lines are empty.
   - Priming the pump heads with the Prime button (see Section 5.16.2). Perform this procedure after the eluent lines are primed.

5.16.1 Priming the Eluent Lines with a Syringe

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

1. Verify that the pump is turned off.

2. Connect a 10 mL syringe (P/N 079803) to the priming valve port on the primary pump head (see Figure 5-31).
3. Open the priming valve by turning it one-quarter to one-half turn counterclockwise.

4. On the Dionex ICS-2100 Control panel in Chromeleon, click the **Pump Settings** button. The **Pump Settings** window opens (see Figure 3-6).

5. Under **Eluent Flow Valve**, click the **Open** button.

6. Draw the syringe back to begin pulling eluent through the flow path. It may take several syringe draws to remove all air or previous eluent from the tubing.

   **NOTE**  If the vacuum degas assembly is installed, draw out an additional 20 mL of eluent.

7. After priming the lines thoroughly, close the priming valve. **Do not overtighten.**
5.16.2 Priming with the Prime Button

NOTE Perform this procedure after priming the eluent lines (see Section 5.16.1).

1. Check that the priming valve on the primary pump head is closed (see Figure 5-32).

2. Open the waste valve on the secondary pump head by turning the knob one-quarter to one-half turn counterclockwise (see Figure 5-32). Opening the valve directs the eluent flow path to waste and eliminates backpressure.

3. In the Pump Settings window (see Figure 3-6), click the Prime button. Confirm that the waste valve is open by clicking OK when the reminder message appears. The pump will begin pumping at about 3 mL/min.

4. Continue priming the Dionex ICS-2100 until no air bubbles are exiting the pump waste line.

5. In the Pump Settings window, click Pump Off.

6. Close the waste valve. **Do not overtighten the valve.**
5.17 Priming the Pump with Isopropyl Alcohol

NOTE  Prime the pump heads with isopropyl alcohol only if the two standard priming procedures described in Section 5.16 are unsuccessful.

1. Connect a 10 mL syringe (P/N 079803) filled with isopropyl alcohol (IPA) to the port in the primary pump head (see Figure 5-33).

2. Open the waste valve on the secondary pump head (see Figure 5-33) by turning the knob one-quarter to one-half turn counterclockwise.

3. In the Pump Settings window (see Figure 3-6), click Pump On.

4. Open the priming valve on the primary pump head by turning it one-quarter to one-half turn counterclockwise.

5. Use the syringe to slowly push alcohol through the pump.

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

6. Close the priming valve. Do not overtighten. Disconnect the syringe from the priming valve.

7. Let the pump run for several minutes, to purge alcohol from the pump heads. Then, click the Prime button in the Pump Settings window to flush the heads with the desired eluent.
8. Close the waste valve. **Do not overtighten.**
9. Select the flow rate required for the analysis.
10. In the **Pump Settings** window, click **Pump Off**.

### 5.18 Changing Main Power Fuses

1. Turn off the main power switch.

   **DANGER**—Disconnect the main power cord from its source and also from the rear panel of the Dionex ICS-2100.

   **DANGER**—Débranchez le cordon d’alimentation principal de sa source et du panneau arrière du Dionex ICS-2100.

   **ACHTUNG**—Ziehen Sie das Netzkabel aus der Steckdose und der Netzbuchse auf der Rückseite des Dionex ICS-2100.

2. The fuse holder is part of the main power receptacle (see Figure 5-34) on the Dionex ICS-2100 rear panel. To remove the fuse holder, squeeze the tab on the top of the holder to release it and pull the holder straight out of its compartment.

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**Figure 5-34. Main Power Fuse Holder**

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*IMPORTANT* Isopropyl alcohol may damage some columns. Be sure to thoroughly rinse the alcohol from the pump, using the process described in **Step 7**.
3. Replace the two fuses in the holder with new IEC 127 fast-blow fuses rated 3.15 amps (P/N 954745). Thermo Fisher Scientific recommends always replacing both fuses.

4. Reinsert the fuse holder into its compartment and push in until the tab clicks in place.

5. Reconnect the main power cord and turn on the power.

5.19 Replacing a Dionex EluGen Cartridge

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

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

Die Dionex EluGen-Kartusche enthält eine korrosive Base (KOH, LiOH oder NaOH), oder eine korrosive Säure (MSA). Tragen Sie daher beim Umgang mit der Kartusche eine Schutzbrille und Handschuhe.

The procedure for replacing an Dionex EluGen cartridge differs, depending on the type of cartridge:

- To replace a KOH, LiOH, MSA, or NaOH Dionex EluGen cartridge, go to Section 5.19.1.
- To replace a K$_2$CO$_3$ cartridge, go to Section 5.19.2.

5.19.1 Replacing a KOH, LiOH, MSA, or NaOH Dionex EluGen Cartridge

1. Turn off the pump from the Dionex ICS-2100 Control panel in Chromeleon or from the Dionex ICS-2100 touch screen HOME page.

2. Disconnect the Dionex EluGen cartridge cable from the EGC-1 connector on the Dionex ICS-2100 top cover.

3. Disconnect the CR-TC cable from the CR-TC connector.
4. Remove the EGC VENT line (see Figure 5-35) from the Dionex EluGen cartridge by unscrewing the luer lock from the luer adapter. If necessary, use a wrench to hold the luer adapter in place while unscrewing the vent line.

Figure 5-35. Dionex EluGen Cartridge Vent Line and Luer Fitting

5. Install the luer cap (P/N 053981), provided with the Dionex EluGen cartridge, onto the luer adapter. This prevents leaks from the vent opening when you turn over the cartridge (see Step 7).


7. Turn the cartridge upside down and set it in the cartridge service area on top of the Dionex ICS-2100 (see Figure 5-36 and Figure 5-37).

Figure 5-36. Dionex EluGen Cartridge Service Area
8. Disconnect the **EGC IN** and **EGC OUT** lines from the **INLET** and **OUTLET** ports on the Dionex EluGen cartridge (see **Figure 5-38**).

9. Follow the instructions in the Dionex EluGen cartridge manual, provided on the Thermo Scientific Reference Library DVD (P/N 053891), to prepare an expended Dionex EluGen cartridge for
disposal or to store a partially used Dionex EluGen cartridge for later use.

10. Remove the new Dionex EluGen cartridge from the shipping box.

11. Orient the Dionex EluGen cartridge with the fittings facing up and remove the plugs from the Dionex EluGen cartridge **INLET** and **OUTLET** ports (see Figure 5-39).

![Figure 5-39. Dionex EluGen Cartridge Inlet and Outlet Ports](image)

12. Set the Dionex EluGen cartridge in the service area on top of the Dionex ICS-2100 and orient it with the cable toward the EGC holder (see Figure 5-40).

![Figure 5-40. Dionex EluGen Cartridge in Service Area](image)
13. Connect **EGC IN** to the Dionex EluGen cartridge **INLET** port.

14. Locate the yellow 0.5 mL/min, 7 MPa (1000 psi) backpressure coil (P/N 053765) in the Dionex ICS-2100 Ship Kit (P/N 064375).

15. Connect one end of this coil to the Dionex EluGen cartridge **OUTLET** port (see Figure 5-41). Leave the other end of the coil unconnected.

![Backpressure Coil OUTLET Port]

**Figure 5-41. Dionex EluGen Cartridge Outlet Connection for Conditioning the Cartridge**

**NOTE** The backpressure coil connection is temporary; it is used only during the Dionex EluGen cartridge conditioning procedure described in “Conditioning the Dionex EluGen Cartridge” on page 150.

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

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

![CAUTION]

**CAUTION**

La cartouche d'Dionex EluGen contient un de ce qui suit: une base corrosive (KOH, LiOH, ou NaOH), ou un acide corrosif (MSA). Porter des lunettes et des gants protectives en manipulant la cartouche.
17. Slide the Dionex EluGen cartridge down into the holder until it stops. Make sure the cable and backpressure coil remain out of the holder (see Figure 5-42).

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

18. Orient the cartridge’s blue 4-pin electrical cable connector as shown in Figure 5-43. Push it onto the EGC-1 connector on the Dionex ICS-2100. Twist the ring on the cable connector fingertight to secure it.

Die Dionex EluGen-Kartusche enthält eine korrosive Base (KOH, LiOH oder NaOH), oder eine korrosive Säure (MSA). Tragen Sie daher beim Umgang mit der Kartusche eine Schutzbrille und Handschuhe.
19. Remove the plug from the Dionex EluGen cartridge vent opening and connect the Dionex EluGen cartridge VENT line.

**Recording the Dionex EluGen Cartridge Serial Number in Chromeleon**

The serial number is printed on the Dionex EluGen cartridge label.

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


3. Click the **Eluent Generator** tab (see **Figure 5-44**).

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

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

![Figure 5-44. Eluent Generator Configuration Properties Example](image)
Conditioning the Dionex EluGen Cartridge

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

1. Set a temporary waste container, such as a beaker, on top of the Dionex ICS-2100 and direct the yellow backpressure coil from the Dionex EluGen cartridge OUTLET port to the container.

2. From the Chromeleon Control panel or the Dionex ICS-2100 touch screen HOME page, set the pump flow rate to 1.00 mL/min and set the Dionex EluGen cartridge concentration to 50 mM.

3. Verify that the suppressor, the auxiliary electrolytic device attached to the EGC-2 connector (if installed), and the CR-TC are off.

4. Verify that the Automatically turn on with pump options are not selected on the touch screen SUPPRESSOR page (see Section B.9) and ELUENT GENERATOR page (see Section B.8). Disabling these options lets you turn on the pump, without automatically turning on the suppressor and CR-TC.

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

6. Turn on the pump.

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

8. Turn off the pump.

9. Disconnect the Dionex EluGen cartridge cable.

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

To avoid damaging the suppressor, auxiliary electrolytic device (if installed), and CR-TC, always turn them off before conditioning the Dionex EluGen cartridge. The pump flow is on during conditioning; however, no flow reaches the suppressor, auxiliary electrolytic device, or CR-TC.
11. Lift the Dionex EluGen cartridge out of the holder, turn it over, and set it in the service area.

12. Disconnect the backpressure coil from the Dionex EluGen cartridge OUTLET port.

13. Connect the EGC OUT line from the holder to the OUTLET port (see Figure 5-45).

Figure 5-45. Dionex EluGen Cartridge Inlet and Outlet Connections

14. Turn over the Dionex EluGen cartridge (fittings facing down). Check for bubbles. If necessary, shake and tap the Dionex EluGen cartridge to remove bubbles.

15. Reinstall the Dionex EluGen cartridge in the holder.

16. Reconnect the Dionex EluGen cartridge cable.

17. Reconnect the CR-TC cable.

18. If you disabled the **Automatically turn on with pump** option in Step 3, select the option.

### 5.19.2 Replacing a \(\text{K}_2\text{CO}_3\) Cartridge

1. Turn off the pump from the Dionex ICS-2100 Control panel in Chromeleon or from the Dionex ICS-2100 touch screen HOME page.

2. Disconnect the Dionex EluGen cartridge cable from the EGC-1 connector on the Dionex ICS-2100 top cover.

3. If an EPM is installed, disconnect the EPM cable from the EGC-2 connector.
4. Remove the EGC VENT line (see Figure 5-46) from the Dionex EluGen cartridge by unscrewing the luer lock from the luer adapter.

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

*Figure 5-46. Dionex EluGen Cartridge Vent Line and Luer Fitting*

5. Install the luer cap (P/N 053981), provided with the Dionex EluGen cartridge, onto the luer adapter. This prevents leaks from the vent opening when you turn over the cartridge (see Step 7).

6. Lift the cartridge straight up and out of the cartridge holder.

7. Turn the cartridge upside down and set it in the Dionex EluGen cartridge service area on top of the Dionex ICS-2100 (see Figure 5-47 and Figure 5-48).

*Figure 5-47. Dionex EluGen Cartridge Service Area*
8. Disconnect the **EGC IN** and **EGC OUT** lines from the **INLET** and **OUTLET** fittings on the Dionex EluGen cartridge (see Figure 5-49).

9. Follow the instructions in the Dionex EluGen cartridge manual, provided on the Thermo Scientific Reference Library DVD (P/N 053891), to prepare an expended Dionex EluGen cartridge for disposal or to store a partially used cartridge for later use.
10. Remove the new Dionex EluGen cartridge from the shipping box.

11. Orient the Dionex EluGen cartridge with the fittings facing up and remove the plugs from the Dionex EluGen cartridge INLET and OUTLET ports (see Figure 5-50).

![Figure 5-50. Dionex EluGen Cartridge Inlet and Outlet Ports](image)

12. Set the Dionex EluGen cartridge in the service area on top of the Dionex ICS-2100 and orient it with the cable toward the EGC holder (see Figure 5-51).

![Figure 5-51. Dionex EluGen Cartridge in Service Area](image)

13. Connect **EGC IN** to the Dionex EluGen cartridge INLET port.
14. Connect **EGC OUT** to the Dionex EluGen cartridge **OUTLET** port.

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

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

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**CAUTION**

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

---

Die Dionex EluGen-Kartusche enthält eine korrosive Base (KOH, LiOH oder NaOH), oder eine korrosive Säure (MSA). Tragen Sie daher beim Umgang mit der Kartusche eine Schutzbrille und Handschuhe.

---

16. Slide the Dionex EluGen cartridge down into the holder until it stops (see **Figure 5-52**). Make sure the cable remains out of the holder.

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

---

**Figure 5-52. Dionex EluGen Cartridge Installed in the Holder**
17. Remove the plug from the EGC-1 connector on top of the Dionex ICS-2100.

18. Orient the cartridge’s blue 4-pin electrical cable connector as shown in Figure 5-53. Push it onto the EGC-1 connector on the Dionex ICS-2100. Twist the ring on the cable connector fingertight to secure it.

Figure 5-53. Connecting the Dionex EluGen Cartridge Cable

19. Remove the plug from the Dionex EluGen cartridge vent opening and connect the Dionex EluGen cartridge VENT line.
Recording the Dionex EluGen Cartridge Serial Number in Chromeleon

The serial number is printed on a label on the Dionex EluGen cartridge.

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


3. Click the **Eluent Generator** tab.

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

5. Enter the Dionex EluGen cartridge serial number. Verify that the cartridge type is **Carb**. If not, make sure the cartridge serial number was entered correctly.

6. Click **OK**.

![Eluent Generator Configuration Properties Example](image)

*Figure 5-54. Eluent Generator Configuration Properties Example*
Continue on to one of the following sections, depending on the type of eluent to be generated:

- For carbonate eluent, go to “Plumbing the Dionex EluGen Cartridge for Conditioning with Carbonate Eluent” on page 159.

- For carbonate/bicarbonate eluent, go to “Plumbing the Dionex EluGen Cartridge and EPM for Conditioning with Carbonate/Bicarbonate Eluent” on page 162.
Plumbing the Dionex EluGen Cartridge for Conditioning with Carbonate Eluent

Figure 5-55 illustrates the liquid flow path during the Dionex EluGen cartridge conditioning procedure with carbonate eluent.

*Figure 5-55. Dionex EluGen Cartridge Plumbing for Conditioning with Carbonate Eluent*
1. Disconnect the **TO INJ VALVE IN - P/ELUENT OUT** line from the EGC CO₃ Mixer inlet.

2. Locate the yellow 0.5 mL/min, 7 MPa (1000 psi) backpressure coil (P/N 053765) and a 10-32 to 10-32 coupler (P/N 042627) in the Dionex ICS-2100 Ship Kit (P/N 064375).

3. Use the coupler to connect the **TO INJ VALVE IN - P/ELUENT OUT** line to one end of the backpressure coil (see Figure 5-56).

4. Direct the free end of the backpressure coil to a temporary waste container.

*Figure 5-56. Plumbing Connections for Conditioning the Dionex EluGen Cartridge with Carbonate Eluent*
**Conditioning the Dionex EluGen Cartridge**

Always condition the Dionex EluGen cartridge for 30 minutes before initial use.

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

2. Verify that the suppressor and the auxiliary electrolytic device attached to the EGC-2 connector (if installed) are off.

**IMPORTANT**

To avoid damaging the suppressor (and auxiliary electrolytic device, if installed), always turn them off before conditioning the Dionex EluGen cartridge. The pump flow is on during conditioning; however, no flow reaches the suppressor or auxiliary electrolytic device.

3. Verify that the *Automatically turn on with pump* option is not selected on the Dionex ICS-2100 touch screen `SUPPRESSOR` page (see Section B.9). Disabling this option lets you turn on the pump, without automatically turning on the suppressor.

4. From the Control panel in Chromelion or the touch screen `HOME` page, set the pump flow rate to **1.00 mL/min**.

5. Turn on the pump.

6. From the Chromelion Control panel or the touch screen `ELUENT GENERATOR` page, set the EGC-1 concentration to **9 mM**.

7. Turn on the EGC-1 current.

8. Run at these settings for 30 minutes.

9. Turn off the EGC-1 current.

10. Turn off the pump.

11. Remove the backpressure coil.

12. Reconnect the **TO INJ VALVE IN - P/ELUENT OUT** line to the mixer inlet.
Plumbing the Dionex EluGen Cartridge and EPM for Conditioning with Carbonate/Bicarbonate Eluent

Figure 5-57 illustrates the liquid flow path through the eluent generator during conditioning with carbonate/bicarbonate eluent.

---

Figure 5-57. Plumbing for Conditioning with Carbonate/Bicarbonate Eluent
1. Locate the yellow 0.5 mL/min, 7 MPa (1000 psi) backpressure coil (P/N 053765) and 10-32 to 1/4-28 coupler (P/N 042806) in the Dionex ICS-2100 Ship Kit (P/N 064375).

2. Disconnect the **TO INJ VALVE IN - P/ELUENT OUT** line from the EGC CO$_3$ Mixer inlet.

3. Connect one end of the backpressure coil to the **TO INJ VALVE IN - P/ELUENT OUT** line.

4. Connect the 10-32 to 1/4-28 coupler to the free end of the backpressure coil.

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

6. Connect the **TO SRS/AES REGEN OUT** line to the 10-32 to 1/4-28 coupler (see Figure 5-58).

**NOTE** The backpressure coil connection in Figure 5-58 is temporary; it is required only during the conditioning procedure described in the next section.

![Figure 5-58. Backpressure Coil Connections for Conditioning the EPM with Carbonate/Bicarbonate Eluent](image-url)
Conditioning the Dionex EluGen Cartridge

Always condition the Dionex EluGen cartridge for 30 minutes before initial use.

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

2. Verify that the suppressor and the auxiliary electrolytic device (if installed) are off.

To avoid damaging the suppressor (and auxiliary electrolytic device, if installed), always turn them off before conditioning the Dionex EluGen cartridge. The pump flow is on during conditioning; however, no flow reaches the suppressor or auxiliary electrolytic device.

3. Verify that the **Automatically turn on with pump** option is not selected on the Dionex ICS-2100 touch screen **SUPPRESSOR** page (see [Section B.9](#)). Disabling this option lets you turn on the pump, without automatically turning on the suppressor.

4. From the Dionex ICS-2100 Control panel in Chromeleon or the touch screen **HOME** page, set the pump flow rate to **1.00 mL/min**.

5. Turn on the pump.

6. Select the following settings from the Chromeleon Control panel or the touch screen **ELUENT GENERATOR** page:
   - Set the **EGC-1** concentration to **9 mM**.
   - Set the **EGC-2** concentration to **1 mM**.

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

8. Run at these settings for 30 minutes.

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

10. Turn off the pump.

11. Remove the backpressure coil.

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

13. Reconnect the **TO SRS/AES REGEN OUT** line to the suppressor **REGEN OUT** port.
5.20 Replacing the CR-TC

1. Turn off the pump from the Dionex ICS-2100 Control panel in Chromeleon or from the touch screen HOME page.

2. Follow the instructions in Section 5.19.1, Step 2 through Step 8 to disconnect the Dionex EluGen cartridge and CR-TC cables, cap the Dionex EluGen cartridge vent opening, remove the Dionex EluGen cartridge from the holder, and disconnect the inlet and outlet tubing.

3. Disconnect the line labeled TO INJ VALVE IN - ELUENT OUT from port P (2) on the injection valve and disconnect the line labeled SRS/AES REGEN OUT from the REGEN OUT port on the suppressor.

4. Lift up the holder and tilt it to view the bottom of the holder.

5. Brace the holder against the back corner of the Dionex ICS-2100.

6. Grasp the top of the CR-TC and lift up to disconnect it from the holder.

7. Disconnect the liquid lines from the four ports on the CR-TC (see Figure 5-59).

8. Remove the CR-TC from the holder.

9. Remove the plugs from the ports on the new CR-TC (P/N 060477, anion; P/N 060478, cation). Reconnect the liquid lines that were disconnected in Step 7 to the corresponding ports on the new CR-TC.

Figure 5-59. Disconnecting CR-TC Liquid Lines
10. Check that none of the lines are caught under the CR-TC and then push the CR-TC onto the metal stud inside the EGC holder. Push down until the CR-TC snaps into place (see Figure 5-60).

11. Feed the CR-TC cable through the slot on the side of the EGC holder (see Figure 5-61).

12. Turn the EGC holder right-side up.

13. Reconnect the **EGC IN** and **EGC OUT** lines to the Dionex EluGen cartridge inlet and outlet ports.

14. Turn over the Dionex EluGen cartridge (fittings facing down). Check for bubbles in the eluent generation chamber; if necessary, shake and tap the Dionex EluGen cartridge to remove bubbles.
15. Reinstall the Dionex EluGen cartridge in the holder.
16. Remove the cap on the luer adapter by twisting. **Save the cap.**
17. Twist the luer lock and **EGC VENT** line into the luer adapter.
18. Do not connect the Dionex EluGen cartridge cable until after hydrating the CR-TC.

**Hydrating the CR-TC**

The CR-TC must be hydrated before initial use by running ASTM filtered, Type 1 (18 megohm-cm) deionized water through the CR-TC for 10 minutes, while bypassing the columns and suppressor.

*Figure 5-62* illustrates the liquid flow path through the CR-TC during the hydration procedure.

![Figure 5-62. CR-TC Plumbing for Hydration](image-url)
Dionex ICS-2100 Ion Chromatography System

1. Locate the 10-32 to 1/4-28 coupler (P/N 042806) in the Dionex ICS-2100 Ship Kit (P/N 064375).

2. Use the coupler to connect the line labeled TO INJ VALVE IN - P/ELUENT OUT and the line labeled SRS/AES REGEN OUT.

3. Verify that the current to the suppressor and the auxiliary electrolytic device (if installed) is turned off.

To avoid damaging the suppressor and auxiliary electrolytic device (if installed), always turn them off before hydrating the CR-TC. The pump flow is on during hydrating; however, no flow reaches the suppressor or auxiliary electrolytic device.

4. Verify that the Automatically turn on with pump option is not selected on the Dionex ICS-2100 touch screen ELUENT GENERATOR page (see Section B.8). Disabling this option lets you turn on the pump, without automatically turning on the CR-TC.

5. Turn on the pump and set the flow to the rate recommended for your application. Pump deionized water through the CR-TC for at least 10 minutes.

6. Turn off the pump and disconnect the coupler.

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

8. Reconnect the line labeled TO SRS/AES REGEN OUT to the REGEN OUT port on the suppressor.

9. Reconnect the CR-TC and Dionex EluGen cartridge cables.

10. If you disabled the Automatically turn on with pump option in Step 3, select the option.
5.21 Replacing the EPM Electrolytic pH Modifier

1. Turn off the pump from the Dionex ICS-2100 Control panel in Chromleon or from the touch screen HOME page.

2. Disconnect the EPM electrical cable from the EGC-2 connector on the Dionex ICS-2100 top cover.

3. Disconnect the four liquid lines from the ports on the EPM.

4. Lift up the mounting bracket with the EPM attached and remove the bracket and EPM from the EGC holder.

5. Pull the EPM off the mounting bracket.

6. Remove the plugs from the ports on the new EPM (P/N 063175).

7. Push the EPM onto the ball studs on the mounting bracket (see Figure 5-63).

8. Reinstall the mounting bracket with new EPM attached onto the EGC holder.

9. Reconnect the liquid lines that were disconnected in Step 3 to the corresponding ports on the new EPM.

10. Connect the EPM electrical cable to the EGC-2 connector.
5.21.1 Recording the EPM Serial Number in Chromeleon

The serial number is printed on a label on the EPM.

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


3. Click the Eluent Generator tab (see Figure 5-44).

4. Select the EGC-2 check box.

5. Enter the serial number of the EPM.

6. Verify that the cartridge type is pH Mod. If not, make sure the serial number was entered correctly.

7. Click OK.

Figure 5-64. Eluent Generator Configuration Properties Example
5.21.2 Plumbing the EPM for Hydrating and Conditioning

Figure 5-57 illustrates the liquid flow path during hydration and conditioning.

Figure 5-65. Dionex EluGen Cartridge and EPM Plumbing for Conditioning
1. Disconnect the **TO INJ VALVE IN - P/ELUENT OUT** line from the EGC CO₃ Mixer inlet.

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

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

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

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

**NOTE** The backpressure coil connection in [Figure 5-66](#) is temporary; it is used only during the hydration and conditioning procedure described in the next section.

---

**Figure 5-66. Backpressure Coil Connections for Hydrating and Conditioning the EPM with Carbonate Eluent**
5.21.3 Hydrating and Conditioning the EPM

Follow the steps below to hydrate the EPM for 5 minutes and then condition the EPM for 30 minutes.

1. Fill the eluent reservoir with ASTM filtered, Type I (18-megohm) deionized water.
2. Verify that the suppressor and the auxiliary electrolytic device (if installed) are off.

To avoid damaging the suppressor and auxiliary electrolytic device (if installed), always turn them off before conditioning the EPM and Dionex EluGen cartridge. The pump flow is on during conditioning; however, no flow reaches the suppressor or auxiliary electrolytic device.

3. Verify that the Dionex EluGen cartridge is off.
4. Verify that the Automatically turn on with pump options are not selected on the Dionex ICS-2100 touch screen SUPPRESSOR page (see Section B.9) and ELUENT GENERATOR page (see Section B.8). Disabling these options lets you turn on the pump, without automatically turning on the suppressor and Dionex EluGen cartridge.

5. From the Dionex ICS-2100 Control panel in Chromelone or the Dionex ICS-2100 touch screen HOME page, set the pump flow rate to 1.00 mL/min.
6. Turn on the pump.
7. Run the pump for 5 minutes to hydrate the EPM.
8. Select the following settings from the Chromelone Control panel or the touch screen ELUENT GENERATOR page:
   • Set the EGC-1 concentration to 9 mM.
   • Set the EGC-2 concentration to 1 mM.
9. Turn on the EGC-1 and EGC-2 currents.
10. Run at these settings for 30 minutes.
11. Turn off the EGC-1 and EGC-2 currents.
12. Turn off the pump.
13. Remove the backpressure coil and couplers from the TO INJ VALVE IN - P/ELUENT OUT and TO SRS/AES REGEN OUT lines.

14. Reconnect the TO INJ VALVE IN - P/ELUENT OUT line to the EGC CO\textsubscript{3} Mixer inlet.

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

### 5.22 Replacing the EGC CO\textsubscript{3} Mixer

#### 5.22.1 Installing the New EGC CO\textsubscript{3} Mixer

1. Turn off the pump from the Dionex ICS-2100 Control panel in Chromeleon or from the touch screen HOME page.

2. Disconnect the inlet and outlet lines (labeled TO EGC CO\textsubscript{3} MIXER IN and TO EGC CO\textsubscript{3} MIXER OUT) from the existing mixer and pull the mixer off the mounting clips.

3. Orient the new EGC CO\textsubscript{3} Mixer (P/N 079943) with the outlet pointing upward and push it onto the mounting clips (see Figure 5-67). The mixer outlet must point upward to ensure thorough mixing of the eluent.
4. Connect the **TO EGC CO3 MIXER IN** line to the mixer inlet and connect the **TO EGC CO3 MIXER OUT** line to the mixer outlet.

![Image of EGC CO3 Mixer](Figure 5-67. Dionex ICS-2100 with an EGC CO3 Mixer Installed)

**5.22.2 Filling the EGC CO3 Mixer with Deionized Water**

Before initial use, follow the steps below to temporarily fill the EGC CO3 Mixer with deionized water. Then, follow the steps in the next section to fill the mixer with eluent of the required concentration for the application to be run.

1. Verify that the EGC-1 and EGC-2 currents are off.
2. Disconnect the Dionex EluGen cartridge inlet line (labeled **TO PUMP/DAMPER**) from the coupler that connects it to the green pump outlet line (see **Figure 5-68**).
3. Disconnect the **TO EGC CO3 MIXER IN** line from the **TO INJ VALVE IN - P/ELUENT OUT** line.
4. Connect the pump outlet to the mixer inlet (see Figure 5-69).

![Figure 5-69. Pump Outlet Connected to Mixer Inlet for Mixer Hydration](image)

5. Disconnect the mixer outlet line (labeled TO INJ VALVE PORT P) from port P (2) on the injection valve.

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

7. From the Dionex ICS-2100 Control panel in Chromeleon or the Dionex ICS-2100 touch screen HOME page, set the pump flow rate to 5.00 mL/min.

8. Verify that the suppressor and the auxiliary electrolytic device (if installed) are off.

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

10. Turn on the pump.
11. Run the pump until the mixer is filled and there is a consistent flow of water exiting the mixer outlet.

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

12. Turn off the pump.

5.22.3 Filling the EGC CO$_3$ Mixer with Eluent

Before initial use, follow the steps in this section to fill the EGC CO$_3$ Mixer with the eluent required for the application to be run. The procedure varies slightly, depending on the type of eluent to be generated:

- For carbonate eluent, see “Filling the EGC CO$_3$ Mixer with Carbonate Eluent” below.

- For carbonate/bicarbonate eluent, see “Filling the EGC CO$_3$ Mixer with Carbonate/Bicarbonate Eluent” on page 182.
Filling the EGC CO$_3$ Mixer with Carbonate Eluent

Figure 5-70 illustrates the liquid flow path through the eluent generator components during initial filling of the EGC CO$_3$ Mixer with carbonate eluent.

Figure 5-70. Plumbing for Initial Filling of the EGC CO$_3$ Mixer with Carbonate Eluent
1. Locate the yellow 0.5 mL/min, 7 MPa (1000 psi) backpressure coil (P/N 053765) and a 10-32 to 10-32 coupler (P/N 042627) in the Dionex ICS-2100 Ship Kit (P/N 064375).

2. Use the coupler to connect one end of the backpressure coil to the TO INJ VALVE IN - P/ELUENT OUT line.

3. Connect the other end of the back pressure coil to the coupler on the mixer inlet.

   **NOTE** The backpressure coil connection is temporary; it is required only during initial filling of the mixer.

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

5. Verify that the suppressor and the auxiliary electrolytic device (if installed) are off.

6. Verify that the **Automatically turn on with pump** option is not selected on the Dionex ICS-2100 touch screen **SUPPRESSOR** page (see Section B.9). Disabling this option lets you turn on the pump, without automatically turning on the suppressor.

7. From the Dionex ICS-2100 Control panel in Chromeleon or the touch screen **HOME** page, set the pump flow rate to the rate required for the application.

8. Turn on the pump.

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

10. From the Chromeleon Control panel or the touch screen **ELUENT GENERATOR** page, set the **EGC-1** concentration to the value required for your application.

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

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

13. Turn off the EGC-1 current.

14. Turn off the pump.

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

16. Retain the coupler on the mixer inlet.

17. Reconnect the TO INJ VALVE IN - P/ELUENT OUT line to the coupler on the mixer inlet.

18. Reconnect the mixer outlet line to port P (2) on the injection valve.
Filling the EGC CO₃ Mixer with Carbonate/Bicarbonate Eluent

Figure 5-71 illustrates the liquid flow path through the eluent generator components during initial filling of the EGC CO₃ Mixer with carbonate/bicarbonate eluent.

*Figure 5-71. Plumbing for Initial Filling of the EGC CO₃ Mixer with Carbonate/Bicarbonate*
1. Locate the following items in the Dionex ICS-2100 Ship Kit (P/N 064375): a yellow 0.5 mL/min, 7 MPa (1000 psi) backpressure coil (P/N 053765), a 10-32 to 10-32 coupler (P/N 042627), and a 10-32 to 1/4-28 coupler (P/N 042806).

2. Use the 10-32 to 10-32 coupler to connect one end of the backpressure coil to the TO INJ VALVE IN - P/ELUENT OUT line (see Figure 5-72).

3. Connect the other end of the back pressure coil to the coupler on the mixer inlet.

4. Use the 10-32 to 1/4-28 coupler to connect the mixer outlet to the TO SRS/AES REGEN OUT line.

**NOTE** The backpressure coil connection is temporary; it is used only during initial filling of the mixer.

![Figure 5-72. Mixer Connected Directly to Eluent Generator Outlet for Initial Filling](image)
5. Verify that the suppressor and the auxiliary electrolytic device (if installed) are off.

**Important**
To avoid damaging the suppressor and auxiliary electrolytic device (if installed), always turn them off before filling the mixer. The pump flow is on during filling; however, no flow reaches the suppressor or auxiliary electrolytic device.

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

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

8. Turn on the pump.

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

10. Set the **EGC-1** and **EGC-2** concentrations to the values required for your application. For example, for a 3.5 mM K$_2$CO$_3$/1.0 mM KHCO$_3$ mixture, set the **EGC-1** concentration to 3.5 mM and the **EGC-2** concentration to 1.0 mM.

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

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

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

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

14. Turn off the pump.

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

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

18. Reconnect the mixer outlet line to port P (2) on the injection valve.

5.23 Replacing the EGC Holder and Degas Assembly

5.23.1 Disconnecting and Removing the Dionex EluGen Cartridge

1. Turn off the power to the Dionex ICS-2100.

2. Disconnect the following EGC holder liquid lines:
   - Disconnect the line labeled TO INJ VALVE IN - P/ELUENT OUT from either port P (2) on the injection valve, or if an EGC CO3 Mixer inlet is installed, from the mixer inlet.
   - If a CR-TC is installed, disconnect the line labeled TO SRS/AES REGEN OUT from the REGEN OUT port on the suppressor.
   - Disconnect the line labeled TO PUMP/DAMPER from the pump damper.
   - Disconnect the line labeled WASTE-GAS SEPARATOR from the gas separator waste tube assembly installed on the waste container.

3. Disconnect the Dionex EluGen cartridge cable, and the CR-TC or EPM cable (if installed) from their respective connectors on the Dionex ICS-2100 top cover.

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

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

Die Dionex EluGen-Kartusche enthält eine korrosive Base (KOH, LiOH oder NaOH), oder eine korrosive Säure (MSA). Tragen Sie daher beim Umgang mit der Kartusche eine Schutzbrille und Handschuhe.
4. Remove the **EGC VENT** line (see Figure 5-73) from the cartridge by unscrewing the luer lock from the luer adapter.

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

   ![Figure 5-73. Dionex EluGen Cartridge Vent Line and Luer Fitting](image)

5. Install the luer cap (P/N 053981), provided with the Dionex EluGen cartridge, onto the luer adapter. This prevents leaks from the vent opening when you turn over the cartridge (see Step 8).

6. If an EPM is installed, lift up the bracket with the EPM attached and remove it from the EGC holder.

7. Lift the cartridge straight up and out of the EGC holder.

8. Turn the cartridge upside down and set it in the cartridge service area on top of the Dionex ICS-2100 (see Figure 5-36).

   ![Figure 5-74. Dionex EluGen Cartridge in Service Area](image)
9. Disconnect the **EGC IN** and **EGC OUT** lines from the **INLET** and **OUTLET** ports on the cartridge.

10. Lift the EGC holder out of the top cover and pull the liquid lines through the tubing chase (see **Figure 5-75**) to remove them from the Dionex ICS-2100.

![Tubing Chase](image)

**Figure 5-75. Top Cover Tubing Chase**

11. If a CR-TC is installed, go on to **Section 5.23.2**.

12. If an EPM is installed, go on to **Section 5.23.3**.

13. If neither a CR-TC or EPM is installed, go on to **Section 5.23.4**.
5.23.2 Removing the CR-TC and Reinstalling it in the New EGC Holder

1. Turn the holder upside down to view the CR-TC.

2. Grasp the top of the CR-TC and lift up to disconnect it from the holder.

3. Disconnect the liquid lines from the four ports on the CR-TC (see Figure 5-59).

4. Turn the new holder upside down (see Figure 5-77) and connect the liquid lines to the CR-TC.

NOTE To help retain the fittings and ferrules on the lines, remove the coupler from each line just before connecting the line to a port.
5. Check that none of the lines are caught under the CR-TC and then push the CR-TC onto the metal stud inside the EGC holder. Push down until the CR-TC snaps in place (see Figure 5-78).

Figure 5-78. CR-TC Installed in Holder

6. Feed the CR-TC cable through the slot on the side of the EGC holder (see Figure 5-79).

Figure 5-79. CR-TC Cable

7. Turn the EGC holder right side up and set it on top of the Dionex ICS-2100.

8. Direct the WASTE, GAS SEPARATOR line from the top of the Dionex ICS-2100 to the rear panel. Snap the line onto one of the tubing clips on the rear panel. Connect the line to the gas separator waste tube (see Section B.10.1).
9. Feed the following liquid lines from the bottom of the holder through the tubing chase to the Dionex ICS-2100 front component panel.
   - **TO SRS/AES REGEN OUT**
   - **TO INJ VALVE IN - P/ELUENT OUT**
   - **TO PUMP/DAMPER**

10. Connect the lines to their respective locations:
   - Connect the line labeled **TO SRS/AES REGEN OUT** to the **REGEN OUT** port on the suppressor.
   - Connect the line labeled **TO INJ VALVE IN - P/ELUENT OUT** to port **P (2)** on the injection valve.
   - Connect the line labeled **TO PUMP/DAMPER** to the pulse damper.

11. Go on to **Section 5.23.5**.

---

5.23.3 Removing the EPM and Reinstalling it in the New EGC Holder

1. Turn the EGC holder upside down to view the connections on the bottom of the holder.

2. Disconnect the following lines that connect from the EGC degas assembly inside the EGC holder to the EPM:
   - Disconnect the line labeled **TO CR-TC ELUENT IN** (red label) from the coupler that connects it to the line labeled **TO CR-TC/EPM ELUENT IN** (red label).
   - Disconnect the line labeled **TO CR-TC ELUENT OUT** (yellow label) from the coupler that connects it to the line labeled **TO CR-TC/EPM ELUENT OUT** (yellow label).
   - Disconnect the line labeled **TO CR-TC REGEN OUT** (blue label) from the coupler that connects it to the line labeled **TO CR-TC/EPM REGEN OUT** (blue label).

3. Remove the old EGC holder.
4. Thread the three lines from the EPM (red, yellow, and blue labels) through the opening on the side of the new holder (see Figure 5-80).

![Figure 5-80. TO CR-TC/EPM Lines Outside of Holder](image)

5. Turn the new EGC holder upside down (see Figure 5-81).

![Figure 5-81. EGC Holder (upside down)](image)

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

6. Connect the lines from the EPM (red, yellow, and blue labels) to the corresponding lines in the holder.

7. Disconnect the line labeled TO CR-TC/EPM REGEN IN (orange label) from the REGEN IN port on the EPM and connect the new TO CR-TC/EPM REGEN IN line (orange label) to the port.
8. Turn the EGC holder right side up and set it in place on top of the Dionex ICS-2100.

9. Slide the EPM mounting bracket and connected EPM onto the side of the EGC holder.

10. Feed the following liquid lines through the tubing chase to the Dionex ICS-2100 front component panel.
   - TO SRS/AES REGEN OUT
   - TO INJ VALVE IN - P/ELUENT OUT
   - TO PUMP/DAMPER

11. Connect the lines to their respective locations:
   - Connect the line labeled TO SRS/AES REGEN OUT to the REGEN OUT port on the suppressor.
   - Connect the line labeled TO INJ VALVE IN - P/ELUENT OUT to the EGC CO₃ Mixer inlet.
   - Connect the line labeled TO PUMP/DAMPER to the pulse damper.

12. Direct the WASTE, GAS SEPARATOR line from the top of the Dionex ICS-2100 to the rear panel. Snap the line onto one of the tubing clips on the rear panel. Connect the line to the gas separator waste tube (see Section B.10.1).

13. Go on to Section 5.23.5.

5.23.4 Installing the New EGC Holder Without a CR-TC or EPM

Follow the instructions in this section if a CR-TC or EPM is not installed.

1. Set the new EGC holder in place on top of the Dionex ICS-2100.

2. Feed the following liquid lines through the tubing chase to the Dionex ICS-2100 front component panel.
   - TO SRS/AES REGEN OUT
   - TO INJ VALVE IN - P/ELUENT OUT
   - TO PUMP/DAMPER

3. Connect the lines to their respective locations:
   - Connect the line labeled TO SRS/AES REGEN OUT to the REGEN OUT port on the suppressor.
• Connect the line labeled **TO INJ VALVE IN - P/ELUENT OUT** to the EGC CO₃ Mixer inlet.

• Connect the line labeled **TO PUMP/DAMPER** to the pulse damper.

4. Direct the **WASTE, GAS SEPARATOR** line from the top of the Dionex ICS-2100 to the rear panel. Snap the line onto one of the tubing clips on the rear panel. Connect the line to the gas separator waste tube (see Section B.10.1).

5. Go on to Section 5.23.5.

### 5.23.5 Reinstalling the Dionex EluGen Cartridge

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

2. Connect the **EGC IN** line to the Dionex EluGen cartridge **INLET** port (see Figure 5-82).

3. Remove the coupler and connect the **EGC OUT** line to the Dionex EluGen cartridge **OUTLET** port.

   ![Figure 5-82. Dionex EluGen Cartridge Inlet and Outlet Port Connections](image)

4. Turn over the Dionex EluGen cartridge (fittings facing down). Check for any bubbles in the eluent generation chamber, and if necessary, shake and tap the Dionex EluGen cartridge to remove them.

5. Reinstall the Dionex EluGen cartridge in the holder.

6. Reconnect the Dionex EluGen cartridge cable and the CR-TC or EPM cable (if installed).
Dionex ICS-2100 Ion Chromatography System

Remove the cap from the luer adapter on the Dionex EluGen cartridge vent opening and re-connect the **EGC VENT** line.
A • Specifications

A.1 Electrical

Main Power 100 to 240 Vac, 50 to 60 Hz (Auto-sensing power supply; no manual voltage or frequency adjustment required)

Fuses Two 3.15 amp fast-blow IEC 127 fuses (P/N 954745)

A.2 Physical

Dimensions (Without reservoir or EluGen cartridge)
- Height: 56.1 cm (22.1 in)
- Width: 22.4 cm (8.8 in)
- Depth: 53.3 cm (21.0 in)

Weight 24.5 kg (54 lb)

Decibel Level <52 dBA

Control Modes Full control through front panel and Chromeleon software; alternative control through TTL or relay closure (two relay outputs, two TTL outputs, four programmable inputs)

USB Communication Protocol One USB input; one built-in USB hub with two outputs
**A.3 Environmental**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Temperature</td>
<td>4 to 40 °C (40 to 104 °F); cold room-compatible (4 °C) as long as system power remains on</td>
</tr>
<tr>
<td>Operating Humidity</td>
<td>5% to 95% relative humidity, noncondensing</td>
</tr>
<tr>
<td>Operating Pressure</td>
<td>35 MPa (5000 psi) maximum liquid path (tubing, valve, columns, etc.)</td>
</tr>
</tbody>
</table>

**A.4 Front Panel**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power LED</td>
<td>On when power is present; off when no power is present</td>
</tr>
<tr>
<td>LCD Touch Screen</td>
<td>¼ VGA (320 x 240 pixels) liquid crystal display with touch screen, which provides:</td>
</tr>
<tr>
<td></td>
<td>• Local control of Dionex ICS-2100 components: pump, detector, suppressor, injection valve, eluent generator, CR-TC, column heater, vacuum degas, TTLs, and relays</td>
</tr>
<tr>
<td></td>
<td>• Display of conductivity data plot and operating status</td>
</tr>
<tr>
<td></td>
<td>• Local control of calibration and diagnostic functions</td>
</tr>
</tbody>
</table>

**A.5 Analytical Pump and Fluidics**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Serial dual-reciprocating pistons, microprocessor-controlled constant stroke, variable speed</td>
</tr>
<tr>
<td>Construction</td>
<td>Chemically inert, metal-free PEEK pump heads and flow paths compatible with aqueous eluents of pH 0 to 14 and reversed-phase solvents</td>
</tr>
<tr>
<td>Operating Pressure</td>
<td>0 to 35 MPa (0 to 5000 psi)</td>
</tr>
<tr>
<td>Flow Rate Range</td>
<td>0.00 to 5.00 mL/min in 0.01 mL/min increments without changing pump heads</td>
</tr>
<tr>
<td>Flow Precision</td>
<td>&lt;0.1% typical</td>
</tr>
</tbody>
</table>
### Specifications

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Flow Accuracy</strong></td>
<td>&lt;0.1% typical</td>
</tr>
<tr>
<td><strong>Pressure Ripple</strong></td>
<td>&lt;1% at 13.8 MPa (2000 psi) and 1.0 mL/min</td>
</tr>
<tr>
<td><strong>Eluent On/Off Valve</strong></td>
<td>Standard feature</td>
</tr>
<tr>
<td><strong>Piston Seal Wash</strong></td>
<td>Dual-pump head; wash can be continuous when connected to rinse solution supply</td>
</tr>
<tr>
<td><strong>Pressure Alarm Limits</strong></td>
<td>• <strong>Upper limit:</strong> 0 to 35 MPa or 0 to 5000 psi in one unit (MPa or psi) increments</td>
</tr>
<tr>
<td></td>
<td>• <strong>Lower limit:</strong> Up to one unit lower than upper limit</td>
</tr>
<tr>
<td><strong>Vacuum Degas</strong></td>
<td>Optional feature; automatic control</td>
</tr>
<tr>
<td><strong>Eluent Bottles</strong></td>
<td>Polypropylene</td>
</tr>
<tr>
<td><strong>Eluent Bottle Pressure</strong></td>
<td>Not required</td>
</tr>
<tr>
<td><strong>Leak Detection</strong></td>
<td>Built-in optical sensor</td>
</tr>
</tbody>
</table>
A.6 Eluent Generation

**Eluent Types**
KOH, LiOH, NaOH, K$_2$CO$_3$, K$_2$CO$_3$/KHCO$_3$, MSA

**Gradient Profiles**
Optional feature; combination of unlimited number of linear, convex, and concave positive and negative gradient profiles

**Concentration Increments**
0.01 mM

**Flow Rate**
0.1 to 3.0 mL/min

**Maximum Operating Pressure**
21 MPa (3000 psi)

**Maximum Solvent Concentration**
- **Anion**: 25% methanol
- **Cation**: No solvents

**Concentration Range**
Dependent on the EluGen cartridge type, the cartridge configuration (single or linked dual), and the flow rate. Refer to Table A-6 and Table A-7.

<table>
<thead>
<tr>
<th>EluGen Cartridge</th>
<th>Eluent Concentration Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>K$_2$CO$_3$</td>
<td>0.1 to 15 mM at 0.1 to 1.0 mL/min flow</td>
</tr>
<tr>
<td></td>
<td>0.1 to X mM at 1.0 to 2.0 mL/min flow where X = 15/flow in mL/min</td>
</tr>
<tr>
<td>KOH</td>
<td>0.1 to 100 mM at 0.1 to 1.0 mL/min flow</td>
</tr>
<tr>
<td></td>
<td>0.1 to X mM at 1.0 to 3.0 mL/min flow where X = 100/flow in mL/min</td>
</tr>
<tr>
<td>LiOH</td>
<td>0.1 to 80 mM at 0.1 to 1.0 mL/min flow</td>
</tr>
<tr>
<td></td>
<td>0.1 to X mM at 1.0 to 3.0 mL/min flow where X = 80/flow in mL/min</td>
</tr>
<tr>
<td>MSA</td>
<td>0.1 to 100 mM at 0.1 to 1.0 mL/min flow</td>
</tr>
<tr>
<td></td>
<td>0.1 to X mM at 1.0 to 3.0 mL/min flow where X = 100/flow in mL/min</td>
</tr>
<tr>
<td>NaOH</td>
<td>0.1 to 100 mM at 0.1 to 1.0 mL/min flow</td>
</tr>
<tr>
<td></td>
<td>0.1 to X mM at 1.0 to 3.0 mL/min flow where X = 100/flow mL/min</td>
</tr>
</tbody>
</table>

*Table A-6. Eluent Concentration Ranges for Single-Cartridge Configurations*
### Table A-7. Eluent Concentration Ranges for Linked Dual-Cartridge Configurations

<table>
<thead>
<tr>
<th>EluGen Cartridges</th>
<th>Eluent Concentration Range</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\text{K}_2\text{CO}_3$/EPM Electrolytic pH Modifier</td>
<td>0.1 to 15 mM at 0.1 to 1.0 mL/min flow 0.1 to X mM at 1.0 to 2.0 mL/min flow X = 15/flow</td>
<td>The total of the eluent concentrations from the EluGen cartridge and the EPM must not exceed the specified range. The EPM concentration must not exceed 10 mM.</td>
</tr>
<tr>
<td>KOH/KOH</td>
<td>0.1 to 50 mM at 0.1 to 1.0 mL/min flow 0.1 to X mM at 1.0 to 3.0 mL/min flow X = 50/flow</td>
<td>The eluent concentration range for each cartridge is cut by 50%.</td>
</tr>
<tr>
<td>KOH/MSA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>KOH/NaOH</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MSA/MSA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MSA/NaOH</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NaOH/NaOH</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LiOH/LiOH</td>
<td>0.1 to 40 mM at 0.1 to 1.0 mL/min flow 0.1 to X mM at 1.0 to 3.0 mL/min flow X = 40/flow</td>
<td>The eluent concentration range for each cartridge is cut by 50%.</td>
</tr>
</tbody>
</table>
A.7 Detector Electronics

<table>
<thead>
<tr>
<th>Type</th>
<th>Microprocessor-controlled digital signal processor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cell Drive</td>
<td>8 kHz square wave</td>
</tr>
<tr>
<td>Detector Linearity</td>
<td>1% up to 1 mS</td>
</tr>
<tr>
<td>Resolution</td>
<td>0.00238 nS/cm</td>
</tr>
<tr>
<td>Full-Scale Output Ranges</td>
<td></td>
</tr>
<tr>
<td>Digital signal range</td>
<td>0 to 15,000 μS</td>
</tr>
<tr>
<td>Analog signal range</td>
<td>0 to 15,000 μS</td>
</tr>
<tr>
<td>Electronic Noise</td>
<td>±0.1 nS/cm when background conductivity is 0 to 150 μS/cm</td>
</tr>
<tr>
<td></td>
<td>±2 nS/cm when background conductivity is 151 to 3200 μS/cm</td>
</tr>
<tr>
<td>Filter</td>
<td>Rise times from 0 to 10 s; user-selectable</td>
</tr>
<tr>
<td>Temperature Compensation</td>
<td></td>
</tr>
<tr>
<td>Fixed at 1.7% per 1 °C at cell temperature</td>
<td></td>
</tr>
<tr>
<td>Temperature Range</td>
<td>Ambient +7 °C; 30 to 55 °C</td>
</tr>
<tr>
<td>Temperature Stability</td>
<td>&lt;0.01 °C</td>
</tr>
</tbody>
</table>

A.8 Conductivity Cell with Heat Exchanger

| Cell Body             | Chemically inert polymeric material              |
| Cell Electrodes       | Passivated 316 stainless steel; compatible with MSA |
| Cell Volume           | <1 μL                                              |
| Maximum Cell Operating Pressure | 10 MPa (1500 psi)                               |
| Heat Exchanger        | Inert, tortuous path for low axial dispersion     |
A • Specifications

A.9 Injection Valve

Injection Valve  6-port, 2-position Rheodyne valve with PEEK wetted components; electrically-activated

A.10 Auxiliary Valve (Optional)

Auxiliary Valve  6-port or 10-port, 2-position Rheodyne valve with PEEK wetted components; electrically-activated

A.11 Vacuum Degas Assembly

Channel  Single-channel degas channel with degas membranes
Pump  Dual-stage diaphragm vacuum pump
Materials  Wetted materials, PEEK, PTFE

A.12 Column Heater

Operating Temperature  30 to 60 °C (86 to 140 °F); minimum 5 °C above ambient temperature. Settable range is equal to working range.
Temperature Stability  ±0.5 °C at sensor
Temperature Accuracy  ±0.5 °C at sensor, at 40 °C
Maximum Column Lengths  250 mm analytical column with 50 mm guard column
### A.13 Auxiliary Power Supply (Optional)

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant Current</td>
<td>200 mA maximum</td>
</tr>
<tr>
<td>Voltage</td>
<td>35 V maximum</td>
</tr>
</tbody>
</table>

### A.14 Suppressors

- **Chemical Suppression**: 2 mm and 4 mm anion and cation, membrane suppression bed types
- **Displacement Chemical Regeneration**: 2 mm and 4 mm anion and cation, membrane suppression bed types
- **Electrolytic Suppression**
  - **Self-Regenerating**: 2 mm and 4 mm anion and cation; both membrane and MonoDisk™ suppression bed types available
  - **Self-Regenerating with External Water Mode**: 2 mm and 4 mm anion and cation; both membrane and MonoDisk suppression bed types available

<table>
<thead>
<tr>
<th>Current Control Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>SRS (4 mm): 0 to 300 mA in 1 mA increments</td>
</tr>
<tr>
<td>SRS (2 mm): 0 to 100 mA in 1 mA increments</td>
</tr>
<tr>
<td>AES: 0 to 150 mA in 1 mA increments</td>
</tr>
<tr>
<td>CMD: 0 to 500 mA in 1 mA increments</td>
</tr>
<tr>
<td>SRN: 0 to 500 mA in 1 mA increments</td>
</tr>
</tbody>
</table>

- **Salt Converter**: 2 mm and 4 mm versions available

- **Dionex AMMS ICE™**: 2 mm and 4 mm versions available

- **Carbonic Acid Removal for Anions**
  - ASRS™ 300 with CRD 200 for hydroxide eluents
  - ASRS 300 with CRD 300 for carbonate eluents

- **Non-Suppressed Supported**

- **Suppressor Wear Parts**
  - None; peristaltic pump and inline filters not required
### A.15 Autosampler

**Automation Using Autosampler**
- Dionex AS, Dionex AS-AP, Dionex AS-DV, or Dionex AS-HV Autosampler (or third-party autosampler)

**Sequential/Simultaneous Injection**
- May be available; depends on autosampler capabilities

**Automated Dilution**
- Available with a Dionex AS Autosampler
  - **Dilution Factor**: 1:1 to 1:1000
  - **Dilution Time**: 15 seconds with sample overlap

**Online Sample Degassing**
- Optional; CRD 200/300 required

**Online Filtration**
- Available with a Dionex AS-DV Autosampler or an inline filter

**Automation Flexibility**
- High, using Chromeleon software and post-run features
### A.16 System Software

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Software</strong></td>
<td>Chromeleon Chromatography Management System or Chromeleon Xpress; validated for use with Windows Vista or Windows XP</td>
</tr>
<tr>
<td><strong>Automated Procedure Wizards</strong></td>
<td>Standard feature</td>
</tr>
<tr>
<td><strong>System Wellness and Predictive Performance</strong></td>
<td>Standard feature</td>
</tr>
<tr>
<td><strong>Data Trending Plots</strong></td>
<td>Numerical device parameters can be plotted</td>
</tr>
<tr>
<td><strong>Virtual Column Simulator</strong></td>
<td>- <strong>Evaluation mode</strong>: Standard feature</td>
</tr>
<tr>
<td></td>
<td>- <strong>Isocratic and gradient modes</strong>: Optional features</td>
</tr>
<tr>
<td><strong>Application Templates</strong></td>
<td>Standard feature</td>
</tr>
<tr>
<td><strong>Automation Support for Third-Party Vendors</strong></td>
<td>Fully controls over 300 different instruments from more than 30 manufacturers, including GC, HPLC, and MS</td>
</tr>
<tr>
<td><strong>3D Software for PDA, MS, and ED</strong></td>
<td>Optional feature</td>
</tr>
<tr>
<td><strong>Customizable System Control Panels</strong></td>
<td>Standard feature</td>
</tr>
<tr>
<td><strong>System Status Virtual Channels</strong></td>
<td>Standard feature</td>
</tr>
<tr>
<td><strong>Power Failure Protection</strong></td>
<td>Standard feature</td>
</tr>
<tr>
<td><strong>Sequential Injection</strong></td>
<td>Standard feature</td>
</tr>
<tr>
<td><strong>System Trigger Commands and Conditionals</strong></td>
<td>Standard feature</td>
</tr>
<tr>
<td><strong>Daily Audit Trail</strong></td>
<td>Standard feature</td>
</tr>
<tr>
<td>Feature</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Sample Audit Trail</td>
<td>Standard feature</td>
</tr>
<tr>
<td>Multiple Network Control</td>
<td>Optional feature</td>
</tr>
<tr>
<td>and Network Failure Protection</td>
<td></td>
</tr>
<tr>
<td>Storage of System Calibration Settings</td>
<td>Factory, current, and previous calibration values are stored; the user can reset current values to factory or previous values</td>
</tr>
<tr>
<td>Customized Reporting</td>
<td>Standard feature; unlimited report workbooks</td>
</tr>
<tr>
<td>Automated System Qualification</td>
<td>Detailed, comprehensive qualification reports</td>
</tr>
</tbody>
</table>
B • Touch Screen Operation

The LCD touch screen on the Dionex ICS-2100 front panel allows local control of most Dionex ICS-2100 functions. This chapter describes how to operate the Dionex ICS-2100 from the touch screen.

When the Dionex ICS-2100 starts up, the touch screen displays a startup page. This is followed by the INFORMATION page, which displays version and serial numbers and a list of installed options. After a few seconds, the HOME page (see Figure B-1) is displayed. The HOME page provides controls for all normal, daily operation of the Dionex ICS-2100.

B.1 Using the Touch Screen

NOTE  To adjust the screen contrast, open the front door and adjust the knurled knob under the screen (see Figure 2-8).
Edit fields and command buttons have blue text on a lightly shaded background. Fields that display status information are not shaded.

Edit fields have square corners while command buttons are rounded.

To edit a field or select a command button, touch and release the field or button with your fingertip.

NOTE When you touch a button or edit field, the action takes effect when you lift your finger. If you unintentionally touch a button or field, you can cancel the action by sliding your finger away from the button or field before lifting.

Touching a command button (for example, [Inject]) executes the command immediately.

Selecting a command button changes the button’s appearance to white text on a dark background (for example, [Inject]).

Touching an edit field (for example, [0.00 mL/min]) opens a page with a number keypad (see Figure B-2). Use the keypad to enter the desired numerical value for the field and then touch the ENTER button.

![Figure B-2. Number Keypad](image-url)
• Touching the page name (for example, \texttt{HOME}) in the bottom right corner opens a menu of pages (see Figure B-3).

\begin{figure}[h]
\centering
\includegraphics[width=0.5\textwidth]{figureB3.png}
\caption{Dionex ICS-2100 Touch Screen Menu of Pages}
\end{figure}

• Touching a page name on the menu of pages displays the selected page. For example, touching \texttt{SUPPRESSOR} displays the \texttt{SUPPRESSOR} page (see Figure B-4).

\begin{figure}[h]
\centering
\includegraphics[width=0.5\textwidth]{figureB4.png}
\caption{Suppressor Page}
\end{figure}
• Touching  returns you to the HOME page.

• Touching  opens a list of options (see Figure B-5).

![Figure B-5. Suppressor Page: Selecting an Option](image)

**B.2 Using the Touch Screen with Chromeleon**

When the Dionex ICS-2100 is connected to a Chromeleon Control panel, the status field at the bottom center of the HOME page displays Remote Mode. In this mode, most of the controls on the touch screen pages are disabled. This prevents touch screen commands from conflicting with Chromeleon commands.

In general, when the Dionex ICS-2100 is connected to Chromeleon, you can:

• View all Dionex ICS-2100 operational status information (pressure, flow rate, conductivity readings, etc.)

• Go to any of the touch screen pages

• View a plot of the conductivity data from the PLOT page and adjust the plot display using the controls on the page. See Section B.5 for details.

To restore touch screen (local) control, clear the Connected check box on the Chromeleon Control panel.
B.3 Overview of Dionex ICS-2100 Touch Screen Pages

Figure B-6 illustrates the organization of the Dionex ICS-2100 touch screen pages.

![Diagram of Dionex ICS-2100 Touch Screen Pages]

Figure B-6. Overview of Dionex ICS-2100 Touch Screen Pages
B.4 Home Page

**Pressure Display**

The HOME page indicates the current pressure reading from the pressure transducer. The pressure unit can be set to psi (the factory default), MPa, or bar (see Section B.7.1).

The minimum and maximum pressure limits are displayed below the current pressure reading. If the pressure reading goes outside these limits, the pump is stopped and an error message appears in the Chromelion Audit Trail and on the touch screen. See Section 4.2 for troubleshooting information. See Section B.7.1 for how to set the pressure limits.

*Figure B-7. Dionex ICS-2100 Touch Screen Home Page*
Flow Rate
The flow rate can be set to 0.00 (which turns off the pump) and to between 0.05 and 5.00 mL/min. The recommended operating flow rate is between 0.40 and 2.00 mL/min. Refer to the column manual for the flow rate to use with your column and application. Column manuals are included on the Thermo Scientific Reference Library DVD (P/N 053891).

Pump On/Off Control
Touching the **On** button immediately starts the pump flow at the rate displayed in the **Flow Rate** field. Touching **Off** stops the flow.

Prime
The **Prime** button is reserved for use during the pump head priming procedure. Touching the **Prime** button displays a confirmation page that reminds you to open the waste valve. Open the valve, and then touch the **OK** button to begin priming. Or, to exit the page without priming, touch the **Cancel** button. To stop priming, touch the **Off** button. During priming, the flow rate is approximately 3 mL/min. See **Section B.13** for detailed priming instructions.

Eluent Level
Use this field to monitor the amount of liquid in the eluent reservoir. When you fill the reservoir, enter the amount of liquid in the reservoir. For example, if the reservoir contains 200 mL and you add 1 liter, enter 1.2 liters. Thereafter, the Dionex ICS-2100 determines the eluent usage by monitoring the flow rate and the length of time the pump is on. The Dionex ICS-2100 updates the **Eluent Level** field as the eluent is depleted. A warning first appears if the level falls below 200 mL. Warnings are repeated at 100 mL and 0 mL.

In order for the eluent level displayed on the screen to be accurate, the level must be entered by the user when the reservoir is filled. The Dionex ICS-2100 does not automatically detect when the reservoir is filled, nor when it is empty.
B.4.2 Home Page EGC Controls

The EGC controls indicate the type and the eluent concentration of each installed EluGen Cartridge (EGC). The CR-TC field indicates whether the Continuously Regenerated Trap Column is on or off.

To determine the eluent concentration for your application, refer to the column manual. Column manuals are included on the Thermo Scientific Reference Library DVD (P/N 053891). When the Dionex ICS-2100 is controlled from the front panel, only isocratic eluent delivery is possible. With isocratic delivery, the eluent composition and concentration remain constant throughout the run. When the Dionex ICS-2100 is under Chromeleon control, gradient delivery, in which the eluent concentration changes over time, is also possible.

To set the eluent concentration or to turn on or off the CR-TC, touch the concentration button. The ELUENT GENERATOR page appears (see Section B.8).

NOTE When the EGC-2 is configured as an auxiliary power supply, the EGC-2 cartridge type field displays AUX and the EGC-2 eluent concentration field displays the actual current (in mA) of the auxiliary power supply.

B.4.3 Home Page Column Heater

The temperature of the column heater can be controlled to between 30 and 60 °C. For optimal performance, set the column heater to at least 5 °C above the ambient temperature. To set the temperature, touch the Column Heater field and enter the desired temperature on the number pad. To turn the column heater off, set the temperature to 0. The display to the right of the temperature setting indicates the heater status:

- column temperature is at equilibrium
- column temperature is rising
- column temperature is falling
- column heater is off
B.4.4 Home Page Injection Valve Controls

The **Inject** and **Load** buttons select the position of the injection valve. A dark background and white text on a button indicates the current valve position. For details about the valve positions, see Section 2.4.6.

The **ELAPSED TIME** field displays the amount of time since the last injection.

B.4.5 Home Page Detector Controls

**Conductivity Readings**

The offset conductivity is displayed in large numbers above the total conductivity. The offset conductivity is the total conductivity minus the current offset.

To determine the offset, allow the system to equilibrate after startup. At equilibration, the conductivity reading is the background conductivity (the eluent conductivity before sample injection). Touch **Autozero** to zero the conductivity and offset this background reading from the total reading.

**NOTE** You can reverse the conductivity display to show the total conductivity in large type, with the offset conductivity below it in small type. Select this option on the **MODULE SETUP** page (see Section B.12).

**Cell Heater Controls**

The temperature of the cell can be set to between 30 °C and 55 °C, but must be at least 7 °C above the ambient temperature. To set the temperature, touch the **Cell Heater** field and enter the desired temperature on the number pad.

To turn off the cell heater, set the temperature to 0. The display to the right of the temperature setting indicates the heater status:

- = cell temperature is at equilibrium
- ↑ cell temperature is rising
- ↓ cell temperature is falling
- Off cell heater is off
Suppressor Controls

The **Suppressor** controls indicate the suppressor current setting and the type of suppressor installed.

To set the suppressor type, change the current setting, or turn the suppressor on or off, touch the suppressor button. The **SUPPRESSOR** page appears (see Section B.9).

### B.4.6 Other Home Page Controls

This field displays **Remote Mode** when the Dionex ICS-2100 is connected to Chromeleon and **Local Mode** when the system is not connected to Chromeleon.

- **PLOT**
  - Opens the **PLOT** page, which provides a real-time plot of the detector conductivity output. See Section B.5 for details.

- **STATUS**
  - Opens the **STATUS** page, which displays the status of various operating parameters. See Section B.6 for details.
B.5 Plot Page

The PLOT page provides a real-time plot of the detector conductivity output. To open the page, touch the PLOT button on the HOME page, or select PLOT from the menu of pages. The page can display up to 60 minutes of data. Data older than 60 minutes is discarded. You can view the plot and adjust the display when the Dionex ICS-2100 is under either local or computer control.

![Plot Page](image)

**Figure B-8. Plot Page**

**Plot Controls**

- The **plot offset** button offsets the current background conductivity reading and sets the plot baseline to zero. Subsequent output is plotted in relation to the new zero point. Offsetting the plot does not affect the data sent to Chromeleon, the analog output, or the data displayed on other pages.

- The **range** field sets the highest conductivity reading displayed on the plot (the vertical scale). If the tops of peaks are cut off, select a higher range. If peaks are short, select a lower range. Select **Auto** to have the scaling of the signal plot automatically adjusted to the height of the signal.

- The **elapsed time** field displays the time since injection.

- The **plot time** field sets the length of time plotted on the page (the horizontal scale).
B.6 Status Page

The **STATUS** page displays the current status of various operating parameters. To open this page, touch the **STATUS** button on the **HOME** page or select **STATUS** from the menu of pages.

**Status Page Controls**

- Pressure and conductivity readings are the same as those displayed on the **HOME** page.

- The eluent bottle depicts the level of liquid in the eluent reservoir. The scale is always 0 to 4 liters (regardless of the size of reservoir installed). After filling the reservoir, go to the **HOME** page and enter the amount of liquid in the reservoir (see Section B.4.1). The Dionex ICS-2100 monitors the eluent usage, based on the flow rate and the length of time the pump is on. The “liquid” level in the bottle falls as the reservoir empties. An error message is first displayed on the screen when the level falls below 200 mL. The message is repeated at 100 mL and then at 0 mL.

In order for the eluent level displayed on the screen to be accurate, the level must be entered by the user when the reservoir is filled. The Dionex ICS-2100 does not automatically detect when the reservoir is filled, nor when it is empty.
• The fields to the right of the bottle display the status of four other operating parameters. You can choose from eight possible parameters to display here. Figure B-9 shows the default parameters: Eluent time, Flow rate, EGC conc, and Suppressor. To select different parameters, touch the Setup button. See Section B.6.1 for details about how to change the status parameters, and Section B.6.2 for a description of each parameter.

• Touching the Busy button displays the BUSY page (see Figure B-10).

![Busy Page](image)

Figure B-10. Busy Page
B.6.1 Viewing Other Status Parameters

Follow the steps below to view the status of a parameter that is not currently displayed on the STATUS page.

1. Touch the Setup button. A drop-down list replaces the label for each field, and the Setup button changes to Apply (see Figure B-11).

![Figure B-11. Status Page Setup](image-url)
2. Touch the down arrow next to the field you want to change. A list of the available status parameters appears (see Figure B-12).

![Figure B-12. Status Page Parameter List]

3. Touch the parameter you want to display.

4. When finished, touch the Apply button.

**B.6.2 Status Parameter Details**

<table>
<thead>
<tr>
<th>Status Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eluent time</td>
<td>The number of hours the eluent supply will last, if the pump runs continuously at the current flow rate.</td>
</tr>
<tr>
<td>Flow rate</td>
<td>The actual flow rate currently output by the pump.</td>
</tr>
<tr>
<td>EGC1 conc</td>
<td>The actual concentration of eluent currently being generated by the EluGen cartridge (EGC1 or EGC2).</td>
</tr>
<tr>
<td>EGC2 conc</td>
<td></td>
</tr>
<tr>
<td>AUX PS</td>
<td>The actual auxiliary power supply current in mA. This field replaces the EGC2 conc field when the EGC-2 power supply is configured as an auxiliary power supply.</td>
</tr>
<tr>
<td>Suppressor</td>
<td>The actual current applied to the suppressor.</td>
</tr>
<tr>
<td>Elapsed time</td>
<td>The number of hours since the last injection.</td>
</tr>
</tbody>
</table>
Dionex ICS-2100 Ion Chromatography System

<table>
<thead>
<tr>
<th>Status Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>EGC1 life</td>
<td>The percentage of ions remaining in the EluGen cartridge (EGC1 or EGC2). When the EGC-2 power supply is configured as an auxiliary power supply, the EGC2 life field will display N/A.</td>
</tr>
<tr>
<td>EGC2 life</td>
<td></td>
</tr>
<tr>
<td>Cell temp</td>
<td>The temperature of the cell heater (°C), followed by a status symbol (=, ↑, or ↓).</td>
</tr>
<tr>
<td>Column temp</td>
<td>The temperature of the column heater (°C), followed by a status symbol (=, ↑, or ↓).</td>
</tr>
</tbody>
</table>
B.7 Pump Page

Use the PUMP page to set parameters related to pump operation, including pressure limits, pressure unit, vacuum degas pump settings, and eluent valve control. To open this page, select PUMP from the menu of pages. The current system pressure is displayed at the top of the screen.

![Figure B-13. Dionex ICS-2100 Touch Screen Pump Page](image)

**B.7.1 Setting Pump Pressure Limits and Selecting the Pressure Unit**

The first time the power to the Dionex ICS-2100 is turned on, the maximum system pressure limit is 34.5 MPa (5000 psi) and the minimum pressure limit is 0. The eluent generator, however, requires a maximum high limit of 20.7 MPa (3000 psi) and a minimum low limit of 1.4 (200 psi). When you configure the eluent generator cartridge in Chromeleon (see Section B.8), the software sets the maximum and minimum limits for the pump automatically. If you are not using Chromeleon to control the Dionex ICS-2100, set the limits on the PUMP page.

- To change the high pressure limit, touch the HIGH field and enter the desired limit on the number pad. The high limit must be at least 0.7 MPa (100 psi) above the low limit.
To change the low pressure limit, touch the LOW field and enter the desired limit on the number pad.

To select the pressure unit for all touch screen pages that display pressure values, touch the pressure unit field and select the desired unit on the list (PSI, bar, or MPa) (see Figure B-14).

![Figure B-14. Pump Page: Selecting the Pressure Unit](image)

**B.7.2 Setting Degas Operating Parameters (Optional)**

By default, the Dionex ICS-2100 monitors the degas pressure reading and turns the degas pump on and off as required. To change the degas operating option:

1. Select PUMP from the menu of pages.
2. Under Degas Settings, touch the options drop-down list. A list of available options appears (see Figure B-15).

![Figure B-15. Pump Page: Selecting Degas Options](image)

**NOTE** Degas options can also be selected from the Chromelion Server Configuration program (see Section 2.4.1).
3. Select the desired option:

**Always Off**: The degas pump is always off.

**Always On**: The degas pump is always on. This setting is reserved for test purposes by a Thermo Fisher Scientific Service Representative.

**Duty Cycle**: The degas pump cycles on and off according to the times specified in the **Duty Cycle** and **Time Off** fields. **Duty Cycle** specifies for how long the degas pump runs during a cycle; **Time Off** specifies the time between cycles.

**Monitor**: The Dionex ICS-2100 monitors the degas pressure reading and turns the degas pump on and off as required.

**B.7.3 Controlling the Eluent Valve**

The eluent valve controls flow from the eluent reservoir. During routine operation, the valve opens and closes automatically when the pump flow is turned on and off. However, during eluent line priming, you can use the controls on the **PUMP** page to manually open the valve, allowing liquid to flow through the lines when the pump is off. See **Section B.13.2** for eluent line priming instructions.
B.8 Eluent Generator Page

Use the **ELUENT GENERATOR** page to set the eluent concentration of each installed EluGen cartridge (EGC). You can also enter the serial number and view the expiration date and remaining life of each cartridge. This page also provides on/off control of a Continuously Regenerated Trap Column (CR-TC). To open the page, touch the **EGC** button on the **HOME** page or select **EGC** from the menu of pages.

![Figure B-16. Eluent Generator Page](image)

**B.8.1 EGC Serial Number**

The **Serial Number** field displays the serial number of the EluGen cartridge currently installed. After installing a new EluGen cartridge, enter the cartridge serial number. If you use Chromeleon to control the Dionex ICS-2100, enter the serial number in the Chromeleon Server Configuration, not on the **ELUENT GENERATOR** page. If you enter the serial number first in Chromeleon, the number is displayed on the **ELUENT GENERATOR** page. However, if you enter the serial number on the **ELUENT GENERATOR** page, it will not be available in Chromeleon.

If the Dionex ICS-2100 is not under Chromeleon control, enter the cartridge serial number by touching the **Serial Number** field on the
ELUENT GENERATOR page (see Figure B-16) and entering the serial number on the keypad.

If you are reinstalling a cartridge that was used previously, touch the down arrow instead of the number field. A list of the last five entered serial numbers drops down. Choose the serial number of the cartridge from the list.

NOTE When the EGC-2 power supply is configured as an auxiliary power supply, the EGC-2 Serial Number field displays None.

B.8.2 Setting the Eluent Concentration

To set the concentration of eluent to be generated, touch the Setpoint field and enter the concentration on the keypad. If the Dionex ICS-2100 power is turned off, the setpoint value is restored when the power is turned on again. The Actual Concentration field displays the concentration of eluent currently being generated.

The suppressor type, EGC type, and flow rate determine the maximum eluent concentration for a particular application. To determine the eluent concentration for your application, refer to the column manual. Column manuals are included on the Thermo Scientific Reference Library DVD (P/N 053891).

If a K$_2$CO$_3$ EluGen cartridge and an EPM Electrolytic pH Modifier are installed (connected to EGC-1 and EGC-2, respectively), set EGC-1 to the concentration of K$_2$CO$_3$ required for your application and set EGC-2 to the concentration of KHCO$_3$ required. When the eluent is generated, the EGC-1 Actual Concentration field displays the total of the two setpoint concentrations. This is the actual concentration of K$_2$CO$_3$ that the cartridge must generate in order to achieve the desired K$_2$CO$_3$/KHCO$_3$ eluent mixture.

For example, for a 3.50 mM K$_2$CO$_3$/1.00 mM KHCO$_3$ eluent, set EGC-1 to 3.50 mM and EGC-2 to 1.00 mM. When the eluent is generated, the EGC-1 Actual Concentration field will display 4.50 mM.

NOTE When the EGC-2 power supply is configured as an auxiliary power supply, the EGC-2 Setpoint and Actual Concentration fields display zeros.
B.8.3 Controlling the Eluent Generator Power

- To manually control the eluent generator power, touch the EGC Off and On buttons on the ELUENT GENERATOR page.

- To automatically control the eluent generator power simultaneously with the pump flow, select Auto turn on with pump.

  NOTE The eluent generator power always turns off when the pump is off, regardless of whether the “Automatically turn on with pump” option is selected.

  NOTE When the EGC-2 power supply is configured as an auxiliary power supply, the EGC-2 Off and On buttons are not functional and the field always displays Off.

- To automatically control the auxiliary power supply simultaneously with the pump flow, select Auto turn on with pump for the EGC-2 and configure a TTL output for control of this function.

B.8.4 Monitoring the EluGen Cartridge Life

- The Expiration Date displayed on the ELUENT GENERATOR page is 2 years from the date of manufacture. Although you can continue operation with the cartridge after the expiration date, performance may be impaired until a new cartridge is installed.

  NOTE When the EGC-2 power supply is configured as an auxiliary power supply, the EGC-2 Expiration Date field is blank.

- Life Remaining (displayed when an EluGen cartridge is installed) indicates the percentage of ions remaining in the cartridge. The ion percentage is counted down in 1% increments. Warning messages are displayed in the Chromeleon Audit Trail when the percentage falls below 30%. At 0%, an error message informs you that the ion count is depleted and the cartridge must be replaced before continuing operation.
NOTE  When the EGC-2 power supply is configured as an auxiliary power supply, the EGC-2 Life Remaining field is blank.

- **Normalized Life Used** (displayed when an EPM is installed) indicates how much the EPM has been used. The value starts at 0 and counts up with use. A count of 1 means the EPM usage is approximately equal to the lifetime of one K₂CO₃ cartridge.

### B.8.5 Controlling the CR-TC Power

- To manually control the CR-TC power, touch the **CR-TC Off** and **On** buttons on the **ELUENT GENERATOR** page (see Figure B-17).

- To automatically control the CR-TC power simultaneously with the pump flow, select **Auto turn on with pump**.

**NOTE**  The CR-TC power always turns off when the pump is off, regardless of whether the “Automatically turn on with pump” option is selected.

*Figure B-17. Eluent Generator Page: CR-TC Controls*
B.9 Suppressor Page

Use the **SUPPRESSOR** page to specify the type of suppressor installed in the Dionex ICS-2100, turn the suppressor on and off, and select the amount of current supplied to the suppressor. To open this page, touch the suppressor button on the HOME page, or select SUPPRESSOR from the menu of pages.

![Suppressor Page](image)

**Figure B-18. Suppressor Page**

**Suppressor Controls**

- The suppressor type is typically selected at initial installation and does not need to be changed. However, if a different type of suppressor is installed later (or if the suppressor is removed from the system), touch the **Type** field and select the new suppressor type (**None/MMS**, **SRS**, or **AES**) from the list.

- To set the current, touch the **Current** field and enter the desired setting (in milliamperes) on the number pad.

The appropriate suppressor current setting depends on several variables: the suppressor type, the column, the eluent, and the flow rate. Refer to the suppressor manual for the recommended current setting for your application. The suppressor manuals are included on the Thermo Scientific Reference Library DVD (P/N 053891).
NOTE When Chromeleon is used to control the Dionex ICS-2100, the Program Wizard automatically calculates the current required for the application.

- To manually control the suppressor power, touch the **Off** and **On** buttons.
- To automatically control the suppressor power simultaneously with the pump flow, select **Automatically turn on with pump**.

NOTE The suppressor always turns off when the pump is off, regardless of whether the “Automatically turn on with pump” option is selected.

**B.10 Detector Page**

Use the **DETECTOR** page to set the data rise time and to select parameters for adjusting the analog output. To open this page, select **DETECTOR** from the menu of pages.

![Detector Page](image)

*Figure B-19. Detector Page*
B.10.1 Setting the Data Rise Time

The data rise time determines the amount of filtering performed on the conductivity data. The rise time is a measure of how quickly the detector responds to a change in signal, and is defined as the time it takes the output signal to rise from 10% of its final value to 90% of its final value.

The selected data rise time is used to filter both the digital data output, which is sent to the computer and the PLOT page, and the analog data output. The default rise time is 2 seconds.

Choosing an appropriate rise time value can optimize performance by keeping the signal-to-noise ratio at a minimum level. A longer rise time allows averaging of the noise frequencies, and subsequently, the baseline will contain much less short-term noise. However, longer rise times may have the following effects on peaks:

- Peak shape will become asymmetric.
- The peak maximum will be shifted.
- The peak height will be reduced.

The rise time should be approximately 25% of the peak width at one-half the height of the narrowest peak of interest.

For example, for a peak width of 5 seconds, calculate the rise time as: (5 sec) 25% = 1.25 sec. Because 1.25 seconds is not one of the available settings for rise time, select the next fastest rise time, 1 second.

To set the data rise time, touch the Data Rise Time field and select the desired time from the list (see Figure B-19).

B.10.2 Selecting the Conductivity Polarity

To change the polarity of the conductivity data, touch the Conductivity Polarity field. Select either Normal or Inverted. In applications in which the analyte output is lower than the background conductance, the polarity must be inverted to have peaks instead of dips on the chromatogram.
B.10.3 Setting Analog Out Options

The analog output connector on the Dionex ICS-2100 rear panel outputs an analog voltage signal proportional to the conductivity measured by the cell. The output is filtered using the selected data rise time (see Section B.10.1). The analog output can be connected to an analog-to-digital converter device, such as an integrator or a chart recorder.

The **Analog Out** options on the **DETECTOR** page (see **Figure B-19**) let you configure the output for your application.

- **Output**: Select **Normal** to output a signal corresponding to the offset conductivity reading from the detector (see “Conductivity Readings” on page 215) and the selected **Analog Out** parameters. Use the other two settings to calibrate an analog-to-digital converter device. Select **Zero** to set the output signal to zero volts. Select **Full Scale** to set the output signal to the full-scale voltage (1000 mV).

- **% Offset**: To adjust the zero position of the analog output when it is plotted, enter a percentage in the **% Offset** field. The value entered is a percentage of the full-scale analog output. An offset allows a recording device to plot the signal if it becomes negative. The offset percentage does not affect the magnitude of the output signal.

- **Polarity**: Select the polarity of the analog output signal: positive (the default settings) or negative. In applications in which the analyte output is lower than the background conductance, the polarity must be negative to have peaks instead of dips on the chromatogram.

- **Range**: Select the range in microSiemens (μS) of a full-scale detector response. For the Dionex ICS-2100, the full-scale voltage is 1000 mV. For example, if the range is 100 μS, then 1 μS is equal to 10 mV from the analog output. The range to use depends on the conductivity readings expected for the application.
B.11 Information Page

The INFORMATION page displays the version numbers of the Dionex ICS-2100 control programs (Moduleware and Boot Block), the serial number of the Dionex ICS-2100, and the options that are installed in the Dionex ICS-2100. The INFORMATION page is displayed at start-up. You can open the page from the menu of pages at any time.

Moduleware is the firmware program installed in the Dionex ICS-2100 that controls instrument functions. Moduleware also sends status information and data to Chromeleon and receives control parameters from Chromeleon.

The Boot Block is the first program to be executed when the Dionex ICS-2100 power is turned on. It starts the Moduleware program.
B.12 Module Setup Page

The **MODULE SETUP** page lets you select options for the touch screen display and conductivity readings. To open this page, select **SETUP** from the menu of pages.

**Module Setup Options**

- **Backlight Duration**: Select **2-hour time-out** to turn off the backlight after 2 hours if the touch screen is not used during that time. Select **Always On** to have the backlight remain on continuously.

- **Screen Time-out**: If the touch screen is not used during the selected time-out, the display will change to show the screen selected from the list. For example, if you select **5 min** and **BUSY**, the display will change to the **BUSY** page (see Figure B-10) 5 minutes after the last time the touch screen was used. Select **Never** to always display the page that was used last.

- **Conductivity Display**: Select either **Offset** (the default setting) or **Total** as the primary conductivity display value. The selected value is shown in large bold type on the **HOME** and **STATUS** screens, with the other value in smaller type.
B.13 Input/Output Page

The INPUT/OUTPUT page provides control of the Dionex ICS-2100 TTL inputs and TTL and relay outputs. To open this page, select INPUT/OUTPUT from the menu of pages. For details about relay and TTL control, see Appendix C.

![Input/Output Page](image)

Figure B-22. Input/Output Page

B.14 Diagnostic and Calibration Pages

Diagnostic and calibration functions can be performed either from the touch screen diagnostic and calibration pages or from the Chromeleon Wellness Panel. To open a touch screen diagnostic or calibration page, select DIAGNOSTIC from the menu of pages. The DIAGNOSTIC page opens (see Figure B-23). From there, you can select the type of diagnostic or calibration to perform.

For detailed instructions on how to perform the various calibration and diagnostic procedures, see Section 5.1.
NOTE When the EGC-2 power supply is configured as an auxiliary power supply, pressing the **EGC2 Verification** button has no effect.

NOTE The **Service** button provides access to service functions that are performed only by Thermo Fisher Scientific personnel. An access code is required to go to the service pages.
C • TTL and Relay Control

C.1 TTL and Relay Connections

A 12-pin connector strip for TTL/relay control is located on the Dionex ICS-2100 rear panel. The connector provides two relay outputs, two TTL outputs, and four TTL inputs (see Figure C-1).

<table>
<thead>
<tr>
<th>Pin Function</th>
<th>Connector Position</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RELAY OUT</td>
<td>1</td>
<td>Solid State Relay Contacts Output</td>
</tr>
<tr>
<td>TTL OUT (+)</td>
<td>2</td>
<td>Solid State Relay Contacts Output</td>
</tr>
<tr>
<td>TTL IN (+)</td>
<td>3</td>
<td>TTL Output 1 (1 kΩ pull up to +5, 100 mA sink)</td>
</tr>
<tr>
<td>TTL IN (-)</td>
<td>4</td>
<td>TTL Output 2 (1 kΩ pull up to +5, 100 mA sink)</td>
</tr>
<tr>
<td>TTL GND (-)</td>
<td>1</td>
<td>TTL Input 1 — Inject/Load</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>TTL Input 2 — Autozero</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>TTL Input 3 — Pump/Suppressor On</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>TTL Input 4 — Mark</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>Ground</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>Ground</td>
</tr>
</tbody>
</table>

*Note: The TTL input functions can be reassigned to different inputs.*

**Figure C-1. TTL and Relay Connector on Rear Panel**

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

**NOTE** TTL 1 Input - Inject/Load applies only to the injection valve (not to the auxiliary valve, if installed).
Dionex ICS-2100 Ion Chromatography System

The outputs can be used to control functions in external devices such as an autosampler or another Dionex module. When connected to a controlling device, the inputs can be programmed to perform the following Dionex ICS-2100 functions:

- Switch the injection valve position (load/inject)
- Perform an autozero command (set the conductivity to zero)
- Turn the pump on and off (also turns the suppressor on and off)
- Automatically turn on the optional auxiliary power supply simultaneously with the pump flow
- Send a chart mark signal to the analog output. The mark is 10% of the full-scale voltage, and the duration is 0.5 seconds. A mark can be used, for example, to indicate the injection.

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.

Connecting a TTL or Relay

1. Locate the twisted pair of wires (P/N 043598) and the 12-position connector plug (P/N 923687) (see Figure C-2) in the Dionex ICS-2100 Ship Kit (P/N 064375).

2. Follow these basic steps to connect the TTL or relays.

   a. For each relay or TTL to be used, connect an active wire (red) and a ground wire (black) to the 12-position connector plug at the appropriate pin locations. Refer to Figure C-1 or the label on the Dionex ICS-2100 rear panel for the connector pin assignments.

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

b. Plug the connector into the 12-pin connector on the Dionex ICS-2100 rear panel.

c. Connect the wires from the Dionex ICS-2100 connector plug to the TTL or relay connector pins on the other module(s). Additional connector plugs are provided with other Dionex modules.

**NOTE** Check the polarity of each connection. Connect signal wires to signal (+) pins and ground wires to ground (-) pins.

3. If you connected a TTL input, verify that the correct function is assigned to the input and that the correct input control type is selected. Select different settings, if necessary. Input functions and control types are assigned from either the INPUT/OUTPUT touch screen page or Chromeleon (see Section C.1.1).
C.1.1 Selecting TTL Input Functions and Control Types

To select TTL input functions and the control type from Chromeleon, open the Chromeleon Server Configuration program and double-click the Dionex ICS-2100 icon under the timebase. Select the TTL Inputs tab (see Figure C-3).

![Dionex ICS-2100 Server Configuration Properties: TTL Inputs](image)

Figure C-3. Dionex ICS-2100 Server Configuration Properties: TTL Inputs
To select TTL input functions and the control type from the touch screen, go to the INPUT/OUTPUT touch screen page (see Figure C-4).

**TTL Input Control Types**

The Dionex ICS-2100 TTL inputs respond to four types of signals to accommodate different controlling devices. The default control type, **Normal Edge**, is compatible with the output signals provided by Dionex modules.

If the device connected to the Dionex ICS-2100 does not send a normal edge signal, select the appropriate control type. Refer to the documentation provided with the controlling device and the information below to select the correct type.

- **Normal Edge**: In normal edge operation, the negative (falling) edge of a signal turns on the function. For example, for the **Load/Inject** function, the negative edge switches the injection valve position to Load.
The action of the positive (rising) edge depends on the function: For the **Load/Inject** function, the rising edge switches the injection valve to the Inject position. For the **Pump On** function, the rising edge turns off the pump (and suppressor). For **Autozero** and **Mark**, the rising edge has no effect.

- **Inverted Edge**: The inverted edge mode works identically to the normal edge mode except that the positive and negative edges are reversed in function.

- **Normal Pulse**: In normal pulse operation, the negative (falling) edge of the TTL signal is the active edge and the positive (rising) edge is ignored.

  A pulse width of 50 ms or more is guaranteed to be detected. A pulse width of 4 ms or less is guaranteed to be ignored. The action for pulse widths that are greater than 4 ms and less than 50 ms is undefined.

- **Inverted Pulse**: The inverted pulse mode operates identically to the normal pulse mode except that the positive and negative edges are reversed in function.
C.2 Controlling TTL and Relay Outputs

The Dionex ICS-2100 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 volts. Setting a TTL output to 0 volts turns on the action in the connected device.

The TTL and relay output states can be controlled from Chromeleon, either by issuing direct control commands from the Chromeleon Control panel or by including the commands in a control program.

To control the TTL and relay output states from the touch screen, select **INPUT/OUTPUT** from the menu of pages. The **INPUT/OUTPUT** page appears (see Figure C-4).

- To set a relay, touch the relay field and select the desired state (Open or Closed). For example, if Relay 1 is connected to the Load input on the autosampler, touch the Relay 1 field and select Closed to start the load cycle.
- To set a TTL outputs, touch the TTL field and select the desired state (5 Volts or 0 Volts).
C.3 Example Setup for Stand-Alone Operation

This section describes an example setup for \textit{stand-alone operation} (operation without Chromeleon software) with a Dionex AS Autosampler and a third-party analog-to-digital converter and controller. If your configuration includes different devices, use the following steps as guidelines and refer to your product documentation for specific connection details.

Connect the Dionex AS Autosampler

Follow the instructions in the Dionex ICS-2100 installation instructions to connect the Dionex AS Autosampler to the Dionex ICS-2100 injection valve.

Connect the TTLs and Relays

1. Locate two twisted pairs of wires (P/N 043598) and 12-position connector plugs (P/N 923686) (see Figure C-5) in the Dionex ICS-2100 and Dionex AS Ship Kits.

2. Attach the wires to the connector plug positions indicated in Figure C-6.

To attach a wire to a connector plug, strip the ends of the wire, insert into the desired connector position, and tighten the locking screw with a screwdriver.

\textbf{IMPORTANT} When attaching wires to the connector plug, be careful not to allow stray strands of wire to short to the adjoining position on the connector.

3. Plug the connector plugs into their respective TTL/Relay connectors on the rear panel of each module.

Make sure the red wires connect to active (+) pins on each module and the black wires connect to ground (–) pins.
Figure C-6. Example Connections for Stand-Alone Operation

**ICS-2100 Rear Panel Connections**

- **ANALOG OUTPUT**: red pos. 7,8,9
- **RELAY OUT**: red: pos. 7,8,9
- **TTL OUT (+)**: red pos. 1,3,5,6
- **TTL IN (+)**: black: pos. 11,12,12
- **TTL GND (-)**: black pos. 11,12,12

**AS Rear Panel Connections**

- **TTL 2 OUT (+)**
- **TTL 1 OUT (+)**
- **RLY 2 OUT**
- **RLY 1 OUT**
- **TTL IN (+)**
- **TTL 2 IN (+)**
- **TTL 3 IN (+)**
- **TTL 4 IN (+)**
- **TTL IN/OUT (-)**

**System Function**

<table>
<thead>
<tr>
<th>System Function</th>
<th>Connection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inject</td>
<td>AS TTL Out 1 to ICS-2100 TTL In 1</td>
</tr>
<tr>
<td>Autozero</td>
<td>AS TTL Out 2 to ICS-2100 TTL In 2</td>
</tr>
<tr>
<td>Pump On/Off</td>
<td>AS RLY Out 2 to ICS-2100 TTL In 3</td>
</tr>
<tr>
<td>Start Data Acquisition</td>
<td>AS RLY Out 1 to Third-party DAC RLY In</td>
</tr>
<tr>
<td>Start/Continue Schedule</td>
<td>Third-party ADC RLY OUT to AS TTL In 2</td>
</tr>
</tbody>
</table>

**ICS-2100 TTL Inputs**

- TTL IN 1 = Inject
- TTL IN 2 = Autozero
- TTL IN 3 = Pump On/Off
- TTL IN 4 = Mark

**AS TTL Inputs**

- TTL IN 1 = (unassigned)
- TTL IN 2 = Start/Continue Schedule
- TTL IN 3 = Tray/Temp. On/Off
- TTL IN 4 = Therm. Compart. On/Off
Assign Dionex ICS-2100 Input Functions

Go to the Dionex ICS-2100 INPUT/OUTPUT touch screen page and verify that the Inject function is assigned to TTL input 1, that Autozero is assigned to TTL input 2, and that the TTL Input Control Type is Normal Edge (see Figure C-7).

![Input/Output Page](image)

Enable Dionex AS Control of the Injection Valve

1. On the Dionex AS front panel, press Menu and 0 to go to the TIME FUNCTION OUT screen. In the LOAD/INJECT VALVE: TTL 1 field, select ENABLED.

![Dionex AS Time Function Out Screen](image)

2. Turn the Dionex AS power off and then back on.

You can now issue commands from the Dionex AS to switch the Dionex ICS-2100 injection valve position.
Connect the Analog Output

1. Locate the analog cable for the third-party analog-to-digital converter and controller.

2. Connect the analog input connector on the third-party controller to the ANALOG OUTPUT connector on the Dionex ICS-2100 rear panel (see Figure C-6).

Configure the Dionex ICS-2100 Analog Output

Go to the Dionex ICS-2100 DETECTOR touch screen page and select the settings shown in Figure C-9:

![Detector Page](image)

*Figure C-9. Detector Page*
Create a Dionex AS Method and Schedule

Figure C-10 is an example of Dionex AS method timed events that can be used with the TTL/Relay connections shown in Figure C-6.

<table>
<thead>
<tr>
<th>TIME</th>
<th>VALVE</th>
<th>CSV</th>
<th>TTL1</th>
<th>TTL2</th>
<th>RLY1</th>
<th>RLY2</th>
</tr>
</thead>
<tbody>
<tr>
<td>INIT</td>
<td>LOAD</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.00</td>
<td>INJECT</td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>0.50</td>
<td></td>
<td></td>
<td></td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

**Timed Event Notes:**

- At time INIT, the injection valve is set to Load.
- At time 0.00, the injection valve is set to Inject, an autozero is performed (TTL2=1), the data acquisition mark is sent (RLY1=1), and the pump is turned on (RLY2=1).
- At time 0.5, TTL2 and RLY1 are switched back to 0 to be ready for the next run. RLY2 remains at 1 to keep the pump on.
- TTL1 does not need to be set in the timed events because the Load and Inject commands control the Dionex ICS-2100 injection valve automatically (see “Enable Dionex AS Control of the Injection Valve” on page 248).

To run the above method, set up a Dionex AS schedule. The example in Figure C-11 includes a four-point calibration (Lines 1–4) followed by two samples (Lines 5 and 6).
# D • Reordering Information

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Reservoirs</strong></td>
<td></td>
</tr>
<tr>
<td>046548</td>
<td>2-L plastic reservoir assembly (includes stopper and cap)</td>
</tr>
<tr>
<td>039164</td>
<td>4-L plastic reservoir assembly (includes stopper and cap)</td>
</tr>
<tr>
<td><strong>Pump</strong></td>
<td></td>
</tr>
<tr>
<td>057937</td>
<td>Primary pump head assembly</td>
</tr>
<tr>
<td>057938</td>
<td>Secondary pump head assembly</td>
</tr>
<tr>
<td>045721</td>
<td>Outlet check valve assembly, 10-32</td>
</tr>
<tr>
<td>045722</td>
<td>Inlet check valve assembly, 1/4-28</td>
</tr>
<tr>
<td>045994</td>
<td>Check valve cartridges</td>
</tr>
<tr>
<td>052840</td>
<td>Piston</td>
</tr>
<tr>
<td>055870</td>
<td>Piston seal</td>
</tr>
<tr>
<td>048722</td>
<td>Piston rinse seal</td>
</tr>
<tr>
<td>055752</td>
<td>O-ring for waste valve or priming valve</td>
</tr>
<tr>
<td>057945</td>
<td>Eluent valve</td>
</tr>
<tr>
<td>079803</td>
<td>10 mL syringe (for priming eluent lines)</td>
</tr>
<tr>
<td><strong>Eluent Generator</strong></td>
<td></td>
</tr>
<tr>
<td>058904</td>
<td>EGC II K$_2$CO$_3$ EluGen Cartridge</td>
</tr>
<tr>
<td>058900</td>
<td>EGC II KOH EluGen Cartridge</td>
</tr>
<tr>
<td>058906</td>
<td>EGC II LiOH EluGen Cartridge</td>
</tr>
<tr>
<td>058902</td>
<td>EGC II MSA EluGen Cartridge</td>
</tr>
<tr>
<td>058908</td>
<td>EGC II NaOH EluGen Cartridge</td>
</tr>
<tr>
<td>060477</td>
<td>CR-ATC (Anion Continuously Regenerated Trap Column)</td>
</tr>
<tr>
<td>060478</td>
<td>CR-CTC (Cation Continuously Regenerated Trap Column)</td>
</tr>
<tr>
<td>063175</td>
<td>EPM Electrolytic pH Modifier</td>
</tr>
<tr>
<td>079943</td>
<td>EGC CO$_3$ Mixer (for 4-mm columns)</td>
</tr>
<tr>
<td>063443</td>
<td>EGC CO$_3$ Mixer (for 2-mm columns)</td>
</tr>
</tbody>
</table>
## Part Number | Item
---|---
058069 | EGC holder and degas assembly

### Sample Loop and Injection Valve

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>042857</td>
<td>25-μL sample loop</td>
</tr>
<tr>
<td>057968</td>
<td>Injection valve</td>
</tr>
<tr>
<td>024305</td>
<td>Luer adapter fitting, 1/4-28 (for manual injections)</td>
</tr>
<tr>
<td>016388</td>
<td>1-mL syringe (for manual injections)</td>
</tr>
<tr>
<td>057896</td>
<td>Injection Valve Rebuild Kit</td>
</tr>
</tbody>
</table>

### Auxiliary Valve

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>069472</td>
<td>Auxiliary Valve Kit (6-port valve)</td>
</tr>
<tr>
<td>069473</td>
<td>Auxiliary Valve Kit (10-port valve)</td>
</tr>
<tr>
<td>057896</td>
<td>Injection Valve Rebuild Kit (for use with auxiliary valve, also)</td>
</tr>
<tr>
<td>061947</td>
<td>Auxiliary valve pod assembly (6-port valve)</td>
</tr>
<tr>
<td>061948</td>
<td>Auxiliary valve pod assembly (10-port valve)</td>
</tr>
</tbody>
</table>

### Suppressors, Cell, and Column Heater

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>056116</td>
<td>Dionex AAES Anion Atlas Electrolytic Suppressor</td>
</tr>
<tr>
<td>056118</td>
<td>Dionex CAES Cation Atlas Electrolytic Suppressor</td>
</tr>
<tr>
<td>064554</td>
<td>Dionex ASRS 300 4-mm Anion Self-Regenerating Suppressor</td>
</tr>
<tr>
<td>064556</td>
<td>Dionex CSRS 300 4-mm Cation Self-Regenerating Suppressor</td>
</tr>
<tr>
<td>064555</td>
<td>Dionex ASRS 300 2-mm Anion Self-Regenerating Suppressor</td>
</tr>
<tr>
<td>064557</td>
<td>Dionex CSRS 300 2-mm Cation Self-Regenerating Suppressor</td>
</tr>
<tr>
<td>057985</td>
<td>Dionex DS6 heated conductivity cell</td>
</tr>
<tr>
<td>069564</td>
<td>Column heater assembly</td>
</tr>
<tr>
<td>059979</td>
<td>Column heater heat exchanger, 0.25-mm (0.010-in) ID tubing</td>
</tr>
<tr>
<td>060943</td>
<td>Column heater heat exchanger, 0.125-mm (0.005-in) ID tubing (for use with 2-mm columns)</td>
</tr>
<tr>
<td>079910</td>
<td>Column heater cover assembly</td>
</tr>
<tr>
<td>052324</td>
<td>Microbore tubing kit</td>
</tr>
</tbody>
</table>

### Relay/TTL

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>923686</td>
<td>12-position connector plug</td>
</tr>
</tbody>
</table>
### D • Reordering Information

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>043598</td>
<td>Twisted pair of wires</td>
</tr>
<tr>
<td></td>
<td><strong>Miscellaneous</strong></td>
</tr>
<tr>
<td>954745</td>
<td>IEC 127 fast-blow fuses, rated 3.15 amps</td>
</tr>
<tr>
<td>060494</td>
<td>USB cable, 5 m (16 ft)</td>
</tr>
<tr>
<td>060392</td>
<td>External USB hub</td>
</tr>
<tr>
<td></td>
<td><strong>Preventive Maintenance Kits</strong></td>
</tr>
<tr>
<td>057954</td>
<td>Dionex ICS-2100 Preventive Maintenance Kit</td>
</tr>
<tr>
<td>060581</td>
<td>Dionex AS Preventive Maintenance Kit</td>
</tr>
<tr>
<td>055647</td>
<td>Dionex AS-DV Preventive Maintenance Kit</td>
</tr>
</tbody>
</table>
E.1 How do I hook up an autosampler?

For instructions on how to connect the Dionex ICS-2100 to an autosampler, refer to the Dionex ICS-2100 installation instructions. Also refer to the autosampler operator’s manuals, which are included on the Thermo Scientific Reference Library DVD (P/N 053891).

E.2 How do I print?

Click the Print toolbar button in Chromeleon.

E.3 Why are the retention times moving?

Retention times can shift if the pump flow is erratic or if the column or eluent is contaminated. See Section 4.7 for pump flow rate troubleshooting. If a contaminated column is suspected, clean the column as instructed in the column manual. The column manual is included on the Thermo Scientific Reference Library DVD (P/N 053891).

E.4 How do I adjust retention times?

Retention times are calculated during calibration. The Use Recently Detected Retention Time parameter in the Chromeleon QNT Editor (General tab) can be used to compensate for some types of retention time drifts; for example, evaporation of volatile components in pre-mixed solvents or an aging column. Refer to the Chromeleon Help or user’s manual for details.

E.5 When should I remake standards?

Standards are used only for calibration and should always be made fresh (they have a lifetime of only one week).
E.6 When should I replace the eluent generator cartridge?

The Dionex ICS-2100 monitors EluGen cartridge use and displays a message when it is time to replace the cartridge. The message appears on the front panel screen and in the Chromeleon Audit Trail. To view the remaining cartridge life, click EG Settings on the Chromeleon Control panel, or go to the touch screen ELUENT GENERATOR page (see Section B.8).

E.7 How do I start Chromeleon?

Click Start on the Windows taskbar, and then select All Programs > Chromeleon > Chromeleon.

E.8 How do I delete data?

In the Chromeleon Browser, highlight the sequence you want to delete and then select File > Delete.

E.9 How do I back up data?

In Chromeleon, select File > Export/Backup. Back up the data and indicate the backup source.

E.10 How do I shut off the system?

In Chromeleon, click the System Shutdown button on the Dionex ICS-2100 Control panel. On the instrument, turn off the power switch on the rear panel (see Figure 2-9).

E.11 How do I store columns?

Columns should be stored in eluent. See the column manual for complete instructions. The column manual is included on the Thermo Scientific Reference Library DVD (P/N 053891).
E.12 How do I know when a column is dirty?

See the troubleshooting section of the column manual.

E.13 How do I clean a column?

See the troubleshooting section of the column manual.

E.14 Why is the conductivity high?

Possible reasons for high conductivity include:

- The suppressor is not on. Turn on the suppressor from the Chromeleon Control panel or the Dionex ICS-2100 touch screen SUPPRESSOR page.
- The suppressor needs regeneration. See the suppressor manual for troubleshooting information. The suppressor manual is included on the Thermo Scientific Reference Library DVD (P/N 053891).
- The cell is out of calibration. See Section 5.1.3 for calibration instructions.
- See Section 4.13 for additional troubleshooting information.

E.15 How do I configure and operate the auxiliary valve?

See Installing the ICS-1100/ICS-1600/ICS-2100 Auxiliary Valve (Document No. 065288), provided in the Auxiliary Valve Kit.
Analytical Column
Synonymous with Separator Column.

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

\[ k = \frac{\kappa}{G} \]

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

\[ k = \frac{l}{A} \]

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

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

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

\[ N = 5.54\left(\frac{t_1}{W_{1/2}}\right)^2 \]

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:

\[ a = \frac{(t_2 - t_0)}{(t_1 - t_0)} \]

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 (e.g., Na\(^+\)) may be the counterion of a Cl\(^-\) analyte. These ions preserve electrical neutrality in solution.

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

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

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

**HETP (H)**
Height Equivalent to a Theoretical Plate. A measure of column efficiency which allows comparison between columns of different lengths.

\[
\text{HETP} = H = \frac{L}{N}
\]

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

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

**Ion-Exchange Resin**
An insoluble polymer matrix containing fixed-charge exchange sites (anionic or cationic). IC resins are formed into small spherical particles (beads).
Packing
The material that fills a chromatographic column; usually a resin or silica-based material.

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

Pre-Column
Synonymous with Guard Column.

Regenerant
A dilute acid or base that converts ion exchange sites in a MicroMembraneSuppressor back to the form that suppresses the eluent conductivity.

Resin
See Ion-Exchange Resin.

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

\[ R = \frac{2(t_2 - t_1)}{(W_2 + W_1)} \]

Where: \( t_1 \) and \( t_2 \) = the retention times of components 1 and 2, respectively
\( W_1 \) and \( W_1 \) = the baseline width of peaks 1 and 2, respectively (measured in the same units as the retention time)

R is proportional to the square root of efficiency (N). A value of \( R = 1.5 \) represents “baseline separation” of the two peaks.

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

Separator Column
The column used to perform a chromatographic separation; also called an analytical column.
Siemens (S)
Unit measure of conductance; the reciprocal of the electrical resistance of a solution.

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

Temperature Coefficient
The percent 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, as well as between the column and the detector cell. Unretained components are eluted in the void volume.
Symbols
% Offset (analog out), 233

A
Adjusting the contrast, 12, 207
Air particulate samples, 61
Alarm conditions, 74 – 85
   See also Error messages
Ambient temperature, 96
Analog output, 231, 233, 240
   % Offset, 233
   Configuring, 233, 249
   Connections, 249
   Connector, 21
   Full-scale, 233
   Range, 233
Analog-to-digital controller, 249
Anion separations, 37, 60
Application Wizard, 67
AS Autosampler, 62
   Connections for stand-alone operation, 246
   Enabling injection valve control, 248
   Maintenance, yearly, 69
   Method for stand-alone operation, 250
   Sample injection, 64
   Schedule for stand-alone operation, 250
   Time Function Out screen, 248
AS-DV Autosampler, 62
   Maintenance, yearly, 69
   Sample injection, 64
AS-HV Autosampler, 63
Atlas Electrolytic Suppressor, 20
   See also Suppressor
Audit Trail
   Error messages, 71
   Icons, 71

Autosampler
   Loading samples with, 64
   See also AS Autosampler
   See also AS-DV Autosampler
Autosampler Control panel, 31
Autosampler specifications
   Automated dilution, 203
   Automation, 203
   Automation flexibility, 203
   Online filtration, 203
   Online sample degassing, 203
   Semiautomated system qualification, 203
   Sequential/Simultaneous injection, 203
Autozero, 59, 66, 215
Auxiliary power supply, 42
   Connection to system, 16
   Home page control, 214
   Specifications, 202
Auxiliary valve, 4, 19, 44, 62
   Applications, 44
   Configuration, 62
   Does not switch position, 83
   Installation instructions, 44
   Leaking, 87
   Maintenance, yearly, 69
   Passages blocked, 93
   Rebuilding, 114
   Reordering, 252
   Replacing the mechanical part (pod), 114 – 115
   Troubleshooting, 83

B
Background conductivity
   High, 95
   Offsetting, 59, 215, 217
Dionex ICS-2100 Ion Chromatography System

Backlight
  Time-out, 235
Backpressure, 36
  Restriction in plumbing, 109
  Troubleshooting, 92
Backpressure coil, 40
Backpressure, low
  How to increase, 40
Bar, 224
Baseline
  Drift, 96
  Noise, 96, 232
  Stability, 46
  Zeroing, 215
Batch processing, 50
Blockages
  Liquid lines, 82, 109
Busy page, 235

C
Cables
  Power cord, 142
Calibration, 99
  Conductivity cell, 103
  Flow rate, 106
  Vacuum degas assembly, 108
Carbonate eluent, 23, 37, 41
Carbonate/bicarbonate eluent, 23, 37, 41
Cation separations, 37, 60
Cell
  See Conductivity cell
Cell calibration, 103
Cell heater, 215
Check valves
  Cleaning procedure, 118 – 119
  Replacement procedure, 118 – 119
Chromatogram, 3
  Zeroing the baseline, 215
Chromeleon, 30
  Alarm conditions, 74
  Application Wizard, 67
  Audit Trail, 71
Audit Trail error messages, 71
Commands, 66
Control panel, 65
Degas options, 97
Error messages, 74
Interface, 30
Menu, 65
Overview, 30
Panel tabset, 30
Programs, 64
Quantification method, 68
Starting, 52
Timebase, 30
Toolbars, 65
Using the touch screen with Chromeleon, 210
Wellness panel, 99
Chromeleon Server
  Starting, 52
Chromeleon Server Monitor, 52
Column heater, 20, 45
  Home page control, 214
  Replacement procedure, 131
  Specifications, 201
Column heater alarms
  Column heater exceeds safe temperature, 75
  Column heater open circuit, 76
  Column heater short circuit, 76
Columns, 20
  Cleaning, 257
  Contaminated, 94
  Damage from IPA, 142
  Storing, 256
Component panel, 18
Concentration, 227
  Upper limits, 79, 227
  See also EGC
Conductivity, 215
  Causes of high conductivity, 257
  Changing the display, 235
  Offset, 215, 235
  Temperature effect, 46
  Total, 215, 235
Conductivity cell, 19 – 20, 46
   Calibrating, 103
   Calibration constant, 128
   High cell output, 95
   Leaking, 87
   No response, 94
   Replacement procedure, 127
   Setting the temperature, 215
   Volume, 46
Conductivity cell specifications
   Active volume, 200
   Cell body, 200
   Chemical compatibility, 200
   Electrodes, 200
   Maximum pressure, 200
   Temperature, 200
Conductivity polarity, 232
Contacting Thermo Fisher Scientific, 8
Contamination
   Column, 92, 94
   Eluents, 93
   Sample, 94
   Standard, 93
Continuously Regenerated Trap Column
   See CR-TC
Control panel (Chromeleon), 30, 65
   Autosampler, 31
   Sequence Control, 31
   Status, 31
CR-TC, 40
   Connector, 16
   Controlling automatically, 229
   Controlling manually, 229
   Home page control, 214
   Replacement, 165
CR-TC alarms
   CR-TC over current error, 76
   CR-TC stopped for zero flow rate, 77
   Current, 230

D
Daily maintenance, 68

Data
   Backing up, 256
   Deleting, 256
   Filtering, 232
   Saving, 65 – 66
Data acquisition, 65
Data analysis description, 3
Data rise time, 231 – 232
Decibel level, 195
Default panel tabset, 31
Degas tubing assembly
   See Vacuum degas assembly
Degas calibration failed alarm, 77
Degas tubing assembly, eluent generator, 37, 39
Degassing eluents, 32
Detection description, 3
Detector controls on Home page, 215
   See also Conductivity cell
Detector page, 231
   Setting analog out options, 233
   Setting the data rise time, 232
Detector specifications
   Auto offset, 200
   Calibration, 200
   Cell drive, 200
   Control and data evaluation, 200
   Linearity, 200
   Range, 200
   Resolution, 200
   Temperature compensation, 200
 Diagnostic pages, 236
Diagnostics, 99
Dimensions, 195
Dionex, 52
Direct software control, 31
Drip tray, 19
DS6 Heated Conductivity Cell
   See Conductivity cell
Duty cycle, 33, 225
## E

**EGC, 16**
- Backpressure requirement, 40, 43
- Concentration ranges, 38
- Concentration upper limits, 79, 227
- EGC-1 connector, 16, 148, 156
- EGC-2 connector, 16
- Eluent types, 37
- Entering the serial number, 226
- Expiration date, 228
- Home page controls, 214
- Life remaining percentage, 228
- Service area, 17
  
  *See also* Eluent generator

**EGC alarms**
- EGC board not present, 77
- EGC-1 calibration error, 78
- EGC-1 disconnected error, 78
- EGC-1 invalid concentration vs. flow rate error, 79
- EGC-1 invalid flow rate error, 79
- EGC-1 over current, 79
- EGC-1 over voltage, 80

**EGC CO3 Mixer**
- Description, 37, 41
- Flow schematics, 23
- Replacement procedure, 174

**EGC Resistive Load, 102**

**EGC Verification, 102**

**EGC-1 connector, 16, 148, 156**

**EGC-2 connector, 16**

**Elapsed time, 215, 217**

**Electrical specifications**
- Fuses, 195
- Main power, 195

**Electrolysis gases**
- Purging from eluent, 40, 43

**Electrolytic pH modifier**
  
  *See* EPM Electrolytic pH Modifier

**Eluent**
- Aqueous, 69, 89
- Concentration, 227
- Degassing, 32

**Delivery process, 2**
**Filtering, 54**

*See also* Eluent generator

**Eluent bottle**
  
  *See* Eluent reservoir

**Eluent concentration, 38**

**Eluent generator, 16, 37**
- Backpressure, 43
- Controlling automatically, 228
- Controlling manually, 228
- Degas tubing assembly, 37, 39
- EGC holder, 39
- EGC replacement procedure, 143
- EGC types, 37
- Electrolysis gases, 40, 43
- Eluent concentration ranges, 38
- Setting the concentration, 227
  
  *See also* EGC

**Eluent Generator page, 226**

**Eluent level, 54, 213**

**Eluent reservoir**
- Connecting, 56
- Monitoring liquid level in, 54, 213

**Eluent valve, 20, 225**
- Replacing, 135

**EluGen cartridge**
  
  *See* EGC

**End-line filter**
  
  *See* Filter, end-line

**Environmental specifications, 196**

**EPM Electrolytic pH Modifier, 16, 40 – 41**
- Replacement procedure, 169

**Equilibration time, 59**

**Error messages, 74 – 80, 82 – 85**
- Audit Trail description, 71
- Auxiliary power supply disconnected, 74
- Auxiliary power supply over current, 74 – 75
- Auxiliary power supply over voltage, 75
- Auxiliary power supply stopped for zero flow rate, 75
- Column heater exceeds safe temperature, 75
Column heater open circuit, 76
Column heater short circuit, 76
CR-TC over current error, 76
CR-TC stopped for zero flow rate, 77
Degas calibration failed, 77
EGC board not present, 77
EGC-1 calibration error, 78
EGC-1 disconnected error, 78
EGC-1 invalid concentration vs. flow rate error, 79
EGC-1 invalid flow rate error, 79
EGC-1 over current, 79
EGC-1 over voltage, 80
Hardware not present, 80
Leak sensor wet, 80
Load/inject valve error, 81
Option not installed, 81
Pump motor lost control, 82
Pump over pressure, 82
Pump pressure hardware error, 82
Pump stopped due to lost USB communication, 83
Pump under pressure, 83
Second valve error, 83
Suppressor not connected, 84
Suppressor over current, 84
Suppressor over power, 85
Suppressor stopped for zero flow rate, 85

Carbonate/bicarbonate eluent generation, 27
KOH, LiOH, MSA, NaOH eluent generation, 25
Flow rate, 19, 196, 213
Calibration, 106
Troubleshooting, 90
Flow schematics
Carbonate eluent generation, 28
Front panel, 11
See also Touch screen
Full-scale analog output, 233
Fuses
Replacement procedure, 142
Requirements, 195

G
Gas separator waste tube, 37
Ghosting, 93
Guard column, 20

H
Hardware not present error, 80
Heater, column, 45
See also Column heater
High pressure alarm, 82
Home page, 12, 207, 212, 214 – 216
Column Heater control, 214
Detector controls, 215
EGC controls, 214
Injection valve controls, 215
Pump controls, 212
Humidity, operating, 196

F
Filter, end-line
   Bacterial contamination, 69, 89
   Dirty or clogged, 69, 89
   Installation, 54
Filtering data, 232
Fittings
   Leaking, 86
   Replacing, 113
   Requirements, 113
Flow description
   Carbonate eluent generation, 29

I
Information page, 234
Injecting samples, 62
   Via autosampler, 64
   Via syringe, 63
Dionex ICS-2100 Ion Chromatography System

Via vacuum syringe, 64
Injection port, 11
Injecting via syringe, 63
Injection valve, 19, 42
   Controlling with a Dionex AS, 248
   Home page controls, 215
   Leaking, 87
   Passages blocked, 93
   Plumbing connections, 43
   Rebuilding, 114
   Specifications, 201
   Troubleshooting, 81
Input/Output page, 236, 248
Installation
   Analog output connection, 249
   Priming, 138, 140
   Stand-alone operation setup, 246 – 247
   TTL and relay connections, 239 – 240
Installed options, 234
Inverted edge TTL input control, 244
Inverted peaks, 232
Inverted pulse TTL input control, 244
Ion chromatography overview, 1
Ion exchange, 3
IonPac ATC-HC Trap Column, 40
IonPac CTC-1 Trap Column, 40
Isopropyl alcohol, 141 – 142

K
KOH EGC, 37

L
LCD screen, 11 – 12, 207
   Specifications, 196
   See also Touch screen
Leak sensor, 19
   Leak sensor wet alarm, 80
   Replacement, 137
Leaks
   Auxiliary valve, 87
   Cell, 87
   Fittings, 86
   Injection valve, 87
   Liquid, 86
   Pressure transducer, 87
   Pump check valve, 86
   Pump head, 86
   Pump head waste valve, 87
   Pump piston seal, 86
   Suppressor, 87
LED, 196
Linearity requirements, 200
LiOH EGC, 37
Liquid leaks, 86
   See also Leaks
Lithium hydroxide eluent, 37
Load/inject valve alarm, 81
Loading samples, 62
Local Mode, 216
Locked Remote mode, 210
Loop
   See Sample loop

M
Main power receptacle, 22
Maintenance, 68
   Daily, 68
   Ongoing, 68
   Weekly, 68
   Yearly, 69
Manual sample processing, 50
Methanesulfonic acid eluent, 37
MicroMembrane Suppressor, 20
   See also Suppressor
Module Setup page, 235
Moduleware, 71, 234
MPa, 224
MSA EGC, 37
Index

N
NaOH EGC, 37
Nitrite in samples, 61
Noise, baseline, 232
Normal edge TTL input control, 243
Normal pulse TTL input control, 244

O
Offset conductivity, 235
Offset percentage (analog out), 233
Offsetting background conductivity, 59, 215
Operating features, 11
Operating humidity, 196
Operating ranges
  Cell heater, 19, 215
  Column heater, 20, 214
  Eluent concentration, 79, 227
  Flow rate, 19, 213
Operating temperature, 196
Operation
  Equilibration time, 59
  Overview, 49
  Priming, 57, 140 – 141
  Reservoir setup, 54
  Sample preparation, 60
  Sample processing, 50
  Setting operating conditions, 58
  Starting Chromeleon, 52
Operational status verification, 59
Option not installed error, 81
Options installed, 234
Oven
  See Column heater
Overview of system, 4

P
Panel tabset, 30
  How to display, 31
Panels
  Chromeleon Control panel, 65
  Chromeleon Wellness panel, 99
  Component panel, 18
Parameters
  Chromeleon operating commands, 66
Peak ghosting, 93
Peak height
  Effect of rise time on, 232
  Reproducibility, 46
  Troubleshooting, 94
Peak shape, 232
Peak width, 232
Peaks
  Effect of rise time on, 232
  Extrinsic (ghosting), 93
  Inverted, 232
  Reversed, 232 – 233
PEEK
  Conductivity cell body, 46
PGM file
  See Programs
pH modifier
  See EPM Electrolytic pH Modifier
Physical specifications
  Decibel level, 195
  Dimensions, 195
  Weight, 195
Piston seals
  Replacement procedure, 120 – 121
Pistons
  Replacement procedure, 124
Plot offset, 217
Plot page, 216 – 217
  Elapsed time, 217
  Plot offset, 217
  Range, 217
Plotting detector output, 217
Plumbing
  Injection valve, 115
  Replacing tubing and fittings, 113
  Troubleshooting, 109
Polarity
  Selecting the conductivity polarity, 232
Potassium carbonate eluent, 41
Potassium hydroxide eluent, 37
Dionex ICS-2100 Ion Chromatography System

Power cord, 142
Power receptacle, 22
Power requirements, 195
Pressure
   Home page display, 212
   Limit, 83, 212, 223
   System, 83, 223
   Unit (selecting), 223
Pressure transducer, 19, 36
   Leaking, 87
   System backpressure, 36
Prime button, 213
Priming, 57, 138, 140 – 141
   Pump is out of prime, 89
   With a syringe, 138
   With isopropyl alcohol, 141
   With the Prime button, 140
Priming valve
   Opening, 34
   O-ring replacement procedure, 125
Printing, 255
Problems
   See Troubleshooting
Processing samples, 50, 65 – 66
   Automatically (batch), 50, 66 – 67
   Manually, 50, 65
Product warranty, 99, 114 – 115
Programmed software control, 31
Programs (Chromeleon), 31
   Controlling an autosampler, 64
PSI, 224
Pulse damper, 25, 27, 29, 36
Pump, 34
   Flow rate, 19, 213
   Home page controls, 212
   Leaks, 86
   Over pressure alarm, 82
   Primary pump head, 34
   Priming, 57, 138
   Priming problems, 88
   Secondary pump head, 35
   Selecting the pressure unit, 223
   Setting pressure limits, 223
   Stopped due to lost USB communication,
   Troubleshooting, 90
   Under pressure alarm, 83
   Pump check valve leaking, 86
   Pump degas
      See Vacuum degas assembly
   Pump head waste valve
      Leaking, 87
      O-ring replacement procedure, 125
   Pump heads, 118
   Pump motor lost control alarm, 82
   Pump page, 223
      Changing the pressure unit, 223
      Setting degas parameters, 224
      Setting pressure limits, 223
   Pump pressure hardware error, 82
   Pump priming valve
      O-ring replacement procedure, 125
   Pump specifications
      Construction, 196
      Delay volume, 196
      Eluent bottle pressure, 196
      Eluent generation, 196
      Flow accuracy, 196
      Flow precision, 196
      Flow rate, 196
      Gradient capabilities, 196
      Operating pressure, 196
      Pressure ripple, 196
      Type, 196
      Vacuum degasser, 196

Q
   Quantification method, 68

R
   Range, 217, 233
   Rear panel, 21
      Analog output connector, 21
      Power receptacle, 22
Index

USB connections, 21
Rebuilding the auxiliary valve, 114
Rebuilding the injection valve, 114
Recorders
  Analog output setting, 233
Relay connections
  Rear panel connector, 22, 239
Relay outputs
  Controlling, 245
  Voltage and current specifications, 240
Remote Mode, 216
Reordering information, 251
Reproducibility, 46
Reservoir
  Connecting, 56
  Monitoring liquid level in, 54
Restriction in liquid lines, 82, 109
Retention time
  Adjusting, 255
  Moving, 255
  Troubleshooting, 94
Reverse peaks, 232
Rise time, 232
Running samples, 65
  See also Processing samples

S
Safety messages, 6
Sample loop, 19, 42
  Changing, 113
  Injecting, 43
  Injection valve connections, 43, 114
  Loading, 42
  Reordering, 252
Sample processing, 50, 65 – 66
  Batch, 50, 66
  Manual, 50, 65
  With Chromeleon, 65 – 66
Samples
  Collecting and storing, 60
  Diluting, 61
  Filtering, 60
  Injecting, 62, 64
  Loading, 62
  Pretreating, 61
Saving data, 65 – 66
Seal replacement, 121
Second valve
  Troubleshooting, 83
Second valve error, 83
Selectivity
  Troubleshooting, 94
Self-Regenerating Suppressor, 20
  See also Suppressor
Separation process, 3
Separator column, 20
Sequence Control panel, 31
Sequence Wizard, 68
Serial number
  EluGen cartridge, 226
Server Configuration program
  Starting, 52
Service chase, 16, 20
Service procedures, 119
  Check valve cleaning, 118 – 119
  Check valve replacement, 118
  Conductivity cell replacement, 127
  CR-TC replacement, 165
  EGC CO3 Mixer replacement, 174
  EGC holder replacement, 185
  Eluent generator cartridge replacement, 143
  EPM replacement, 169
  Fuse replacement, 142
  Injection valve rebuilding, 114
  Isolation of liquid lines restriction, 109
  Leak sensor replacement, 137
  Piston replacement, 124
  Piston seal replacement, 120
  Priming valve O-ring replacement, 125
  Rebuilding the auxiliary valve, 114
  Rebuilding the injection valve, 114
  Replacing tubing and fittings, 113
  Suppressor replacement, 130
  Tubing and fittings replacement, 113
  Waste valve O-ring replacement, 125
Signal-to-noise ratio, 232
Sodium hydroxide eluent, 37
Software control, 30
  Modes of, 31
Software specifications
  Application templates, 204
  Automated procedure wizards, 204
  Automation support for third-party vendors, 204
  Customizable system control panels, 204
  Customized reporting, 205
  Daily Audit Trail, 204
  Multiple network control, 205
  Network failure protection, 205
  Power failure protection, 204
  Sample Audit Trail, 204
  Sequential injection, 204
  Storage of calibration settings, 205
  System status virtual channels, 204
  System trigger commands and conditionals, 204
  System Wellness and Predictive Performance, 204
  Virtual column simulator, 204
Specifications
  Autosampler, 203
  Column heater, 201
  Conductivity cell, 200
  Detector, 200
  Electrical, 195
  Eluent generator, 198
  Environmental, 196
  Injection valve, 201
  LCD touch screen, 196
  Physical, 195
  Pump, 196
  Supressors, 202
  System software, 204
  Vacuum degas assembly, 201
Stand-alone operation, 246 – 250
  Analog output connection, 249
  AS setup, 248, 250
  Example connections, 247
  TTL and relay connections, 246
Standards
  When to remake, 255 – 256
Status Control panel, 31
Status page, 216, 218
Sulfite in samples, 61
Suppression description, 3
Suppressor
  Controlling the current to, 230
  Description, 20, 46
  Gas separator waste tube, 37
  Leaking, 87
  Replacement procedure, 130
  Selecting the type, 230
Suppressor alarms
  Suppressor not connected, 84
  Suppressor over current, 84
  Suppressor over power, 85
  Suppressor stopped for zero flow rate, 85
Suppressor page, 230
Suppressor specifications
  Chemical suppression, 202
  Displacement chemical regeneration, 202
  Electrolytic suppression, 202
  Sequential suppression for anions, 202
  Suppression capacity, 202
  Suppressor wear parts, 202
  Void volume, 202
Syringe injection, 63
  Vacuum, 64
System
  Shutdown, 256
  Status, 59
System backpressure, 36
System components
  Descriptions, 32
System overview, 4
System Wellness, 31
T
Technical Support, 8, 71, 99
Temperature
  Cell heater, 46, 215
Index

Column heater, 20, 45, 214
Minimizing the effect of variations, 46
Temperature compensation, 46
Temperature, operating, 196
Thermo Fisher Scientific
  Contacting, 8
Thermo Fisher Scientific Technical Support, 8, 71, 99
Timebase, 30
Time-out (screen), 235
Top cover, 16
Total conductivity, 215, 235
Touch screen, 11, 207
  Adjusting the contrast, 12, 207
  Number keypad, 13, 208
  Operation, 12, 207
  Specifications, 196
  Time-out, 235
  Using with Chromeleon, 210
Touch screen pages
  Busy page, 235
  Detector page, 231
  Diagnostic pages, 236
  Eluent Generator page, 226
  Home page, 12, 207, 212, 215 – 216
  Information page, 234
  Input/Output page, 236, 248
  Module Setup page, 235
  Overview, 211
  Plot page, 216 – 217
  Pump page, 223
  Status page, 216, 218
  Suppressor page, 230
Troubleshooting, 71
  Alarm conditions, 74
  Baseline noise or drift, 96
  Calibrations, 99
  Diagnostics, 99
  Error messages, 74
  Excessive backpressure, 92
  Flow rate, 90
  High cell output, 95
  Liquid leaks, 86
  No cell response, 94
  Peak ghosting, 93
  Peak height, 94
  Pump, 88 – 90
  Retention time, 94
  Selectivity, 94
  Vacuum degas assembly, 97
TTL and relay connector, 239
  Connection instructions, 240
  Pin assignments, 239
TTL inputs
  Assigning functions to, 243, 248
  Control type, 248
  Default function assignments, 240
  Rear panel connector, 22
TTL outputs
  Controlling, 245
  Rear panel connector, 22
Tubing
  Replacing, 113
  Requirements, 113
  Routing clips, 22
Tubing connections
  Isolating a restriction, 82, 109

U

USB connections, 21

V

Vacuum degas assembly, 32
  Calibration, 108
  Components, 32
  Fails to run, 97
  Setting operating parameters, 224
  Specifications, 201
  Troubleshooting, 88
Valve
  See Auxiliary valve
  See Eluent valve
  See Injection valve
  See Waste valve
Dionex ICS-2100 Ion Chromatography System

Version number, 234

W
Warranty, voiding, 99, 114 – 115
Waste container, 185
Waste lines
   Blocked, 86
   Gas separator waste tube, 37
Waste valve, 35
   Opening, 35, 120
   O-ring replacement procedure, 125
Water samples, 61
Weekly maintenance, 68
Weight, 195
Wellness, 31
Wellness panel, 99

Y
Yearly maintenance, 69

Z
Zero position (analog out), 233
Zeroing the baseline, 215