thermo scientific

Dionex SC-CERS 500 Suppressor

User Guide

031849 Revision 08 • May 2024

ThermoFisher SCIENTIFIC

Special notices, symbols, and cautions

Make sure that you follow the special notices presented in this guide.

Table 1 Notices, symbols, labels, and their meanings

Notice, symbol, or label	Meaning
IMPORTANT	Highlights information necessary to prevent damage to software, loss of data, or invalid test results; or might contain information that is critical for optimal performance of the product.
Note	Highlights information of general interest.
Tip	Highlights helpful information that can make a task easier.
	**Caution**: Read the cautionary information associated with this task.
	**Warning**: Indicates a potentially hazardous situation which, if not avoided, could result in damage to equipment.
	**Danger**: Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

Copyright and trademarks

MASTERFLEX C/L is a registered trademark of Barnant Company.

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

Table 2 Revision history

Revision	Date	Description
8	May 2024	Removed obsolete storage line P/N.
7	January 2024	Removed consumables monitoring disabled P/Ns.
6	November 2021	Added consumables monitoring disabled P/Ns.
5	May 2018	Removed all references to “Velcro” and replaced with “hook and loop”. Updated Thermo Scientific logo on cover page.
4	December 2016	Rebranded for Thermo Fisher Scientific Inc. Product name changed from SC-CSRS 300 to SC-CERS 500.

1

Introduction to electrolytically regenerated suppression for cation analysis

The Dionex Salt-Converter-Cation Electrolytically Regenerated Suppressor 500 (Dionex SC-CERS 500) replaces the Dionex SC-CSRS 300 suppressor product line. The Dionex SC-CERS 500 is designed with exterior hardware changes that allow the suppressor to be more pressure and temperature tolerant than previous generation suppressor devices.

See the following table for a list of suppressors covered in this guide.

Suppressor	Part Number
Salt Converter-Cation Electrolytically Regenerated Suppressor 500 (Dionex SC-CERS 500)	Dionex SC-CERS 500 (4 mm) Item # 083547
	Dionex SC-CERS 500 (2 mm) Item # 083549

About the Dionex SC-CERS 500

The Dionex SC-CERS 500 is a post column electrolytic eluent suppressor for cation exchange applications using conductivity detection.

The Dionex SC-CERS 500 is used in cation exchange applications as a replacement for the Dionex CERS 500 when extended linearity or increased sensitivity for ammonium and amines are required. The Dionex SC-CERS 500 converts weakly ionized amines and ammonium to the highly ionized methanesulfonate acid, thus increasing their response and extending the linear range to three orders of magnitude.

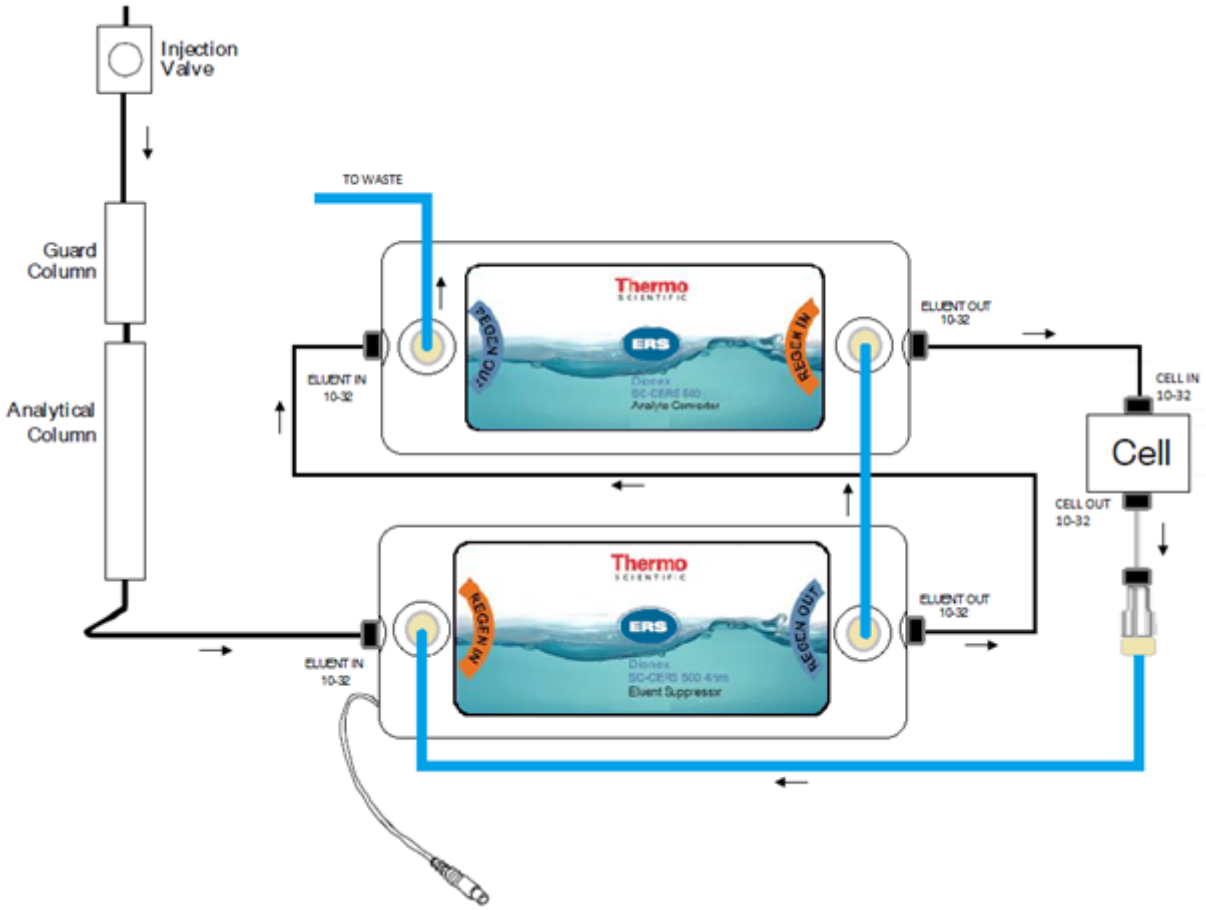
The Dionex SC-CERS 500 is a specialty suppressor package that consists of:

- An Eluent Suppressor component (ES)
- An Analyte Converter component (AC)

This enables the suppressed conductivity detection of low-level ammonia and other amines with an extended linear response.

The Dionex SC-CERS 500 is installed in a cation ion exchange system and uses the same power supply used for SRS and ERS suppressors, as shown in the following figure.

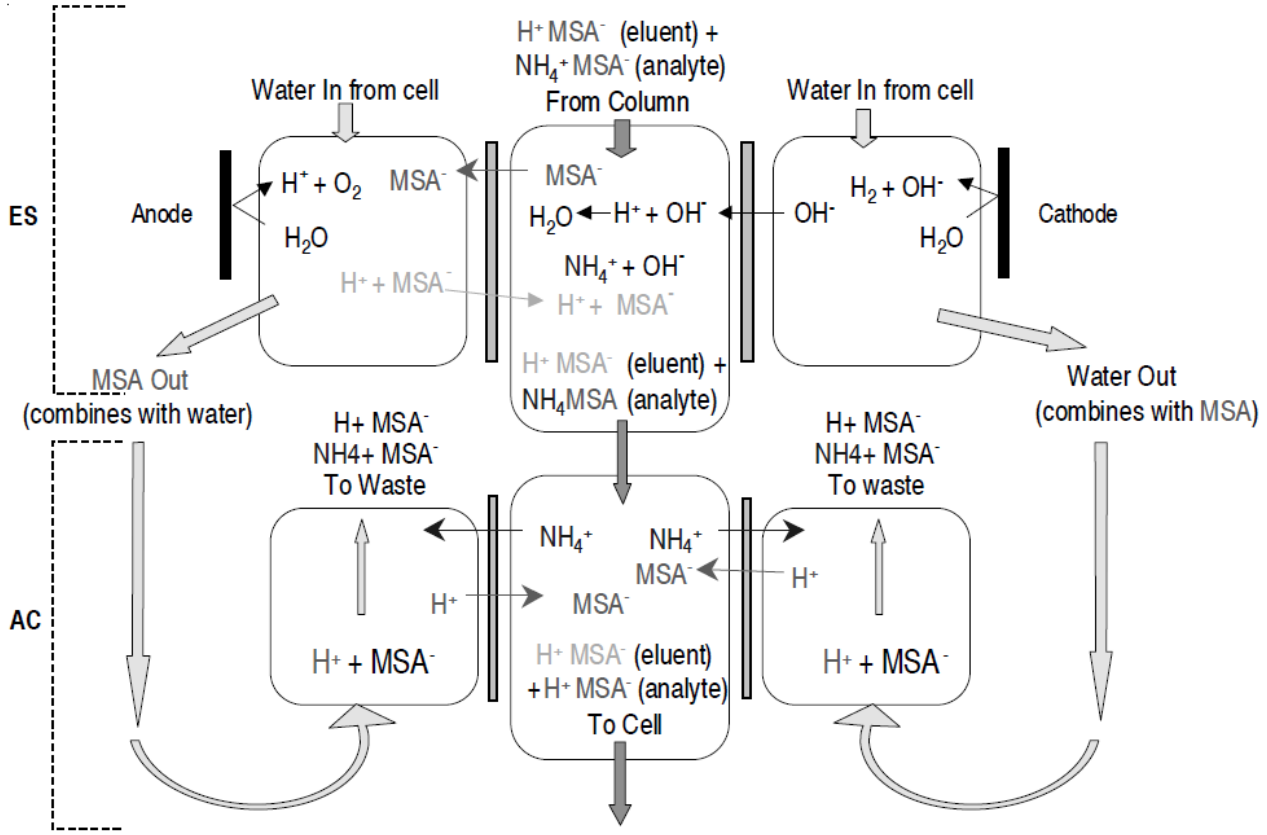
Figure 1 The Salt Converter-Cation Electrolytically Regenerated Suppressor System



In the Eluent Suppressor (ES) component, the majority of the eluent (methanesulfonic acid, H+MSA–) is suppressed, but the analytes remain in the MSA– salt form; for example, Na+MSA– in a background of dilute methanesulfonic acid.

In the Analyte Converter (AC) component, the analyte cation is exchanged for a hydronium ion (H+), thus resulting in conversion of the analyte to methanesulfonic acid (H+ MSA–). The analyte is detected as methanesulfonic acid in a background of methanesulfonic acid. See the following figure.

Figure 2 Salt Converter-Cation Electrolytically Regenerated Suppressor 500 Operational Schematic



For example, ammonium hydroxide (ammonia) which is weakly dissociated is converted to ammonium MSA in the ES component, and in the AC component the ammonium MSA is converted to the conductive MSA form. Since MSA is fully dissociated, linear response vs. concentration calibration is observed at a wide range of concentration.

The Dionex SC-CERS 500 suppressor is recommended and optimized for isocratic MSA (methanesulfonic acid) only. The Dionex SC-CERS 500 is compatible with typical HPLC solvents up to 40%. The external water mode must be used for eluents containing solvents.

The Dionex SC-CERS 500 is available in both 4 mm and 2 mm formats. The Dionex SC-CERS 500 (2 mm) is specially designed with reduced internal volume to ensure optimum performance with 2 mm and 3 mm i. d. columns and microbore systems.

The electrolytic suppressor component of the Dionex SC-CERS 500 includes two regenerant compartments and one eluent compartment separated by ion exchange membranes. Regenerant flow channels and an eluent flow channel are defined by the membranes. The eluent flow is in a direction that is concurrent to the regenerant flow in the Eluent Suppressor component and countercurrent in the Analyte Converter.

In the Eluent Suppressor, electrodes are placed along the regenerant channels. When an electrical potential is applied across the electrodes, water from the regenerant channels is electrolyzed, supplying regenerant hydroxide ions (OH-) for the neutralization reaction. The membrane allows these hydroxide ions to pass into the eluent chamber resulting in the conversion of the electrolyte of the eluent to a weakly ionized form. Eluent anions are simultaneously passed into the regenerant chamber to maintain charge balance.

In the Eluent Suppressor, the electrode lengths are optimized to promote a transfer of methane sulfonic acid across the membranes at the outlet end. This transfer forms dilute MSA in the eluent stream resulting in a slightly elevated background and the analyte is in the MSA form.

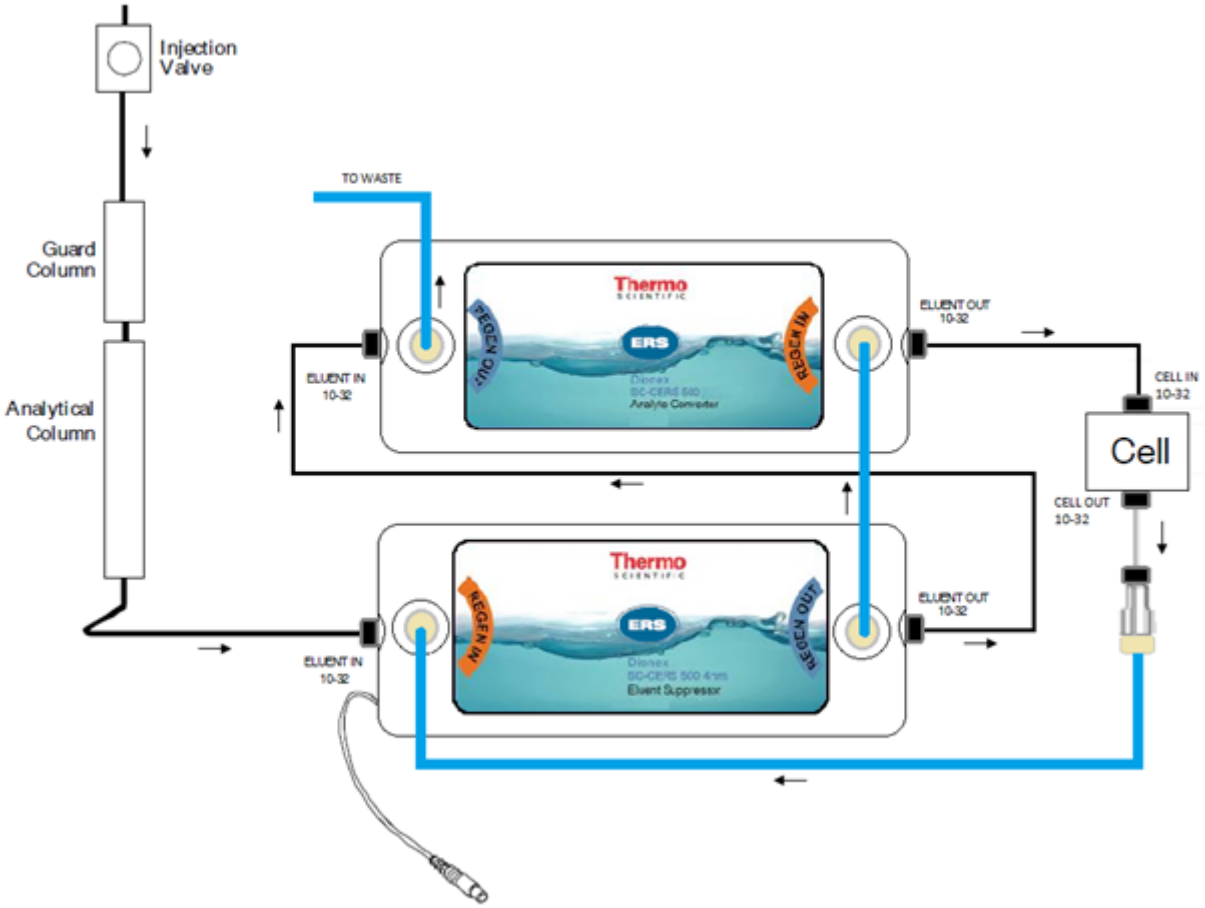
The Analyte Converter is a chemical suppression system and has no electrodes. This component exchanges the analyte for hydronium ions, forming methanesulfonic acid.

NOTE: Assistance is available for any problem that may be encountered during the shipment or operation of Thermo Scientific Dionex instrumentation and columns through the Thermo Scientific North America Technical Call Center at 1-800-DIONEX-0 (1-800-346-6390) or through any of the Thermo Scientific Offices.

Operating the Dionex SC-CERS 500

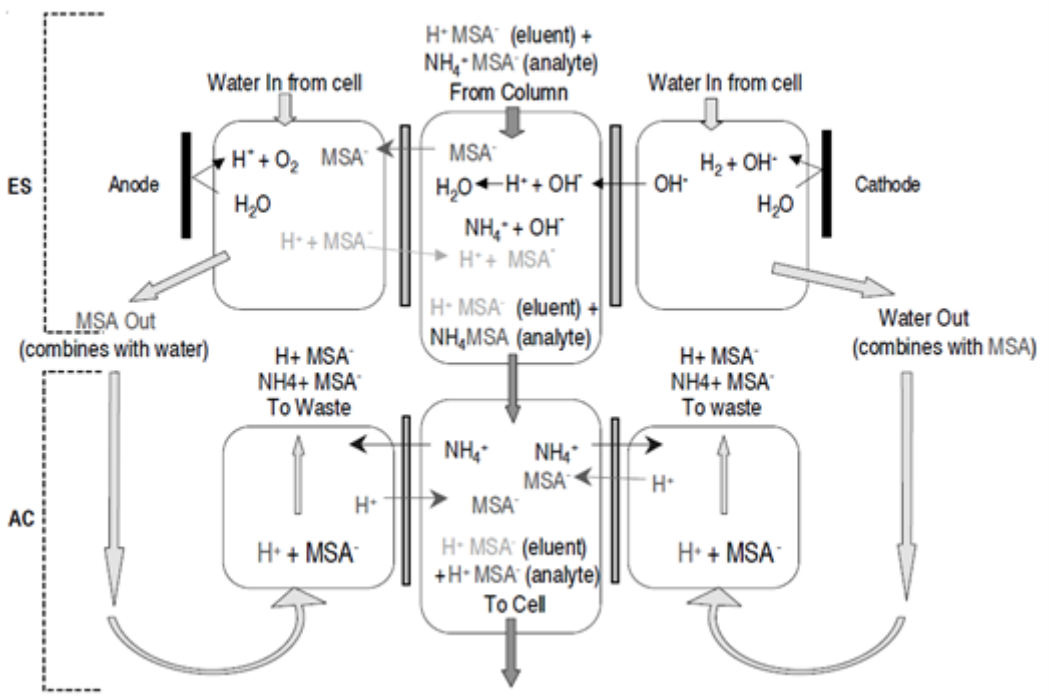
As shown in the figure below, regenerant flow is in the same direction as the eluent flow in the ES Component.

Figure 3 Salt Converter-Cation Electrolytically Regenerated Suppressor System



This ensures that the screens and the membranes are in the MSA form and converts the analyte to the MSA form, as shown in the following figure. The electrodes in the ES are optimized to ensure that there is a small transfer of MSA to aid the dissociation of all species. The effluent (MSA) from the ES is diverted into the regenerant channel of the AC in order to regenerate the AC chemically. All cations are converted to MSA.

Figure 4 Salt Converter-Cation Electrolytically Regenerated Suppressor 500 Operational Schematic



Suppression modes

There are two basic suppression modes for the Dionex SC-CERS 500:

- AutoSuppression Recycle Mode
- AutoSuppression External Water Mode

The following topics explain each mode and their recommended applications. After selecting a suppression mode, see Operation for more detailed plumbing configuration and operating instructions.

Select an operation mode

The Dionex SC-CERS 500 mode of operation depends mainly on the eluent composition.

For example, eluents containing organic solvents are not compatible with the AutoSuppression Recycle Mode; the AutoSuppression External Water Mode should be used instead.

The Eluent Suppressor component of the Dionex SC-CERS 500 uses dilute MSA and electrolysis as the regenerant to achieve substantial eluent suppression.

The most common mode of operation is the AutoSuppression Recycle Mode. In this mode of operation, substantially suppressed eluent flows from the eluent outlet of the suppressor into the conductivity cell and is then recycled through the Dionex SC-CERS 500 regenerant chambers. This eliminates the need for an external source of water but restricts the regenerant flow rate to the eluent flow rate.

The Analyte Converter component uses the MSA effluent from the Eluent Suppressor as a regenerant to achieve conversion of the analytes to MSA. The AutoSuppression External Water Mode incorporates an external source of deionized water flowing through the regenerant chambers. This requires the installation of a water delivery system such as a pressurized bottle system or peristaltic pump to provide an external source of water. With this configuration, the regenerant flow rate is not restricted to the eluent flow rate.

Both the AutoSuppression Recycle Mode and the AutoSuppression External Water Mode require application of electric current to the Eluent Suppressor component of the Dionex SC-CERS 500.

To improve performance and increase suppressor lifetime, the optimum current must be applied. The optimum current setting produces just enough hydroxide ions to displace the eluent counter ions, thus neutralizing the eluent. When using solvents in the eluent, the optimum current setting is critical for prevention of oxidation of the solvent.

See Recommended current settings.

Table 3 Dionex SC-CERS 500 Eluent Composition and Suppression Mode Compatibility

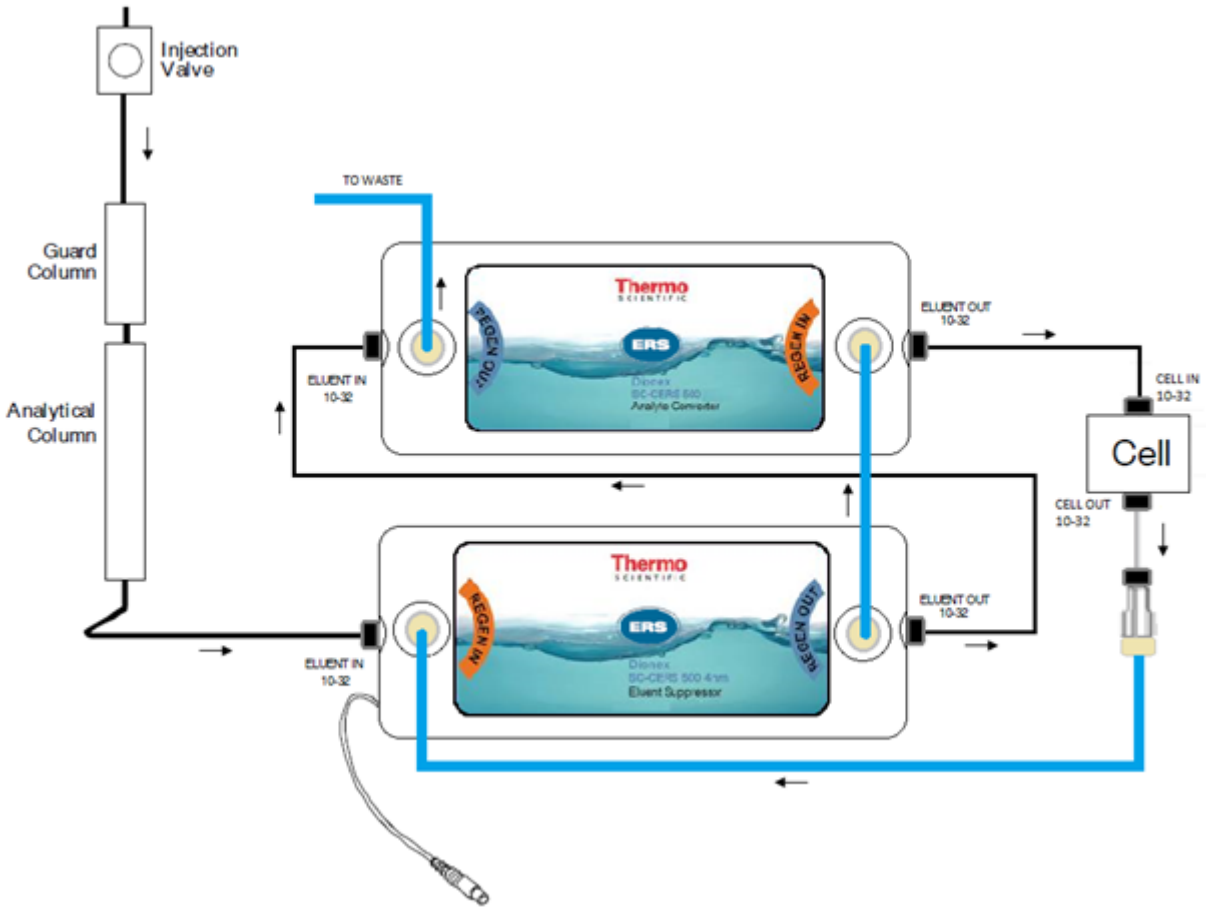
Eluent Composition	AutoSuppression Recycle	AutoSuppression External Water
MSA Eluents	Yes	Yes
Sulfuric Acid and Other Eluents	No	No
MSA Eluent Containing Organic Solvents	No	Yes
Eluents Containing Ion Pair Reagents	No	No

AutoSuppression Recycle Mode

The AutoSuppression Recycle Mode uses the suppressed conductivity cell effluent as the source of water for the regenerant chamber water. This is the recommended method of operation for the Dionex SC-CERS 500.

The advantage of this mode of operation is its simplicity and ease of use. It reliably provides salt conversion for most suppressed conductivity applications using MSA eluents. As the eluent passes through the Dionex SC-CERS 500, it is substantially neutralized to form a low background. After passing through the conductivity cell, the effluent is redirected to the regenerant inlet on the Dionex SC-CERS 500 Eluent Suppressor, thus supplying it with a source of water containing low levels of MSA and minute amounts of diluted analyte. See the following figure.

Figure 5 AutoSuppression Recycle Mode Plumbing Diagram



The amount of water flowing through the regenerant chambers is therefore equal to the eluent flow rate. Because of this limitation, the AutoSuppression Recycle Mode of operation cannot be used with eluents containing organic solvents. See Operation for more information.

AutoSuppression External Water Mode

The AutoSuppression External Water Mode is used for any applications requiring organic solvents in the eluent. This mode uses a constant source of deionized water from a pressurized bottle or a line source of deionized water that delivers at least 3 to 5 mL/ min. The amount of water flowing through the regenerant chambers is therefore independent of the eluent flow rate.

The AutoSuppression External Water Mode eliminates the potential for buildup of contaminating ions resulting from the oxidation of solvents. If it is determined that the system must be plumbed for applications requiring AutoSuppression External Water Mode, any analysis performed using the AutoSuppression Recycle Mode can also be performed using the AutoSuppression External Water Mode.

See Operation for more information.

Shipment and storage

The Dionex Salt Converter-Cation Electrolytically Regenerated Suppressor 500 (Dionex SC-CERS 500) contains components that are heat sensitive. The suppressor should not be subjected to temperatures above 40°C during shipment, storage, or operation.

Ensure the suppressor is stored in a temperature controlled environment away from direct exposure to sunlight or other sources of heat. Do not store the suppressor in a non-temperature controlled environment where temperatures exceed 40°C, such as a parked car, a tool shed, or a lab-bench in close proximity to an open window with direct sunlight.

Installation

The following components are required for the installation of the Dionex SC-CERS 500 in a Dionex Ion Chromatograph.

Table 4 Gas Separator Waste Tube

	P/N	Description
Found in:	046297	ED40, ED50/A Shipkit
	046298	CD20, CD25/A Shipkit
	045935	CDM-3 On-Line Shipkit
	050130	Dionex DX-120 Shipkit
	059218	Dionex DX-320 Shipkit
	045720	RFC-30 Shipkit
Additional components are required to plumb a 2-mm system:	052324	Microbore tubing (containing tubing, fittings and 2-mm backpressure coils required for plumbing a 2-mm system). **NOTE**: Backpressure coils must not be used with Dionex SC-CERS 500.
SC-CERS 500 Spare Parts:	016388	Syringe, 1.0 mL, disposable For flushing the Dionex SC-CERS 500 at start-up.
	024305	Syringe Adapter, female Luer lock, 1/4-28 threads
Installation Kit for LC30:	060044	Metal bracket, spacers and screws required for mounting the SC-CERS 500 AC in a LC30.
Options: Pressurized Water Delivery System (used with the AutoSuppression External Water Mode)	038018	External Regenerant Installation Kit For Dionex SC-CERS 500 suppressor operation in the External Water mode when up to 40% HPLC solvents are used in the eluent. Contains one pressure regulator (0-30 psi/0-210 kPa), and all tubing and fittings required to install the Dionex SC-CERS 500.
RFC-10 / RFC-30		See the Reagent-Free Controller Manual for detailed instructions.

CAUTION: The Dionex SC-CERS 500 must be operated with the gas separator waste tube (P/N 045460).

NOTE: During the course of installing and using the Dionex SC-CERS 500, it may be necessary to assemble 1/4-28 or 10-32 ferrule/ bolt style liquid lines. See, “Installation of DIONEX Liquid Line Fittings,” Document No. 031432, for complete details.

System requirements

The Dionex SC-CERS 500 is designed to be run on any Dionex Ion Chromatograph (IC) equipped with a cation exchange column set and suppressed conductivity detection. See the following table for details.

Table 5 Electrolytically Regenerated Suppressor Requirements for Selected Ion Chromatographs

Dionex Ion Chromatograph Series Module		Dionex RFC-10 or Dionex RFC-30 Suppressor Controller Required?	
2000i		YES	
QIC		YES	
2000 SP		YES	
4000i		YES	
4500i		YES	
8000		YES	
8100	CDM-2, PED	YES	
	CDM-3, PED-2	RECOMMENDED	(for 1 mA increment control)
8200	CDM-3, PED-2	RECOMMENDED	(for 1 mA increment control)
Dionex DX-320	IC20	RECOMMENDED	(for 1 mA increment control)
	IC25	RECOMMENDED	
	IC25A	NO	(for 1 mA increment control) (integral with detector)
Dionex DX-300	CDM-2, PED	YES	
	CDM-3, PED-2	RECOMMENDED	(for 1 mA increment control)

Dionex Ion Chromatograph Series Module		Dionex RFC-10 or Dionex RFC-30 Suppressor Controller Required?	
Dionex DX-500		RECOMMENDED	(for 1 mA increment control)
Dionex DX-600	CD25	RECOMMENDED	(for 1 mA increment control)
	CD25A	NO	(integral with detector)
	ED50	RECOMMENDED	(for 1 mA increment control)
	ED50A	NO	(integral with detector)
Dionex DX-800		RECOMMENDED	(for 1 mA increment control)
Dionex ICS-1000/1500/2000 / 1100/1600/2100		NO	(integral with system)
Dionex ICS-2500		NO	(integral with detector)
Dionex ICS-3000 / 5000/5000+		NO	(integral with detector)

The Dionex SC-CERS 500 is installed in the column compartment of the chromatography module immediately after the analytical column and before the conductivity detector cell. The mounting location depends on the system. See the following table.

Table 6 SC-CERS 500 mounting position

System	Mounting location
Dionex ICS-5000+/5000/3000	SC-CERS 500 ES: On the CD in the DC module
	SC-CERS 500 AS: On the suppressor plate of the second detector console (if fitted), or in the top section of the upper compartment.
Dionex ICS-2100/2000/1600/1500/1100/1000	SC-CERS 500 ES: On the vertical suppressor brackets between the CD cell and column in the component panel.
	SC-CERS 500 AS: On the horizontal suppressor brackets at the top of the component panel.
Dionex Integrion	SC-CERS 500 ES: On the tangs in the detector compartment.
	SC-CERS 500 AS: Affixed next to the ES in the detector compartment using double sided tape or hook and loop.

Electrolytically regenerated suppressor control

This section describes the available detectors. For information on selecting current settings, see Dionex SC-CERS 500 current settings.

Electrolytically Regenerated Suppressor Control consists of the electronic components necessary to control and provide conditioned power to the Dionex SC-CERS 500 Suppressors.

CAUTION: Always turn the pump and ERS Control on and off at the same time. Eluent flow through the Dionex SC-CERS 500 is required for proper operation. However, without current, the membranes and screens in the Dionex SC-CERS 500 will become expended by the flowing eluent resulting in anomalous analyte peak areas and baseline drift.

If this should occur, perform the procedure outlined in Nonlinear response or loss of sensitivity.

The Dionex SC-CERS 500 can also be controlled using the Dionex RFC-10 Power Supply Module which has the capabilities of supplying the optimum current to the Dionex SC-CERS 500. See Using a Dionex RFC-10 or Dionex RFC-30 power supply to power the Dionex SC-CERS 500 for information on using the Dionex RFC-10 to control the Dionex SC-CERS 500.

ERS Control for the CD20/ED40 CD25/ED50 (Dionex DX-600, Dionex DX-500, Dionex DX-320)

SRS/ERS control for these instruments is accessible from the detector front panel or PeakNet/Chromeleon software. For information on operation from PeakNet/Chromeleon, please see the Help file in the Run or Method files.

NOTE: If using the ED40, first select **Conductivity Mode** from the Main Screen.

NOTE: If using the Dionex DX-600, DX-500, or Dionex DX-320, it is recommended to use a Dionex RFC-10 or Dionex RFC-30 power supply to provide more accurate current to the Dionex SC-CERS 500.

To operate the SRS/ERS from the front panel of the detector, follow the procedure below.

Procedure

1. Select **Main Screen** or **Detail Screen** to ensure the detector is in one of the main conductivity screens.

2. Select **Menu** until you see this as an option. Press the appropriate number, then press **Enter**.
3. Make sure you are in 1, the Local mode. If you are in the Remote mode, use the arrow keys to select **Local**, then press **Enter**.
4. In the Main or Detail screens, use the arrow keys to navigate to the **SRS** field.
5. Set the current output level. Increase or decrease the levels by using the select keys, labeled 50, 100, 300, and 500 mA.
6. Press **Enter**.

Table 7 SRS/ERS controls for Dionex DX-500, Dionex DX-600, Dionex DX-320

Task	Procedure
SRS/ERS Control Connections for the CD20/ED40	**Procedure** 1. Connect one end of the SRS/ERS control cable to slot 2. 2. Plug J3 behind the instrument front panel. 3. Route the cable through the chase beneath the electronics to the back. 4. Route the female ERS plug end to the chromatography module that you are using. 5. Place the cable close to the ERS and attach.
SRS/ERS Line Voltage for the CD20/ED40	These detectors have automatic switching power supplies to adjust to the line voltage. No user settings are required.
SRS/ERS Power Control for the CD20/ED40	The CD20 and ED40 are controlled from the instrument front panel on Dionex DX-500 instruments. **Procedure** 1. Navigate to the SRS field, then use the **Select** keys to scroll the current settings to **Off**. 2. Press **Enter**.

CAUTION: As a general operating precaution, never apply current to the Dionex SC-CERS 500 without eluent or water regenerant flowing through the Dionex SC-CERS 500 at the same time. Always apply current whenever eluent is running through the suppressor.

NOTE: The Dionex SC-CERS 500 is not compatible with the Dionex DX-120 power supply. A Dionex RFC-10 or RFC-30 power supply is recommended for use with Dionex DX-120 instruments.

See the following figure and table for details on CDM-3/PED-2 control (Dionex DX-300 instruments).

Figure 6 Figure CDM-3/PED-2 Control

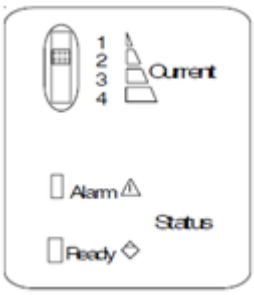


Table 8 CDM-3/PED-2 Control (Dionex DX-300 Instruments)

Detector Power Switch	Located on the rear panel. Powers SRS/ERS control when turned on.
Cell OFF/ON	Located on the front panel. Turns current flow on or off to both the cell and the Dionex SC-CERS 500.
SRS Control Current Selector	Located on the top panel of the detector.

Table 9 SRS/ERS controls for the CDM-3/PED-2 (Dionex DX-300 Instruments)

Function	Description
SRS/ERS Control connections	Use the SRS/ERS Control extension cable (P/N 045343) to connect the SRS/ERS Control output connector on the back of the detector chassis, to the Dionex SC-CERS 500 current input connector.

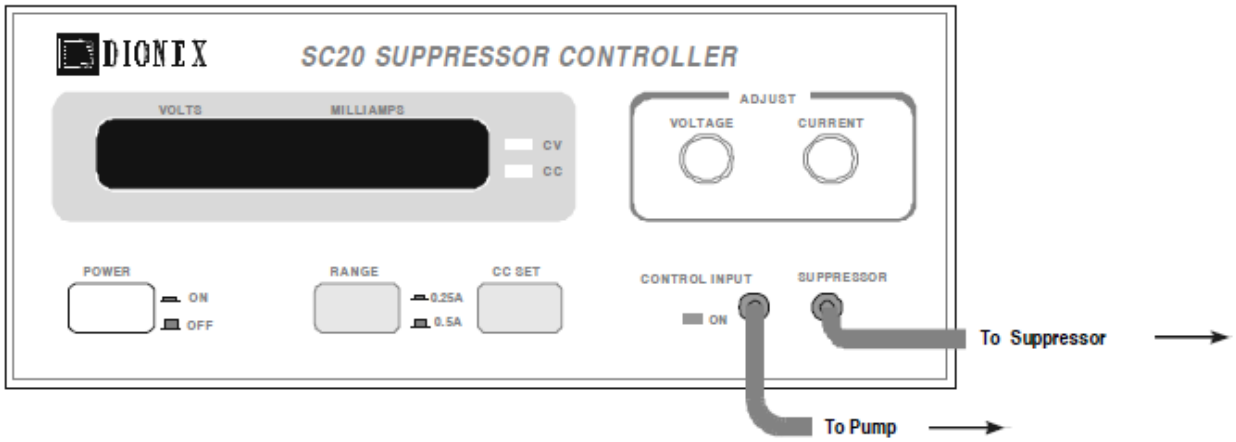
Function	Description
SRS/ERS Line Voltage	Receives its power directly from the CDM-3 or PED-2 detector. If the detector's voltage control (CORCOM) is properly set (see the appropriate CDM-3 or PED-2 Operator's Manual), the control portion of the detector will receive the correct power without further adjustment.
SRS/ERS Power Control for The CDM-3/PED-2 (Dionex DX-300 Instruments)	The control and display panels on the CDM-3 and PED-2 detectors for the Dionex SC-CERS 500 are located under the top cover, visible through an opening in the cover. LED indicators inform the operator of the system's operational status. The CDM-3 and the PED-2 detector VAC Power On/Off switch, located on the rear panel of the instrument, toggles the VAC Line voltage to the CDM-3 or PED-2 detector and the internal SRS/ERS Control on and off. SRS/ERS Control is therefore powered whenever the detector is powered. To interrupt the current to the Dionex SC-CERS 500 while the detector is On, use the detector cell On/Off control. With the detector cell On, the detector conductivity cell is On and the detector SRS/ERS Control provides current to the SC-CERS 500. With the detector cell Off, the detector conductivity cell is Off and the detector SRS/ERS Control output current to the Dionex SC-CERS 500 is Off although the detector SRS/ERS control still receives power.

NOTE: If using the Dionex DX-500, it is recommended to use a Dionex RFC-10 or RFC-30 power supply to provide more accurate content to the Dionex SC-CERS 500.

CAUTION: As a general operating precaution, never apply current to the Dionex SC-CERS 500 without eluent or water regenerant flowing through the Dionex SC-CERS 500 at the same time. Always apply current whenever eluent is running through the suppressor.

SC20 Suppressor Controller

Figure 7 SC 20 Suppressor Controller



The SC20 can be used to supply current to the Dionex SC-CERS 500 in 1 mA increments. Refer to the SC20 manual (Document No. 031768), Dionex SC-CERS 500 current settings, and Dionex SC-CERS 500 Current Settings for AutoSuppression External Water Mode for more information.

Dionex RFC-10 or Dionex RFC-30 Controller

The Dionex RFC-10 and Dionex RFC-30 units can be used to supply current to the Dionex SC-CERS 500 in 1 mA increments. Refer to the Reagent-Free Controller Operator's Manual (Document # 031880) for detailed instructions.

Select the CERS_2MM or CERS_4MM for Dionex SC-CERS operation and use the current settings for CERS operation.

NOTE: If using DX 1-03, it is recommended to use a Dionex RFC-10 or Dionex RFC-30 power supply to provide more accurate current to the Dionex SC-CERS 500

The 2-position rotary switch located on the back of the RFC-30 allows the selection of either 110 V or 220 V input line voltage. It can be adjusted with a large flat-bladed screwdriver or a small coin. The unit is not frequency sensitive and will work equally well on 50 or 60 Hz without adjustment. Each position accepts a wide range of input line voltages.

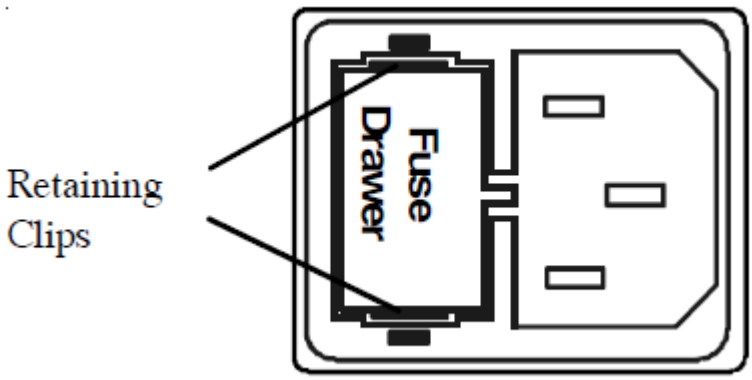
- Use the 110 V position for all input line voltages between 85 VAC and 135 VAC.
- Use the 220 V position for all input line voltages between 175 VAC and 265 VAC.

The control and display panel on the Dionex RFC-30 is located on the front of that module's cabinet. LED indicators inform the operator of the system's operational status.

The Dionex RFC-30 has its own VAC Power On/Off switch to toggle the VAC line current to the Dionex RFC-30 on and off. This is the only way to turn the current output to the Dionex SC-CERS 500 on and off on the Dionex RFC-30. See the following figure.

Two line input fuses are located in the fuse drawer on the socket of the VAC input connector on the back panel of the RFC-30.

Figure 8 Dionex RFC-30 Fuse Holder



To replace fuses, first remove the VAC line cord, and then remove the fuse drawer by squeezing the retaining clips located at the right and left of the drawer. Pull the drawer outward to replace both fuses. Spare fuses are found in the shipping kit. The fuses are 5 x 20 mm, 0.315A/250V, FAST IEC127 (P/N 954747).

NOTE: It is recommended to use a Dionex RFC-10 or Dionex RFC-30 power supply to provide more accurate current to the Dionex SC-CERS 500.

CAUTION: As a general operating precaution, never apply current to the Dionex SC-CERS 500 without eluent or water regenerant flowing through the Dionex SC-CERS 500 at the same time. Always apply current whenever eluent is running through the suppressor.

Temperature

For applications requiring high temperatures (40°C to 60°C), the Dionex SC-CERS 500 must be installed outside the chromatography oven; add a length of tubing (up to 20”, 50 cm) between the column outlet and the suppressor inlet to allow time for the eluent to cool to room temperature if operating the column above 40°C.

Use a minimal length of tubing from the column outlet to the ELUENT IN port of the Dionex SC-CERS 500 and from the REGEN OUT port to the conductivity cell. The tubing should have the ends square cut so no dead volume is introduced.

The line from the cell to the REGEN IN port should be 1/8” i.d. to minimize backpressure to the Dionex SC-CERS 500.

When using a temperature controlled chromatography module, a conductivity cell with a shield (P/N 044132) should be placed inside the oven.

CAUTION: The Conductivity Cell with DS3 (P/N 044130) will not compensate for temperatures above 45°C. Placing the DS3 Cell outside the oven will lead to poor sensitivity since the Dionex SC-CERS 500 and DS3 are at a lower temperature than the oven.

Backpressure coils

No backpressure coils are required for the Dionex SC-CERS 500 Suppressor operation. Remove any existing backpressure coils before installing the Dionex SC-CERS 500.

Assemble the gas separator waste tube

The Gas Separator Waste Tube (P/N 045460) is an integral part of the Dionex SC-CERS 500, similar to the Cation Electrolytically Regenerated Suppressor (CERS 500) system. Its function is to ensure the separation of any hydrogen/oxygen gas generated in the Dionex SC-CERS 500 during the electrolytic operation.

The Gas Separator Waste Tube is used to avoid concentrating the gas in the waste container. The gas separator waste tube is shipped in the ED40, ED50, ED50A, CD20, CD25, CD25A, Dionex DX-320, and Dionex RFC-30 Ship Kits.

CAUTION: Do not cap the waste reservoir. The very small amount of hydrogen gas generated by the Dionex SC-CERS 500 is not dangerous unless the gas is trapped in a closed container and allowed to concentrate. The gas separator waste tube must be open to the atmosphere and not in a confined space to operate properly.

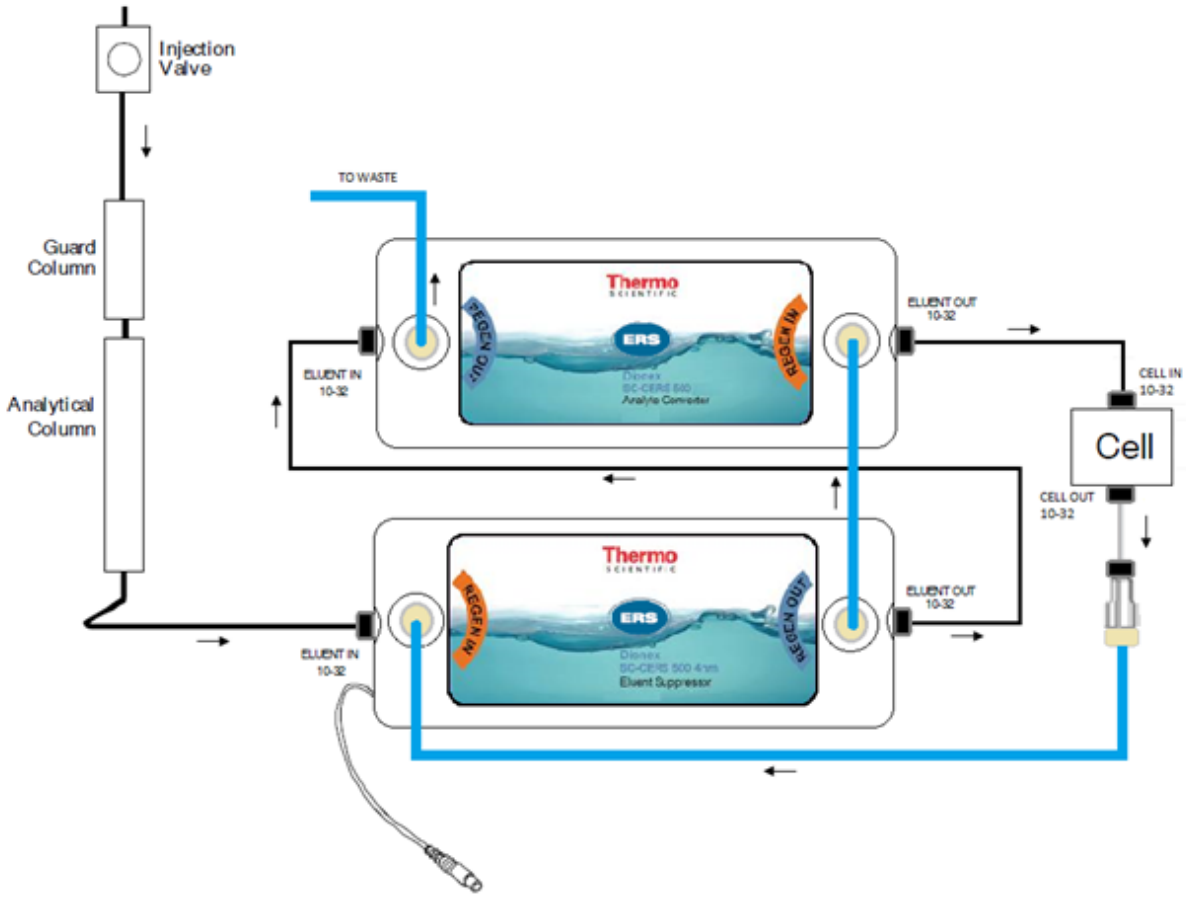
Procedure

1. Use one or two couplers (P/N 045463) to connect two or three lengths of 1/2" ID black polyethylene tubing (P/N 045462), depending of the depth of your waste container.

   It is important that the top of the waste separator tube extend above the top of the waste container as shown in the following figure.

2. Place the Gas Separator Waste Tube with the 1/8" OD tubing attached into the waste container. Ensure the following:
   - The bottom of the gas separator waste tube is resting on the floor of the waste container.
   - The top of the device (where the white 1/8" OD tubing meets the black 1/2" OD tubing) is above the top of the container.
   - The gas separator waste tube and the waste container are open to the atmosphere.

Figure 9 AutoSuppression Recycle Mode Plumbing Diagram



Setting the current for the electrolytically regenerated suppressor

Refer to AutoSuppression Recycle Mode, Using a Dionex RFC-10 or Dionex RFC-30 power supply to power the Dionex SC-CERS 500, and AutoSuppression External Water Mode for recommended current settings required for the chromatographic conditions required in the specific application being performed.

Procedure

- On CD20/25/25A, ED50/50A and ED40 detectors in Dionex DX-500, Dionex DX-600, and Dionex DX-320 instruments, use the Select keys to navigate to the SRS field in the Main Menu, then change the current setting.

  The read-out is the approximate current level.

Some general guidelines for setting the current are noted below.

- The lower the concentration of the eluent, the lower the current needed for total suppression. This depends on both the nature of the eluent components and their concentration.

- The lower the eluent flow rate, the lower the current required.
- Too high a current may create unnecessary baseline noise and reduce suppressor lifetime.
- Less current is required for Dionex SC-CERS 500 (2 mm) than Dionex SC-CERS 500 (4 mm).
- If background increases over time at a given current setting for a given application, increase current setting (see High background conductivity). The maximum recommended setting for the Dionex SC-CERS 500 (4 mm) is 300 mA. The maximum recommended setting for the Dionex SC-CERS 500 (2 mm) is 100 mA.
- If solvent is used in the eluent, use the current setting recommended for electrolytic suppression of aqueous eluents.

Power requirements

The existing SRS/ERS power supply can be used for powering the ES component of the Dionex SC-CERS 500 device. Choose SRS or ERS as the suppressor option when operating from Chromeleon, PeakNet, or from the front panel of the instrument.

The ES Component is an electrolytic device and will operate using any SRS/ERS power supply. The AC Component is a chemical suppressor and hence requires no power.

Always use the recommended currents for a given application. Calculate the optimum current for your application as described in Dionex SC-CERS 500 current settings and set this current using the ED50A, CD25A or Dionex RFC-10/RFC-30.

When using older equipment, choose the lowest current available. For example, for 4 mm applications (such as 20 mM MSA with CS12A columns or 26 mM MSA with CS16 columns) use 100 mA setting and for 2 mm applications use 50 mA setting. For other eluent strengths of MSA refer to Dionex SC-CERS 500 current settings for calculating the optimized current setting.

Operation

This section provides instructions for the start-up and operation of the Dionex SC-CERS 500. The selection and description of each of the suppression modes of operation are covered.

Chemical purity requirements

Obtaining precise and accurate results requires eluents that are free of ionic impurities. Chemicals and deionized water used to prepare MSA eluents must be of the purities described below. Water with low trace impurities and low particulate levels in eluents and regenerants also help protect your Dionex SC-CERS 500 and system components from contamination.

Thermo Fisher Scientific cannot guarantee proper Dionex SC-CERS 500 performance when the quality of the chemicals and water used to prepare eluents has been compromised.

Inorganic chemicals

Reagent-grade inorganic chemicals should always be used to prepare ionic eluents. Whenever possible, inorganic chemicals that meet or surpass the latest American Chemical Society standard for purity (universally accepted standard for reagents) should be used. These inorganic chemicals will detail the purity by having an actual lot analysis on each label. Thermo Fisher Scientific supplies high purity methanesulfonic acid (P/N 033478).

Solvents

Since solvents used with the Dionex SC-CERS 500 are added to ionic eluents to modify the ion exchange process or improve sample solubility, the solvents used must be free of ionic impurities. However, since most manufacturers of solvents do not test for ionic impurities, it is important that the highest grade of solvents available be used.

Currently, several manufacturers are making “Ultrahigh” purity solvents that are compatible for HPLC and spectrophotometric applications. These “ultrahigh” purity solvents will usually ensure that your chromatography is not affected by ionic impurities in the solvent.

Thermo Fisher Scientific has obtained consistent results using High Purity Solvents manufactured by Burdick and Jackson and Optima® Solvents manufactured by Fisher Scientific.

Deionized water

The deionized water used to prepare eluents should be degassed Type I Reagent Grade Water with a specific resistance of 18.2 megohm-cm. The water used for the AutoSuppression External Water Mode should have a specific resistance of 18.2 megohm-cm.

The deionized water should be free of ionized impurities, organics, microorganisms and particulate matter larger than 0.2 µm. It is good practice to filter eluents through a 0.2 µm filter whenever possible.

Bottled HPLC-Grade Water should not be used since most bottled water contains an unacceptable level of ionic impurities.

Finally, thoroughly degas all deionized water prior to preparing any eluents or regenerants.

Installation and start up

The Dionex SC-CERS 500 is installed in the column compartment of the chromatography module right after the analytical column and before the conductivity detector cell.

Procedure

1. Orient the Dionex SC-CERS 500 with the ELUENT IN port and the cable at the top; align the slots on the back of the Dionex SC-CERS 500 with the tabs on the panel.
2. Press in, and then down, to lock the Dionex SC-CERS 500 in place.
3. Lift up, then pull out to remove the Dionex SC-CERS 500. Make sure the Dionex SC-CERS 500 is plumbed properly, according to the selected mode of operation.

Refer to Installation for detailed instructions.

Table 10 Mounting locations

System	Mounting location
Dionex DX-600, DX-500, DX-320, ICS-1000, ICS-1500, ICS-2000, ICS-2100, ICS-2500, ICS-3000, ICS-5000, ICS-5000+ and Integrion	Dionex SC-CERS 500: Mounts on tabs on the component panel.
Dionex ICS-3000, ICS-5000, and ICS-5000+	Dionex SC-CERS 500 ES: Mounts on the CD in the DC module.
	Dionex SC-CERS 500 AS: Mounts on the suppressor plate of the second detector console (if fitted), or in the top section of the upper compartment.
Dionex ICS-2100, ICS-2000, ICS-1600, ICS-1500, ICS-1100, and ICS-1000	Dionex SC-CERS 500 ES: Mounts on the vertical suppressor brackets between the CD cell and column in the component panel.
	Dionex SC-CERS 500 AS: Mounts on the horizontal suppressor brackets at the top of the component panel.
Dionex Integrion	Dionex SC-CERS 500 ES: Mounts on the tangs in the detector compartment.
	Dionex SC-CERS 500 AS: Needs to be affixed next to the ES in the detector compartment using double sided tape or hook and loop.

CAUTION: The membranes and screens in the Dionex SC-CERS 500 must be completely hydrated to maintain liquid seals and chromatographic performance. This requirement is achieved by maintaining the regenerant chambers full of the appropriate regenerant solution when in operation or full of water during storage. This will ensure that the membranes and screens remain properly hydrated.

Regeneration

Complete the steps in the following topics before installing the Dionex SC-CERS 500 for the first time or after storage of the suppressor.

- Regenerate the Eluent Suppressor (ES)
- Regenerate the Analyte Converter (AC)

Regenerate the Eluent Suppressor (ES)

Procedure

1. Disconnect the lines to the component labeled Eluent Suppressor.

2. Attach a temporary waste line from the ELUENT IN port to a waste container.
3. Use a disposable plastic syringe push approximately 3 ml of 200 mN NaOH through the ELUENT OUT port.
4. Attach a temporary waste line from the REGEN OUT port to a waste container.
5. Push approximately 5 ml of 200 mN NaOH through the REGEN IN port.
6. Allow the ES component to sit for approximately 20 minutes to fully hydrate the suppressor membranes and screens.
7. Displace the 200 mN NaOH by pushing 3 mL of DI water through the ELUENT OUT port and 5 mL of DI water through the REGEN IN port.

Regenerate the Analyte Converter (AC)

Procedure

1. Disconnect the lines to the component labeled Analyte Converter.
2. Attach a temporary waste line from the ELUENT IN port to a waste container.
3. Use a disposable plastic syringe push approximately 3 mL of 200 mN MSA through the ELUENT OUT port.
4. Attach a temporary waste line from the REGEN OUT port to a waste container.
5. Push approximately 5 mL of 200 mN MSA through the REGEN IN port.
6. Allow the AC component to sit for approximately 20 minutes to fully hydrate the suppressor membranes and screens.
7. Displace the 200 mN MSA by pushing 3 mL of DI water through the ELUENT OUT port and 5 mL of DI water through the REGEN IN port.

CAUTION: Do not cap the waste reservoir. The very small amount of hydrogen gas generated by the Dionex SC-CERS 500 is not dangerous unless the gas is trapped in a closed container and allowed to accumulate. The Gas Separator Waste Tube must be open to the atmosphere and not in a confined space to operate properly.

8. After regeneration is complete, do the following:
9. Mount the suppressors and plug in the ES power cable. Plumb the Dionex SC-CERS 500 components according to the mode of operation.

10. Turn on the power to the Dionex SC-CERS 500 and establish eluent flow through the Dionex SC-CERS 500. Be sure to turn on the SRS or ERS Control power and the pump flow at the same time.

CAUTION: Always turn the pump and the SRS/ERS Control on and off at the same time.

CAUTION: Eluent flow through the Dionex SC-CERS 500 is required for proper operation. However, without current, the membranes and screens in the Dionex SC-CERS 500 will become expended of regeneration ions by the flowing eluent, resulting in small analyte peak areas. If this should occur, perform the procedure outlined in Decreased sensitivity.

11. Start operation. Allow the system to equilibrate before beginning analysis.

Quick start instructions

Complete the following steps before installing the Dionex SC-CERS 500 for the first time or after storage of the suppressor:

- ES - Eluent Suppressor Quick Start
- AC - Analyte Converter Quick Start

ES - Eluent Suppressor Quick Start

Procedure

1. Disconnect the lines to the component labeled Eluent Suppressor.
2. Attach a temporary waste line from the ELUENT IN port to a waste container.
3. Use a disposable plastic syringe push approximately 3 mL of deionized water through the ELUENT OUT port.
4. Attach a temporary waste line from the REGEN OUT port to a waste container.
5. Push approximately 5 mL of deionized water through the REGEN IN port.
6. Allow the ES component to sit for approximately 20 minutes to fully hydrate the suppressor membranes and screens.

AC - Analyte Converter Quick Start

Procedure

1. Disconnect the lines to the component labeled Analyte Converter.
2. Attach a temporary waste line from the ELUENT IN port to a waste container.
3. Use a disposable plastic syringe push approximately 3 mL of deionized water through the ELUENT OUT port.
4. Attach a temporary waste line from the REGEN OUT port to a waste container.
5. Push approximately 5 mL of deionized water through the REGEN IN port.
6. Allow the AC component to sit for approximately 20 minutes to fully hydrate the suppressor membranes and screens.

Installing the Dionex SC-CERS 500

Procedure

1. Remove all existing backpressure coils and long lengths of tubing leading into the conductivity cell.

   No backpressure coils are required for the Dionex SC-CERS 500 suppressor operation.
2. Assemble and install the Gas Separator Waste Tube and the waste line
3. Install the two regenerated Dionex SC-CERS 500 components (ES and AC components) using the lines and fittings shipped with the Dionex SC-CERS 500.

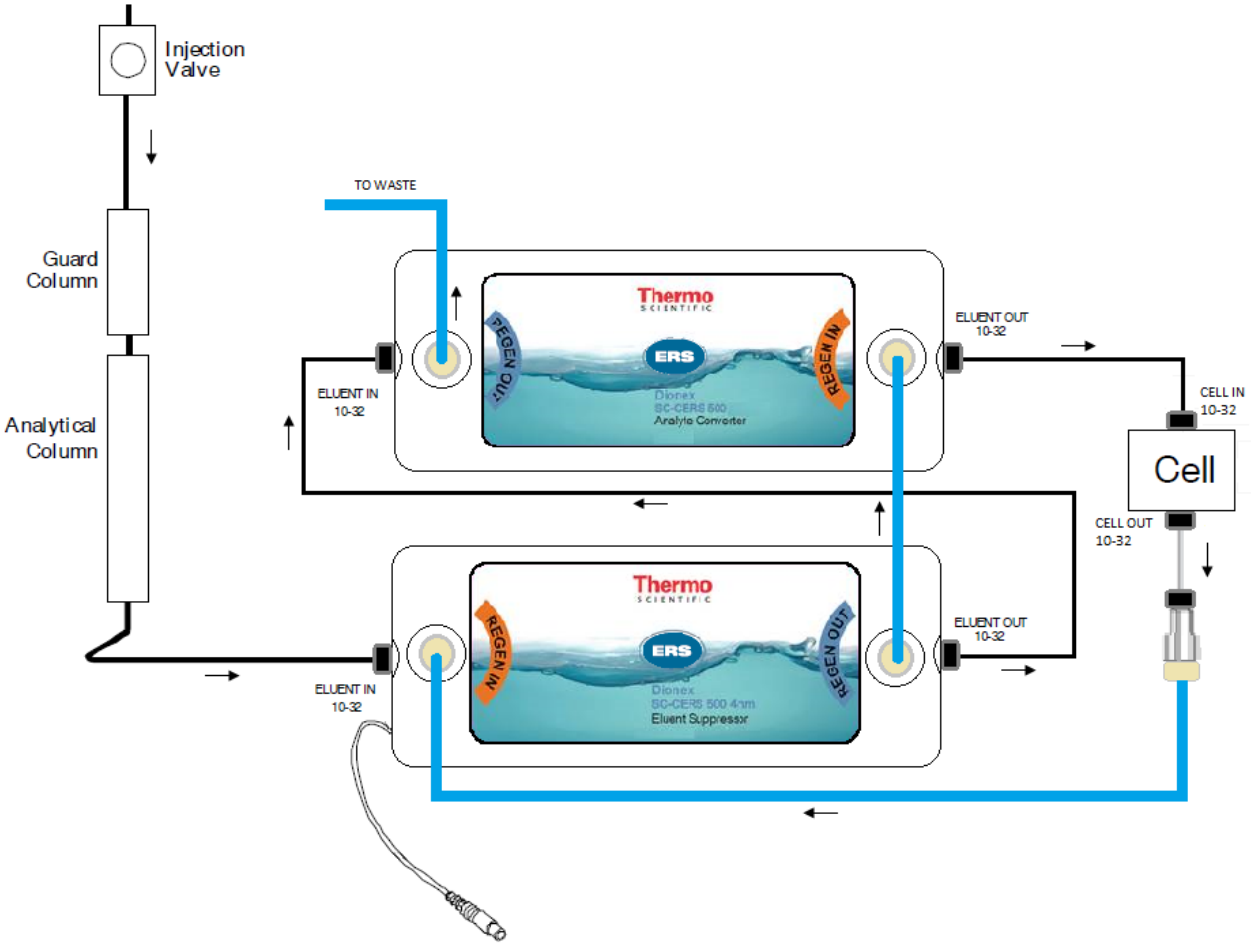
Plumbing for Autosuppression Recycle Mode

The AutoSuppression Recycle Mode is the easiest method of operation. As the eluent passes through the suppressor, it is substantially neutralized to produce its weakly ionized form.

After passing through the conductivity cell, this effluent is redirected to the regenerant inlet on the ES component, thus supplying it with a source of water containing a small amount of dilute MSA and diluted analyte (see the following figure). The main advantage of this mode is its simplicity and ease of use. It is not necessary to have an external supply of water available for the suppressor. Refer to Select an operation mode to select the appropriate mode of operation for your application.

CAUTION: Only use the AutoSuppression Recycle Mode for MSA eluents without organic solvents.

Figure 10 AutoSuppression Recycle Mode Plumbing Diagram



Eluent flow path connections in the AutoSuppression Recycle Mode

Depending on the specific components (analytical column, conductivity cell) in the system, 1/4-28 or 10-32 ferrule/bolt liquid lines may be required. All necessary tubing and fittings are supplied in the system, detector, Dionex RFC-10 or Dionex RFC-30 Ship Kits.

To purchase or assemble 1/4-28 or 10-32 ferrule/bolt liquid lines, refer to, “DIONEX Liquid Line Fittings” (P/N 031432). Always use 0.005" ID PEEK tubing with 10-32 ferrule/bolt fittings on 2 mm systems. Use 0.010" ID PEEK tubing with 10-32 ferrule/bolt fittings on 4 mm systems.

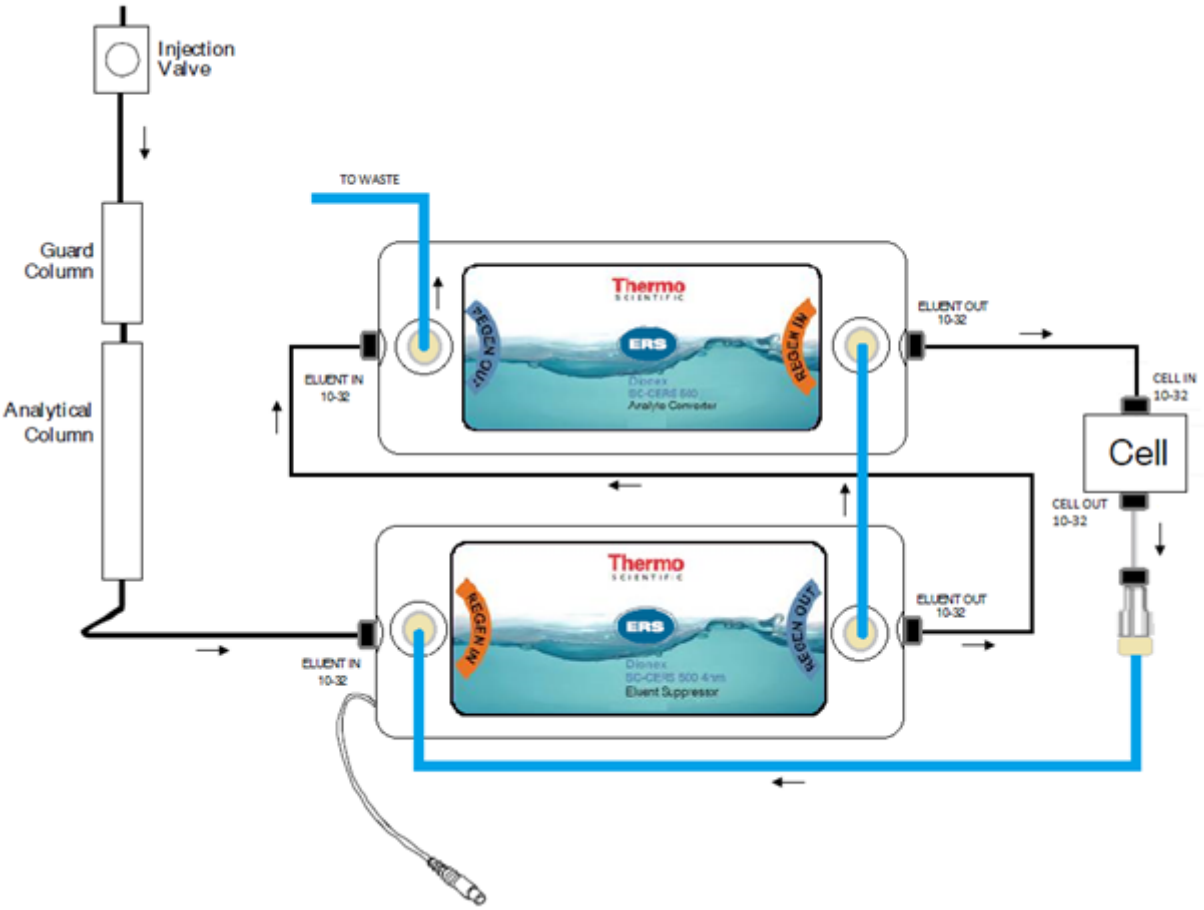
Install the Dionex SC-CERS 500 in the Chromatography Module as described in Installation.

Plumbing

The Dionex SC-CERS 500 comes pre-plumbed, and the detailed plumbing schematic is shown in the figure below.

Procedure

1. The column outlet should be connected to the line labeled “Column Out.”
2. The line labeled “Cell in” should be connected to the conductivity cell inlet.
3. Do not connect any backpressure coils or additional tubing that may add backpressure to the conductivity cell. Remove all preinstalled tubing and backpressure coils.
4. The line from the conductivity cell should be connected using a coupler to an 1/8" line labeled “Cell Out”. An 1/8" waste line should be connected to the port labeled “To Waste.” Do not use 1/16" black/colored tubing for the waste line because this tubing adds backpressure to the device.
5. Install a gas separator waste tube at the end of the waste line.



AutoSuppression Recycle Mode

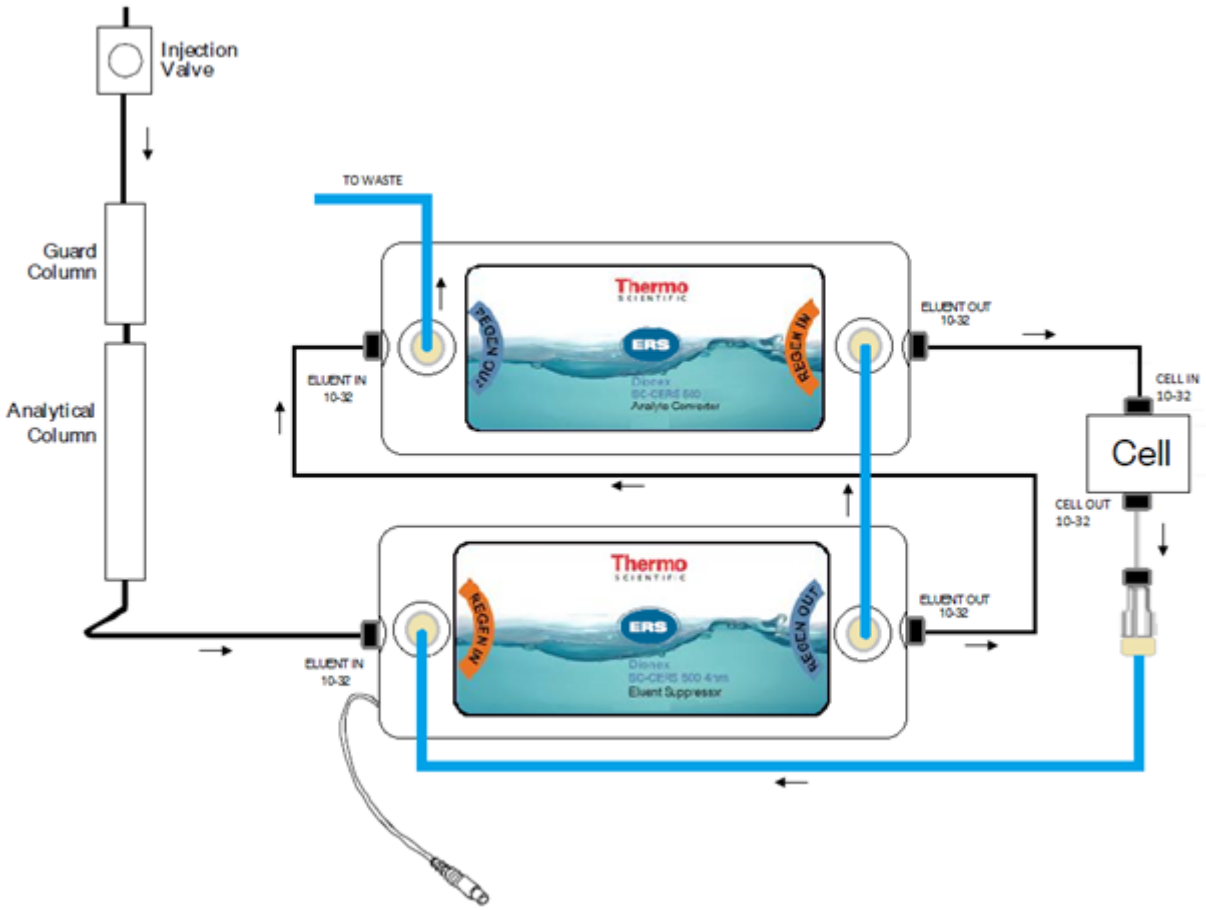
The Eluent Suppressor in the Dionex SC-CERS 500 uses dilute MSA and electrolysis as the regenerant and has the ability to provide continuous suppression. See Recommended current settings to determine the correct amount of current that should be applied to a Dionex SC-CERS 500.

Always operate the Dionex SC-CERS 500 at the lowest current setting that will suppress the eluent. Increasing the current setting will not improve the performance and could damage the suppressor. The operation of the Dionex SC-CERS 500 requires a constant flow of the water over the membrane, in a direction that is concurrent to the flow of the eluent.

In the AutoSuppression Recycle Mode, the eluent leaving the conductivity cell is recycled through the regenerant chambers as the water supply. This eliminates the need for an external regenerant water supply. See the following figure.

When the Dionex SC-CERS 500 is operating in this mode, the amount of water flowing through the regenerant chambers is limited to the eluent flow rate. Because of this limitation, the AutoSuppression Recycle Mode cannot be used with eluents containing organic solvents. The Dionex SC-CERS 500 should be operated in the AutoSuppression External Water Mode for eluents containing organic solvents

Figure 11 AutoSuppression Recycle Mode Plumbing Diagram



Dionex SC-CERS 500 current settings

NOTE: Dionex SC-CERS 500 applications will operate best at current settings of 300 mA or lower. Operating the Dionex SC-CERS 500 (4 mm) at current settings over 300 mA or Dionex SC-CERS 500 (2 mm) at current settings over 100 mA can reduce the life of the suppressor.

Table 11 Matching the Current Setting to the Eluent Concentration and Flow Rate for the Dionex SC-CERS 500 in the AutoSuppression Recycle Mode

Eluent Concentration, Methanesulfonic Acid, mM	Eluent Flowrate mL/min	Optimized current setting (mA)	Current Selection with older systems (mA)
9	0.25	7	50
9	1.00	27	50
10	0.25	8	50
10	0.50	15	50
10	1.00	30	50

Eluent Concentration, Methanesulfonic Acid, mM	Eluent Flowrate mL/min	Optimized current setting (mA)	Current Selection with older systems (mA)
10	1.25	37	50
10	2.00	59	100
16	0.50	24	50
16	2.00	95	100
18	1.00	53	100
18	0.50	27	50
20	0.25	15	50
20	0.50	30	50
20	1.00	59	100
22	0.25	17	50
22	0.50	33	50
25	0.36	27	50
26	1.00	77	100
28	1.00	82	100
30	0.36	32	50
30	1.00	88	100
33	0.50	49	50
33	0.80	78	100
33	1.00	97	100
34	1.00	100	100
35	0.25	26	50
35	1.00	103	300
36	1.00	106	300
38	0.36	41	50
40	0.25	30	50
40	1.00	117	300
44	1.00	129	300
48	1.00	141	300
52	0.43	66	100
56	0.36	59	100

NOTE: Dionex SC-CERS 500 applications will operate best at the optimized current setting. Excess current can reduce the life of the suppressor.

ERS maximum current setting

To ensure the optimal performance of the Dionex SC-CERS 500, avoid applying excess current to the suppressors. Excess operation currents lead to excess heat generation, which can reduce the suppressor lifetime and cause higher chromatographic baseline noise.

Dionex SC-CERS 500 (4 mm) – Do not exceed 300 mA
Maximum Current (mA) = sum of eluent concentration (mN) * flow rate (ml/min) * 4

Dionex SC-CERS 500 (2 mm) – Do not exceed 100 mA
Maximum Current (mA) = sum of eluent concentration (mN) * flow rate (ml/min) * 4

Recommended current settings

The following equations determine the correct amount of current that should be applied to a Dionex SC-CERS 500 based on the eluent concentration (mN) and flow rate (mL/min) for an application.

Dionex SC-CERS 500 (4 mm)
Operating Current (mA) = sum of eluent concentration (mN) * flow rate (mL/min) * 2.924

Dionex SC-CERS 500 (2 mm)
Operating Current (mA) = sum of eluent concentration (mN) * flow rate (mL/min) * 2.924

Maximum suppression capacity

Sum of Eluent Concentration Calculation

When using the Dionex SC-CERS 500 (4 mm) and Dionex SC-CERS 500 (2 mm), the sum of the eluent concentration can be calculated using the equation below:

Sum of eluent concentration (mN) = MSA (mM)

Using Thermo Scientific PeakNet 6.4 to power the Dionex SC-CERS 500

For optimal suppressor performance, it is important to use the recommended suppressor currents for the target applications. The Program Wizard of the Dionex Chromatography Management System (see Control Programmed Program Wizard) guides you in setting the recommended current for the Dionex SC-CERS 500.

The Wizard supplies a recommended current based on the eluent concentration and flow rate settings (See Recommended current settings to determine the correct amount of current that should be applied to a Dionex SC-CERS 500.). The Dionex Chromatography Management System automatically enters the recommended current into the Program and applies that current to the Dionex SC-CERS 500.

When setting the current to the Dionex SC-CERS 500 using the Chromeleon Wizard, choose CERS as the suppressor type.

NOTE: In Chromeleon, the suppressor current could also be entered manually by editing the program file. For calculating the current manually, refer to Dionex SC-CERS 500 current settings.

Using a Dionex RFC-10 or Dionex RFC-30 power supply to power the Dionex SC-CERS 500

See the Reagent-Free Controller Manual for details instructions.

Plumbing for the Auto Suppression External Water Mode

Any analysis that can be performed using the AutoSuppression Recycle Mode can be done using the AutoSuppression External Water Mode. However, for eluents that do not contain any solvents the AutoSuppression Recycle Mode is preferred. A constant source of deionized water having a specific resistance of 10 megohm or greater is supplied to the regenerant chambers to generate hydroxide ions for neutralization.

Refer to Select an operation mode to select the appropriate mode of operation for your application.

CAUTION: The AutoSuppression External Water Mode must be used whenever organic solvents up to 40% are present in the eluent.

Eluent flow path connections in the AutoSuppression External Water Mode

Depending on the specific components (analytical column, conductivity cell) in the system, 1/4-28 or 10-32 ferrule/bolt liquid lines may be required. All necessary tubing and fittings are supplied in the detector or Dionex RFC-10 or Dionex RFC-30 Ship Kits. To purchase or assemble 1/4-28 or 10-32 ferrule/bolt liquid lines, refer to, “DIONEX Liquid Line Fittings” (P/N 031432).

Always use 0.005" ID PEEK tubing with 10-32 ferrule/bolt fittings on 2 mm systems. Use 0.010" ID PEEK tubing with 10-32 ferrule/bolt fittings on 4 mm systems.

Install the Dionex SC-CERS 500 in the Chromatography Module as described in System requirements.

Plumbing

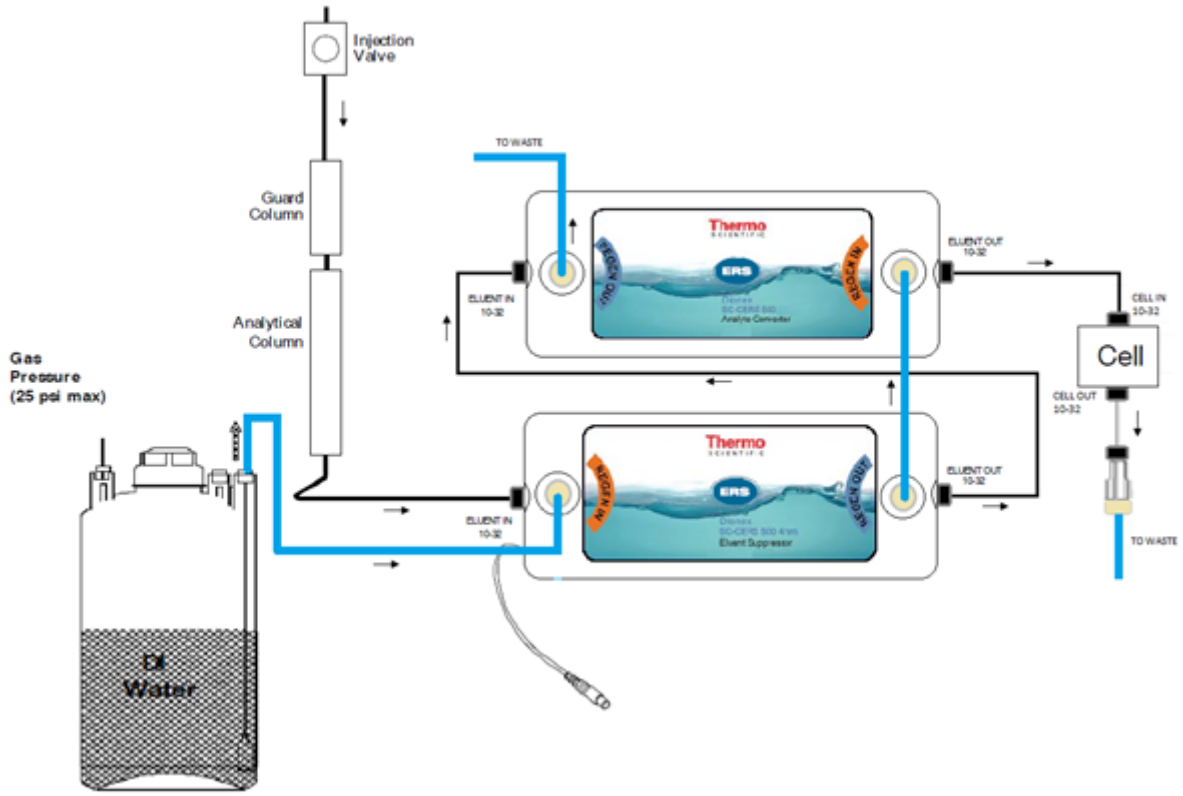
The Dionex SC-CERS 500 comes pre-plumbed and the detailed plumbing schematic is shown in the following figure.

Procedure

1. The column outlet should be connected to the line labeled “Column Out.”
2. The line labeled “Cell in” should be connected to the conductivity cell inlet.
3. Do not connect any backpressure coils or additional tubing that may add backpressure to the conductivity cell. Remove all preinstalled tubing and backpressure coils.
4. The line from the conductivity cell should be connected using a coupler to an 1/8" waste line and diverted to waste.

CAUTION: No backpressure is required for the Dionex SC-CERS 500 suppressor. Remove any backpressure coils, if present.

Figure 12 AutoSuppression External Water Mode Plumbing Diagram



Regenerant flow path connections in the AutoSuppression External Water Mode using the pressurized water delivery system

The External Regenerant Installation Kit (P/N 038018) contains all of the components needed to install and operate the Dionex SC-CERS 500 with a pressurized water reservoir. The kit contains one 4-L bottle, one pressure regulator (0-30 psi/0-210 KPa) and appropriate tubing (P/N 039164).

Procedure

1. Make the following air line connections:
   a. Locate the pieces of tinted 1/8" OD plastic tubing (P/N 050089) supplied in the Installation Parts Kit.
   b. Push the end of one piece of 1/8" OD tubing over the barbed fitting of the regulator. Connect the other end of the tubing to the source of air pressure.
   c. Push one end of the second piece of 1/8" OD tubing over the other barbed fitting of the regulator. Push the other end of this tubing over the barbed fitting (P/N 050077) in the pressure inlet of the plastic reservoir (see the figure below).
2. Make the following water line connections.

a. Use a coupler (P/N 039056) to connect one end of the 30" tubing assembly (P/N 035727) that comes in the Installation Kit to the water reservoir. Connect the other end of this tubing to the REGEN IN port of the Eluent Suppressor component of the Dionex SC-CERS 500.

b. Using a coupler (P/N 039056) and a 1/8" OD piece of tubing (P/N 035728) from the Installation Kit, connect one end of this line to the waste port of the Dionex SC-CERS 500 and then connect the other end of the line to the Gas Separator Waste Tube.

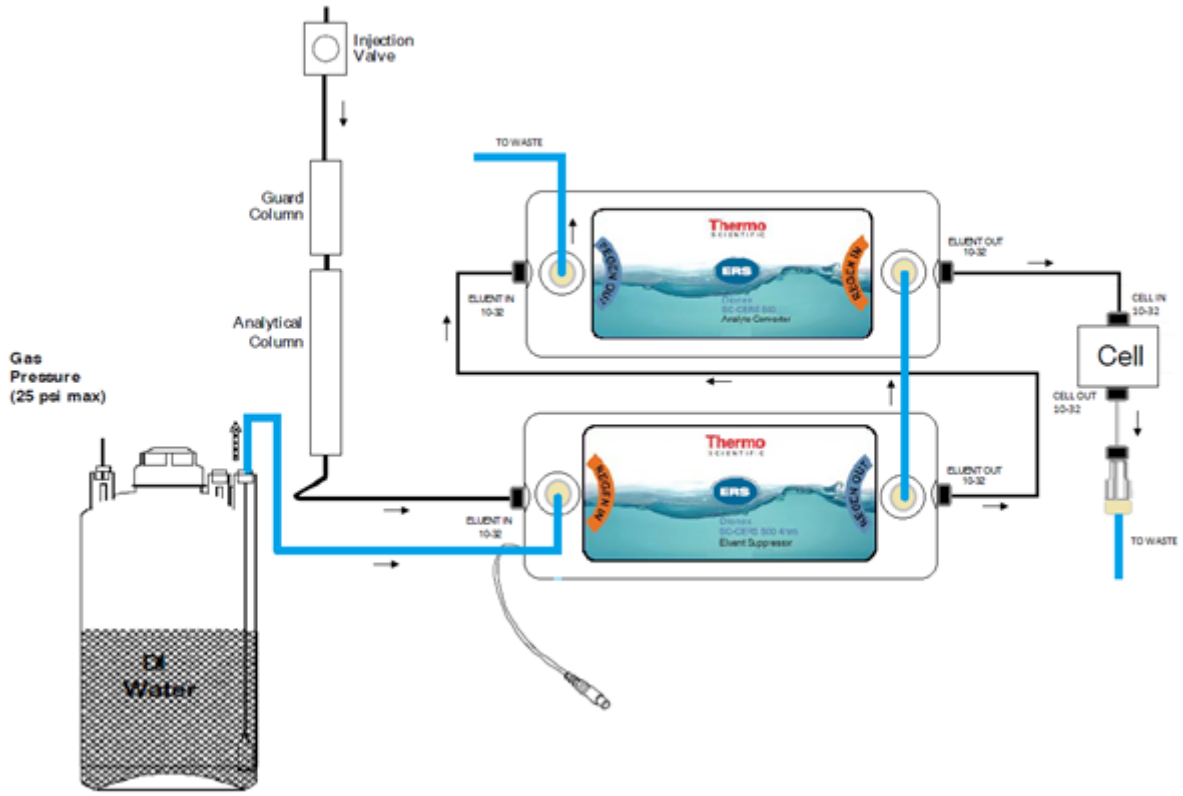
3. Fill the water source reservoir. Make sure that the O-ring is inside the cap of the reservoir before screwing the cap onto the reservoir. Screw the cap onto the reservoir tightly and place the reservoir near the Chromatography Module.

4. With no current applied, use the air pressure gauge to adjust the external water flow rate to approximately 3-5 mL/ min for the Dionex SC-CERS 500 (4 mm) and 1-2 mL/min for the Dionex SC-CERS 500 (2 mm).

   The external water flow rate is controlled by two factors: the pressure applied to the water reservoir (0-25 psi) and the current setting on the Electrolytically Regenerated Suppressor Control unit. After the current is applied, the flow rate will drop due to gas formation in the regenerant chambers and the pressure must then be adjusted to give the correct flow rate at the specific current setting required for the application.

   See AutoSuppression External Water Mode.

Figure 13 AutoSuppression External Water Mode Plumbing Diagram



NOTE: A safety relief valve on the reservoir regulator prevents pressure greater than 25 psi from being applied to the water reservoir.

AutoSuppression External Water Mode

The Dionex SC-CERS 500 uses water as the regenerant and has the ability to provide continuous suppression. The Dionex SC-CERS 500 suppressor uses the same current in External Water Mode as Recycled Eluent Mode. See Recommended current settings to determine the correct amount of current that should be applied to a Dionex SC-CERS 500.

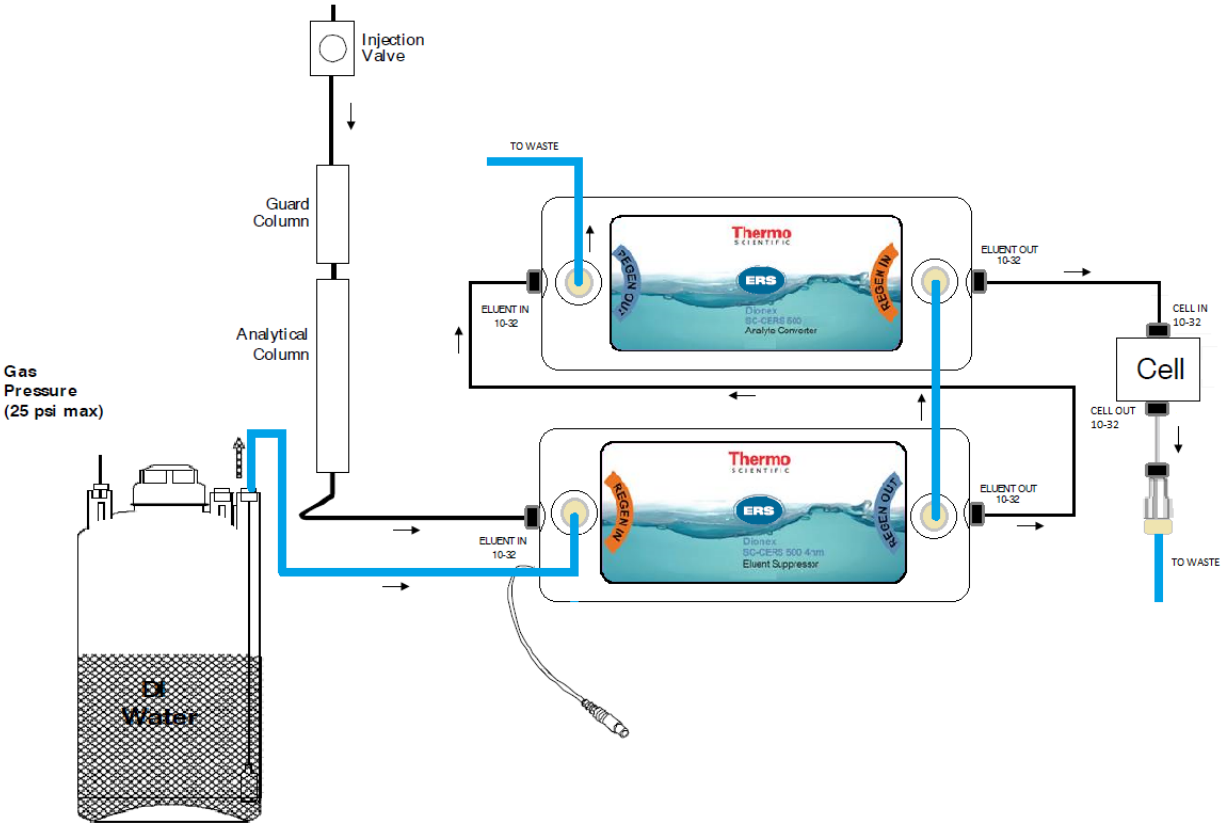
Always operate the Dionex SC-CERS 500 at the lowest current setting that will suppress the eluent. Increasing the current setting will not improve the performance and could damage the suppressor. The operation of the Dionex SC-CERS 500 requires a constant flow of the water over the membrane, in a direction that is concurrent to the flow of the eluent.

The AutoSuppression External Water Mode requires an external source of deionized water for the regenerant chambers. When the Dionex SC-CERS 500 is operating in this mode, the amount of water flowing through the regenerant chambers is independent of the eluent flow rate.

The AutoSuppression External Water Mode is the mode used when up to 40% organic solvents are present in the eluent. It eliminates the potential for buildup of contaminating ions resulting from the oxidation of solvents.

The Dionex SC-CERS 500 must be operated in the AutoSuppression External Mode with eluents containing up to 40% solvent. When using solvents in the eluent it is strongly recommended to use an ED50A, CD25A, IC25A, or Dionex RFC-10 to optimize the current setting, which will extend suppressor lifetime.

Figure 14 The AutoSuppression External Water Mode Plumbing Diagram



Dionex SC-CERS 500 Current Settings for AutoSuppression External Water Mode

NOTE: Dionex SC-CERS 500 applications will operate best at current settings of 300 mA or lower. Operating the Dionex SC-CERS 500 4- mm at current settings over 300 mA or Dionex SC-CERS 500 2 mm at current settings over 100 mA can reduce the life of the suppressor.

Table 12 Matching the Current Setting and Regenerant Flow Rate to the Eluent Concentration and Flow Rate for the Dionex SC-CERS 500 in the AutoSuppression External Water Mode[a]

Eluent Concentration, Methanesulfonic Acid, mM	Eluent Flowrate mL/min	Optimized current setting (mA)	Current Selection with older systems (mA)
9	0.25	7	50
9	1.00	27	50
10	0.25	8	50
10	0.50	15	50
10	1.00	30	50
10	1.25	37	50
10	2.00	59	100
16	0.50	24	50
16	2.00	95	100
18	1.00	53	100
18	0.50	27	50
20	0.25	15	50
20	0.50	30	50
20	1.00	59	100
22	0.25	17	50
22	0.50	33	50
25	0.36	27	50
26	1.00	77	100
28	1.00	82	100
30	0.36	32	50
30	1.00	88	100
33	0.50	49	50
33	0.80	78	100
33	1.00	97	100
34	1.00	100	100
35	0.25	26	50
35	1.00	103	300
36	1.00	106	300
38	0.36	41	50
40	0.25	30	50
40	1.00	117	300

[a] Measured with power ON using a graduated cylinder. Higher current settings require higher pressures applied to the pressurized regenerant delivery bottle to maintain adequate regenerant flow.

Eluent Concentration, Methanesulfonic Acid, mM	Eluent Flowrate mL/min	Optimized current setting (mA)	Current Selection with older systems (mA)
44	1.00	129	300
48	1.00	141	300
52	0.43	66	100
56	0.36	59	100

Background and noise

The Dionex SC-CERS 500 device will give a higher background than a standard CERS 500 suppressor for a given application. This is due to the fact that the device transfers MSA across the membranes in order to aid dissociation of weak bases. This transfer increases the background.

For a system operating under optimal conditions:

- Using CS12A operated with 20 mM MSA, the expected background should be less than 5 µS/cm and the peak to peak noise < 3 nS/cm.
- Using CS16 operated with 30 mM MSA at 65°C, the expected background should be less than 7 µS/cm and peak to peak noise < 4 nS/cm.

The following table shows the expected backgrounds at various concentrations.

Eluent Concentration	Expected Background (4 mm)	Expected Background (2 mm)
≤20 mM	< 5 µS/cm	< 5 µS/cm
20 – 30 mM	< 7 µS/cm	< 7 µS/cm
30 – 40 mM	< 15 µS/cm	< 10 µS/cm
40 – 50 mM	< 40 µS/cm	< 10 µS/cm

Some differences in background may occur dependent on the ambient temperature of the laboratory. Also note that the noise will increase with increasing background.

Storing the Dionex SC-CERS 500

The Dionex SC-CERS 500 is shipped with deionized water as the storage solution. When the suppressor is removed from service and will not be used for more than one day, prepare it for storage. The screens and membranes in the Dionex SC-CERS 500 must be completely hydrated to maintain liquid seal and chromatographic performance.

See the following topics:

- Short-term storage (1 to 5 days)
- Long-term storage (more than 5 days)

Short-term storage (1 to 5 days)

Procedure

1. Plug all eluent ports. Connect one end of the storage line that is shipped with the Dionex SC-CERS 500 to the REGEN OUT port. Using a plastic syringe, push deionized water through the REGEN IN port, and through the storage line until all bubbles are removed. Attach the free end of the filled storage line to the REGEN IN port.
2. To resume operation, connect the suppressor to the system. Allow the system to equilibrate before starting analysis.

NOTE: If the eluent last used contained organic solvents, flush the Dionex SC-CERS 500 with deionized water for 10 minutes through both chambers before plugging the fitting ports.

Long-term storage (more than 5 days)

Procedure

1. Attach the storage line that is shipped with the Dionex SC-CERS 500 to the REGEN OUT port.
2. Flush the Dionex SC-CERS 500 with deionized water for 10 minutes.
3. Plug all Dionex SC-CERS 500 eluent ports. Connect the filled storage line to the REGEN IN port.
4. To resume operation, perform a quick start before connecting the suppressor to the system. Allow the system to equilibrate before starting analysis.

4

Troubleshooting

This section provides solutions for operating problems that might arise while using the Dionex SC-CERS 500. For more information on problems that originate with the Ion Chromatograph or the specific cation exchange column set in use, refer to the Troubleshooting Guide in the appropriate Installation Manual.

If you cannot solve the problem on your own, contact the Thermo Scientific Regional Office nearest you.

CAUTION: Do not allow eluent to flow through the Dionex SC-CERS 500 without the power turned on. Doing so will cause noticeable anomalous analyte peak areas. If this should occur, perform the procedure outlined in Nonlinear response or loss of sensitivity.

Electrolytically Regenerated Suppressor Operational Status Displays

Alarm State for ED50A, CD25A, and IC25A (Dionex DX-600 System with Chromeleon 6.2 SP2 or later)

ED50A, CD25A, and IC25A modules in Dionex DX-600 systems equipped with Chromeleon 6.2 SP2 or later chromatography workstation provides full operation control to the Dionex SC-CERS 500. When using these modules, the suppressor type and current setting will be shown on the module front panel.

The "Open circuits are detected from the suppressor" error message can be caused by incorrect identification of the suppressor being used or the suppressor is damaged.

Procedure

- Make sure that the SRS cable is connected properly to the Dionex SC-CERS 500 suppressor, the CERS suppressor type is selected, and the eluent flow is on.

If the problem persists, it is possible that the Dionex SC-CERS 500 suppressor is damaged or fouled. See Cleanup. Check and ensure it is identified as a CERS suppressor.

Dionex RFC-10 suppressor controller is “not enabled” for Dionex DX-600, Dionex DX-500, and Dionex DX-320 operation

The Dionex RFC-10 suppressor controller is required to operate the Dionex SC-CERS 500 in IC systems without Chromeleon and a Dionex ICS system with suppressor power supply. Refer to the Dionex RFC-10 operator's manual for details on its installation and operation.

When the Dionex RFC-10 module status says “not enabled” even through the pump is on, perform the following steps to solve the problem.

Procedure

1. Check the TTL-2 OUT connector for a loose wire.
2. Check that the pump TTL2 output is set to 0 Flow in the Pump Options screen.

Alarm states for the CD20/ED40 (Dionex DX-500 Instruments)

When using these detectors, the power setting will be shown on the screen when the ERS is on. The SRS/ERS cable must be connected to the ERS and conductive liquid must be flowing to prevent an alarm state.

When the SRS/ERS Control unit is in shutdown mode after detecting a malfunction in the system, an alarm message “SRS Alarm” will flash on the screen. To determine the cause, follow the steps below.

Procedure

1. Press **Menu**, then navigate to **Diagnostics Menu** > **Analog Status**.

   On the left side of the screen, two fields give the SRS/ERS status:
   - **SRS CONNECTED: Y (or N)**: This indicates that the Dionex SC-CERS 500 is connected. If it shows “N,” connect the SRS/ERS cable.
   - **SRS OVER VOLT: N (or Y)**: This indicates whether the Dionex SC-CERS 500 has a voltage higher than the upper limit (7.5 to 8 V). Lower the power setting on the front panel.

Suppressor high voltage error message

Procedure

- Verify that the Dionex SC-CERS 500 is connected to the power supply and the current is set properly (see Recommended current settings).

The Electrolytically Regenerated Suppressor does not support electrolysis: There is no conductive liquid in the eluent and/or the regenerant chamber(s). Causes of this malfunction may include the following:

- Lack of eluent and regenerant flow.
- Plugged or leaking tubing.
- Plugged or leaking or fittings.
- Lack of pneumatic pressure on the eluent or water bottles in the AutoSuppression External Water Mode.
- Empty eluent or water bottles.
- Analytical pump is not operating.
- Eluent is non-ionic liquid.

High background conductivity

Procedure

1. Check that the Dionex SC-CERS is operating at the correct current (see Recommended current settings), and that there are no suppressor alarms.
2. Check for eluent flow out of the ELUENT OUT port of the Eluent Suppressor component of the Dionex SC-CERS 500.
   a. If there is no flow out of the ELUENT OUT port, make sure that eluent is entering the Dionex SC-CERS 500 at the ELUENT IN port. If there is no flow at this point, trace the eluent flow path backward through the system to find and remove the blockage.
   b. If there is flow into the Dionex SC-CERS 500 but not out, and there are no visible leaks from the side seam of the suppressor, a break in the membrane is probably allowing eluent to leak into the regenerant chambers. If this is the case, then the Dionex SC-CERS 500 must be replaced. The Dionex SC-CERS 500 is sealed during manufacture. Attempting to open it will destroy it.
   c. If there is flow into and out of the Eluent Suppressor, then check the Analyte Converter for eluent flow out by following the above steps.

CAUTION: Do not attempt to disassemble the Dionex SC-CERS 500.

d. If there is flow from the ELUENT OUT ports of both suppressors, but no eluent suppression, the membranes may have been contaminated. Try to restore system performance by cleaning the membranes (see Cleanup).

3. Remake the eluent to be sure that the concentration is correct. Be sure that chemicals of the required purity were used to make the eluent (see Chemical purity requirements).

   If the eluent concentration is high, the Dionex SC-CERS 500 may not be set up to suppress this high concentration, resulting in high background conductivity. See Recommended current settings to determine the correct amount of current that should be applied to a Dionex SC-CERS 500.

4. Increase the power setting on the suppressor. Raising the current above 300 mA for a 4mm ES suppressor or above 100 mA for a 2mm ES suppressor will shorten the suppressor lifetime.

Drifting baseline

If the baseline drifts steadily upward, increase the current setting to reduce the background conductivity. As the background conductivity decreases, the baseline drift should decrease.

Baseline instability or excessive drift

Thermo Fisher Scientific recommends a 1M MSA treatment for the Analyte Converter component. Wear appropriate safety gear during this operation.

Procedure

1. Disconnect the lines to the device labeled Analyte Converter and perform the following treatment to the Analyte Converter device.
2. Push 3 mL of 1 M MSA using a syringe through ELUENT IN port and divert a line out of ELUENT OUT port to waste.
3. Push 5 mL of 1 M MSA using a syringe through REGEN IN port and divert a line out of REGEN OUT port to waste.
4. Allow the Analyte Converter unit to equilibrate for 20 minutes.
5. Repeat steps 2 and 3 with DI water and reinstall the unit on the system.

Nonlinear response or loss of sensitivity

Nonlinear response and loss of sensitivity may occur from carbonate contamination. Thermo Fisher Scientific recommends a freshly prepared 1M base treatment under these conditions for the Eluent Suppressor component. Wear appropriate safety gear during this operation.

Procedure

1. Disconnect the lines to the Eluent Suppressor and perform the following treatment on the Eluent Suppressor component.
2. Push 3 mL of 1 M NaOH using a syringe through ELUENT IN port and divert a line out of ELUENT OUT port to waste.
3. Push 5 mL of 1 M NaOH using a syringe through REGEN IN and divert a line out of REGEN OUT port to waste.
4. Allow the Eluent Suppressor unit to equilibrate for 20 minutes
5. Repeat steps 2 and 3 with DI water and reinstall the unit on the system.
6. Repeat treatment for a longer time if problem persists.

Decreased sensitivity

Procedure

1. Ensure that the injection valve is operating correctly. Refer to the valve manuals that accompany the chromatography module for troubleshooting assistance. Be sure to check the slider port faces for damage.
2. If sensitivity remains low, clean the suppressor membranes (see Cleanup).
3. Replace the Dionex SC-CERS 500 if cleaning the suppressor membrane does not restore sensitivity.
4. Verify that no backpressure coils are installed. Remove long lengths of connector or waste line tubing if necessary.

System backpressure increases over time

If the increased backpressure does not affect system performance, no maintenance is necessary.

Procedure

1. Check the inlet frits on the guard and analytical column and replace them if necessary. The most common cause of increasing system back pressure is a contaminated frit in the analytical or guard column inlet end fitting. The complete instructions for replacing column bed support assemblies are in Document No. 032285.

   Recheck the system back pressure. If it remains high, go on to the next step. Eluents and samples should be filtered using 0.45 µm filters.

2. Find and eliminate any system blockage. Bypass the Dionex SC-CERS 500 by coupling the lines attached to the ELUENT IN and ELUENT OUT ports.

   If the back pressure decreases by less than 150 psi with the Dionex SC-CERS 500 out of line, a blockage in the system rather than in the Dionex SC-CERS 500 is causing the high pressure

3. Remove a blockage from Dionex SC-CERS 500 by reversing the eluent flow. If the back pressure decreases by more than 150 psi with the Dionex SC-CERS 500 out of line, the high pressure may be caused by a blockage in the Dionex SC-CERS 500. Reverse the direction of flow of the eluent or both the eluent and the external water through the Dionex SC-CERS 500.
   - After the pressure drops, allow eluent, or eluent and regenerant, to flow to waste for several minutes after the pressure drops. Perform the steps in Installation and start up and reinstall the Dionex SC-CERS 500 in the appropriate configuration.

4. Clean the suppressor membranes if reversing the flow through the Dionex SC-CERS 500 does not decrease the pressure (see Cleanup).

5. Replace the Dionex SC-CERS 500 if cleaning the suppressor membrane does not reduce the pressure.

Liquid leaks

If there is leakage from the bottom or side seam of the Dionex SC-CERS 500, check the system back pressure.

Procedure

- If the system back pressure is greater than 100 psi, the leaks are caused by excessive back pressure downstream from the Dionex SC-CERS 500. Find and eliminate the source of the pressure.

  The Dionex SC-CERS 500 will usually recover from momentary overpressure conditions if allowed to stand approximately 20 minutes with the membranes fully hydrated (see Installation and start up).

If the Dionex SC-CERS 500 continues to leak when operated within the proper back pressure range, it must be replaced. Backpressure greater than 125 psi after the suppressor can cause irreversible damage.

Cleanup

This section describes routine cleanup procedures for the Dionex SC-CERS 500 in the case of contamination. Review the topics in Troubleshooting to first determine that the system is operating properly.

If the Dionex SC-CERS 500 is determined to be the source of higher than normal back pressure, higher than anticipated conductivity, decreased suppression capacity or decreased sensitivity, cleaning the membrane may restore the performance of the system. Use the following procedures to clean the membrane.

Metal contaminants or precipitates

NOTE: A Trap Column Suppressor Cleanup Kit (P/N 059659) is recommended for all of the following cleanup procedures.

NOTE: The suppressor voltage is a good indicator of the resistance across the suppressor. Higher resistance may indicate contamination of the suppressor. For more information regarding monitoring the voltage, see Document No 031814-02, “Removal of Iron Contamination from Electrolytic Suppressors.”

Procedure

1. Turn off the SRS/ERS Control unit.
2. Disconnect the analytical (and guard) column(s) from the injection valve and the Dionex SC-CERS 500. Refer to the specific analytical column Installation Instructions and Troubleshooting Guide for column cleanup procedures.
3. (AutoSuppression External Water Mode), turn off the external water and disconnect the external water line from the Dionex SC-CERS 500 REGEN IN port.
4. Disconnect the liquid line from the ELUENT OUT port of the Analyte Converter to the cell at the cell fitting and reconnect it to the REGEN IN port of the Eluent Suppressor.

5. Connect a temporary line from the priming block or the low-pressure tee on the isocratic or gradient pump to a container with a solution of 0.2 M oxalic acid. Pump this solution through the Dionex SC-CERS 500 (4 mm) at 1-2 mL/min for 30 minutes. For 2 mm systems pump this solution through the Dionex SC-CERS 500 (2 mm) at 0.25-0.50 mL/min for 30 minutes.

   NOTE: Bypassing internal pump manifolds when temporarily pumping high concentration cleaning solutions significantly reduces the time required to reequilibrate the system to low concentration eluents.

6. Flush the Dionex SC-CERS 500 components with deionized water for 10 minutes.
7. Perform the regeneration procedure described in Regeneration.
8. Turn on the SRS/ERS Control unit for the AutoSuppression Recycle or External Water Modes of operation.
9. Flush the Dionex SC-CERS 500 components with eluent for 10 minutes.
10. Reinstall the analytical (and guard) column(s). Begin pumping eluent through the system at the flow rate required for your analysis and equilibrate the system.

Organic contaminants

Procedure

1. Turn off the SRS Control unit.
2. Disconnect the analytical (and guard) column(s) from the injection valve and the Dionex SC-CERS 500. Refer to the specific analytical column Installation Instructions and Troubleshooting Guide for column cleanup procedures.
3. (AutoSuppression External Water Mode) Turn off the external water and disconnect the external water line from the Dionex SC-CERS 500 REGEN IN port.
4. Disconnect the liquid line from the ELUENT OUT port of the Analyte Converter to the cell at the cell fitting and Reconnect it to the REGEN IN port of the Eluent Suppressor.
5. Connect a temporary line from the priming block or the low-pressure tee on the isocratic or gradient pump to a container with a solution of freshly prepared 10% 1.0 M methanesulfonic acid (MSA)/90% acetonitrile or methanol. MSA/acetonitrile solutions are not stable during long term storage so this cleanup solution must be made

immediately before each suppressor cleanup. Alternatively, the cleaning solution can be proportioned from 1 bottle containing 1.0 M MSA and another bottle containing 100% acetonitrile.

Pump this solution through the Dionex SC-CERS 500 (4 mm) at 1-2 mL/min for 30 minutes. For 2 mm systems, pump this solution through the Dionex SC-CERS 500 (2 mm) at 0.25-0.50 mL/min for 30 minutes.

NOTE: Bypassing internal pump manifolds when temporarily pumping high concentration cleaning solutions significantly reduces the time required to reequilibrate the system to low concentration eluents.

6. Flush the Dionex SC-CERS 500 components with deionized water for 10 minutes.
7. Perform the regeneration procedures described in Regeneration.
8. Turn on the SRS/ERS Control unit for the AutoSuppression Recycle or External Water Modes of operation. Ensure that the SRS/ERS Control unit is off for the Chemical Suppression Mode of operation.
9. Flush the Dionex SC-CERS 500 with eluent for 10 minutes.
10. Reinstall the analytical (and guard) column(s). Begin pumping eluent through the system at the flow rate required for your analysis and equilibrate the system.