

Coupling lon Chromatography and Titration

Installation and Setup Guide

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Installation Instructions

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System Overview

The IC-titration system is based on the coupling of a titration system, provided by Mettler Toledo, and two ion chromatography (IC) systems, provided by Thermo Fisher Scientific. The integrated system is controlled by Thermo Scientific Dionex[™] Chromeleon[™] 6.8 Chromatography Data System software (release 6.8 SR10, or later).

The IC-titration system is an integrated solution for ion analysis in water. The parameters determined by this setup are:

- IC analysis of standard anions (F⁻, Cl⁻, NO₂⁻, Br⁻, NO₃⁻, PO₄³⁻, SO₄²⁻)
- IC analysis of standard cations (Na⁺, NH₄⁺, K⁺, Mg²⁺, Ca²⁺)
- Measurement of conductivity and pH

- Titration of acid capacity
- Total hardness (calculated from measured Mg²⁺ and Ca²⁺ amounts)
- Ion balance for each sample

Reporting of all the parameters is done by Chromeleon software.

The ion chromatography part of the IC-titration system consists of either two Thermo Scientific Dionex ICS-1100 Ion Chromatography Systems or two Dionex ICS-1600 Ion Chromatography Systems. The systems are used for anion and cation analysis. Anions are analyzed on a Thermo Scientific Dionex IonPac[™] AS22-Fast column (4 x 150 mm); cations are analyzed on a Thermo Scientific Dionex IonPac CS12A-5 µm column (3 x 150 mm). Thermo Scientific Dionex Self-Regenerating Suppressors[™] (ASRS[™] 300 (4 mm) and CSRS[™] 300 (2 mm)) are installed. Optionally, the IC systems can be equipped with Thermo Scientific Dionex RFIC-ER[™] (Reagent Free[™] Ion Chromatography with Eluent Regeneration), and a UV detector can be installed for anion analysis.

The titration part of the IC-titration system consists of a T90 Excellence Titrator, a Rondo 30 Sample Changer, a liquid handler, and the One Click[™] Terminal; optional LabX[™] software can be installed.

Communication between Chromeleon and the titrator is through an RS-232 interface. RS-232 interfacing provides for bidirectional control of the titrator and IC systems. Titration and chromatography operations are coordinated so that each system waits until the other is ready for a sample.

General Remarks on Installation

The installation of this coupled IC-titration system follows the procedures described in the respective installation instructions:

- Dionex ICS-1100 Ion Chromatography System and ICS-1600 Ion Chromatography System Installation Instructions (Document No. 065292)
- Installing the Dionex ICS-1100/1600/2100 Auxiliary Valve (Document No. 065288)
- Installing the RFIC-ER Startup Kit for Dionex ICS-1100 and ICS-1600 Ion Chromatography Systems (Document No. 065295)
- Dionex ICS-Series Variable Wavelength Detector Operator's Manual (Document No. 065141)
- Product Manual for Dionex IonPac AG22; IonPac AS22; IonPac AG22-Fast; IonPac AS22-Fast (Document No. 065119)
- Product Manual for Dionex IonPac CG12A; IonPac CS12A (Document No. 031132)
- Dionex ASRS 300 and CSRS 300 Self-Regenerating Suppressors Product Manual (Document No. 031956)

These manuals are included on the Thermo Scientific Reference Library DVD (P/N 053891). This document highlights the specific installation steps to be taken for the combination of ion chromatography with titration.

The anions system will be equipped with a Dionex IonPac AS22-Fast analytical column (4 x 150 mm) and guard; the cations system will be equipped with a Dionex IonPac CS12A-5 μ m analytical column (3 x 150 mm) and guard.

The ICS systems are bundled with the parts and instructions required for installing the Dionex ICS-1100 and Dionex ICS-1600 instruments in the IC-titration system (see Table 1 and Table 2). In some instances it may be necessary to add more USB ports. This can be done by the addition of a powered USB hub, acquired locally.

If you test the IC systems with columns (recommended), additional ion standards are needed: "Six Cation Standard II" (PN 046070) and "Seven Anion Standard II" (PN 057590); these should be ordered separately.

Part Number	Quantity	Description
069574	2	Dionex ICS-1100 (pump, degasser, injection valve, conductivity detector) with ship kit
069564	2	Column heater
069472	1	Auxiliary 6-Port Valve Kit for Dionex ICS-1100/1600/2100
042949	1	10 µL PEEK [™] sample loop
060943	1	Microbore heat exchanger assembly for ICS-1100/1600/2100
072784	1	Dionex IonPac AG22-Fast Guard Column (4 x 30 mm)
072782	1	Dionex IonPac AS22-Fast Analytical Column (4 x 150 mm)
064554	1	Dionex Anion Self-Regenerating Suppressor ASRS 300 4 mm
057184	1	Dionex IonPac CG12A-5 µm Guard Column (3 x 30 mm)
057185	1	Dionex IonPac CS12A-5 µm Analytical Column (3 x 150 mm)
064557	1	Dionex Cation Self-Regenerating Suppressor CSRS 300 2 mm
064261	1	Serial-to-USB adapter
061360	1	Chromeleon software
079660	1	<i>Chromeleon Tools for IC-Titration</i> CD-ROM with installation manual, Chromeleon programs, and Chromeleon sequences
052309	1	Tubing, PEEK, orange, 0.51 mm (0.02 in) ID, 13 cm (5 in)
052306	1	Tubing, PEEK, black, 0.25 mm (0.01 in) ID, 13 cm (5 in)
074373	20	Blue (high-pressure) bolts
074449	20	Blue (high-pressure) ferrules
052230	2	1/4-28 bolt for 1/16 in tubing, used with ferrules below
062511	2	1/16 in two-piece ferrules

 Table 1.
 Contents of the Dionex ICS-1100 bundle (P/N 078921)

Part Number	Quantity	Description
069575	2	Dionex ICS-1600 (pump, degasser, injection valve, conductivity
		detector, column oven, touchscreen display) with ship kit
069472	1	Auxiliary 6-Port Valve Kit for Dionex ICS-1100/1600/2100
042949	1	10 μL PEEK sample loop
060943	1	Microbore heat exchanger assembly for ICS-1100/1600/2100
072784	1	Dionex IonPac AG22-Fast Guard Column (4 x 30 mm)
072782	1	Dionex IonPac AS22-Fast Analytical Column (4 x 150 mm)
064554	1	Dionex Anion Self-Regenerating Suppressor ASRS 300 4 mm
057184	1	Dionex IonPac CG12A-5 µm Guard Column (3 x 30 mm)
057185	1	Dionex IonPac CS12A-5 µm Analytical Column (3 x 150 mm)
064557	1	Dionex Cation Self-Regenerating Suppressor CSRS 300 2 mm
079660	1	Chromeleon Tools for IC-Titration CD-ROM with installation
		manual, Chromeleon programs, and Chromeleon sequences
061360	1	Chromeleon software
064261	1	Serial to USB adapter
052309	1	Tubing, PEEK, orange, 0.51 mm (0.02 in) ID, 13 cm (5 in)
052306	1	Tubing, PEEK, black, 0.25 mm (0.01 in) ID, 13 cm (5 in)
074373	20	Blue (high-pressure) bolts
074449	20	Blue (high-pressure) ferrules
052230	2	1/4-28 bolt for 1/16 in tubing, used with ferrules below
062511	2	1/16 in two-piece ferrules

Table 2. Contents of the Dionex ICS-1600 bundle (P/N 078922)

Installing the Serial-to-USB Adapter

✤ To install the serial-to-USB adapter

- 1. Connect the serial-to-USB adapter (PN 064261; included in the ICS system bundle) to a free USB port on the computer.
- 2. The driver for the device should be automatically installed by Windows[®] 7. For Windows XP, locate the driver on the CD provided with the adapter and install the driver by double-clicking the Windows (2000, XP, 2003 Server, Vista).exe file (see Figure 1).

File Edit View Favorites Tools Help	
🔇 Back + 🕥 - 🏂 🔎 Search 🎼 Folders 📑 🎲	≻ ∽ 💷 🐨
Address 🗁 D:\Windows Drivers	
Folders ×	Name 🔺
Pesktop	USA-19HS Windows (98, Me)_v3.4.exe
E 📋 My Documents	📇 USA-19H5 Windows (2000, XP, 2003 Server, Vista)_v3.75.exe
🗉 😼 My Computer	
🗄 🧼 System (C:)	
🖃 💽 50-P03001-01 (D:)	
Contract MAC Drivers	
🛅 MAC Manuals	
C Windows Drivers	
🛅 Windows Manuals	

Figure 1. Driver for the serial-to-USB adapter on Windows XP

- 3. Verify that the green light on the adapter is blinking.
- 4. Click **Start** on the Windows taskbar, right-click **Computer** (or **My Computer** on Windows XP), and click **Manage**.
- 5. Click **Device Manager**, expand the list of **Ports**, and locate the "Keyspan USB Serial Port." Note the number of the COM port (see Figure 2).

Figure 2. Location of the serial-to-USB adapter COM port

😓 Computer Management		
<u>File Action View H</u> elp		
🧇 🏟 🖄 🖬 🚺 🚺 🐼		
Computer Management (Local System Tools Carl Task Scheduler Event Viewer Shared Folders Cocal Users and Groups Cocal Users Cocal Users and Groups Cocal Users and Cocal Users Cocal Users Cocal Users Cocal Users and Cocal Users Cocal Users Cocal Users and Cocal	 L-OLTLAB02 Batteries Computer Disk drives Display adapters DVD/CD-ROM drives IDE ATA/ATAPI controllers IDE ATA/ATAPI controllers IEEE 1394 Bus host controllers IEEE 1394 Bus host controllers Mettler Toledo Mice and other pointing devices Modems Monitors Network adapters PCMCIA adapters PCMCIA adapters Ports (COM & LPT) ECP Printer Port (LPT1) Keyspan USB Serial Port (COM4) Processors Sound, video and game controllers 	Actio

Installing Chromeleon

To install Chromeleon

- 1. Verify that the Chromeleon disk contains Chromeleon version 6.80 SR10 (or later).
- 2. Verify that you have the *Chromeleon Tools for IC-Titration* CD-ROM at hand. The tools provided are: generic RS-232 driver; server configuration; and control panels, template datasource, and default sequence.
- 3. Follow the instructions in *Dionex ICS-1100 Ion Chromatography System and ICS-1600 Ion Chromatography System Installation Instructions,* Sections 4 to 8.
- 4. Copy the entire folder "RS232_Generic" from the *Chromeleon Tools for IC-Titration* CD-ROM to a folder. The default location is C:\Chromel\Bin\DDK\V1\Drivers (see Figure 3).

Figure 3. Location of the generic RS-232 driver in the Windows Explorer structure



Installing the IC Systems

- ✤ To install the IC systems
- 1. Follow the instructions in *Dionex ICS-1100 Ion Chromatography System and ICS-1600 Ion Chromatography System Installation Instructions,* Sections 1 and 2.

- 2. To install the auxiliary valve in the IC system intended to be used for anions analysis, please refer to *Installing the Dionex ICS-1100/1600/2100 Auxiliary Valve* (Document No. 065288), Section 1. The document is provided with the valve.
- 3. Proceed with Sections 9 to 11 in *Dionex ICS-1100 Ion Chromatography System and ICS-1600 Ion Chromatography System Installation Instructions.*

Note Both IC systems should be equipped with column heaters. Before continuing, verify that a column heater is installed in each system. If not, turn off the power to the systems and install the heaters. This is required for correct server configuration in Chromeleon (refer to Section 13.2 in *Dionex ICS-1100 Ion Chromatography System and ICS-1600 Ion Chromatography System Installation Instructions*). For the cations system, install a microbore heat exchanger (P/N 060943).

Setting Up Chromeleon

Note If you plan to operate the Dionex ICS-1100 or ICS-1600 in the RFIC-ER mode, do not add the Thermo Scientific Dionex ER Controller (Dionex ERC 10) to the timebase until after you complete the initial RFIC-ER system setup. For details, refer to *Installing the RFIC-ER Kit for Dionex ICS-1100 and ICS-1600 Ion Chromatography Systems.*

To set up the timebase

- 1. To start the Chromeleon Server, click **Start** on the Windows taskbar and select **All Programs > Chromeleon > Server Monitor**. In the Server Monitor window, click **Start**.
- 2. To start the Chromeleon Server Configuration program, click **Start** on the Windows taskbar and select **All Programs > Chromeleon > Server Configuration**.
- Select File > Import. On the Chromeleon Tools for IC-Titration CD-ROM, browse for the server configuration file (either ServConf_D1100.cfg for two Dionex ICS-1100 systems or ServConf_D1600.cfg for two ICS-1600 systems). Click Open.
- 4. Right-click the "Dual_ICS_Titration" timebase (see Figure 4).

Figure 4. Example Server Configuration with two ICS-1600 systems



✤ To configure the anions system

- 1. Right-click the first IC system and select **Properties**. The Properties dialog box for the IC system used for anions analysis appears.
- 2. Change the Mode to Live.
- 3. Click the arrow next to **Module Serial No.** In the list, select the serial number of the system you are configuring for the anions analysis (see Figure 5).
 - **Figure 5.** General tab page of the ICS Properties dialog box for anions system (ICS-1600 version shown)

Dionex ICS-1600 IC System
Solvents State Devices Inject Valve Error Levels Demo Chromatogram ITL Inputs Trend Calibration Diagnostics General Options Signals Head Type & Limits Device Name: Fump_ECD
Mode
Moduleware version: 1.1.0 Download
C Simulated
Use Live mode to control a physical module connected to the server. Simulated mode can be used to demonstrate the software support for the module and allows one to create methods and panels without having a physical module attached to the server.
Click on the arrow to select the serial number
OK Cancel Apply Help

4. Click the **Options** tab and verify that the options installed are enabled (see Figure 6).

Note If you plan to operate the Dionex ICS-1100 or ICS-1600 in the RFIC-ER mode, do not link to an ERC Controller at this time.

Figure 6. Options tab page of the ICS Properties dialog box for the anions system

Ivents State Dev	rices Inject	Valve Error	Levels	Demo Chromatogran
I I L Inputs	Irend		tion	Diagnostics
General	Options	Signals	He	ead Type & Limits
✓ Degas				
C Always Off				
C Always On				
C Cycle	On: 0	(0120 sec)	Off: 0	(05940 sec)
Monitor	,			
🔽 Column Heater				
₩ Valve 2				
RFIC-ER				
Link to ERC Cor	troller:	<none></none>		-

- 5. Click the **Inject Valve** tab and verify control of the valves is correctly assigned (see Figure 7).
 - **Figure 7.** Inject Valve tab page of the ICS Properties dialog box for the anions system (ICS-1600 version shown)

onex ICS-1600 IC	System			×
TTL Inputs	Tre	nd	Calibration	Diagnostics
General	Options	s S	ignals	Head Type & Limits
Solvents Sta	te Devices	Inject Valve	Error Levels	Demo Chromatogram
Name	cuon. Jvaive	-' Controlle	d By	
✓ Pump_InjectValve ICS-1600				
✓ Valve_2				

- 6. Click the Signals tab and verify the settings (see Figure 8).
 - **Figure 8.** Signals tab page of the ICS Properties dialog box for the anions system (ICS-1600 version shown)

onex ICS-1600 IC System			— ×
TTL Inputs	Trend	Calibration	Diagnostics
Solvents State Devices	Inject V	/alve Error Lev	vels Demo Chromatogram
General Opti	ons	Signals	Head Type & Limits
Name	Unit	Factor	
ECD_1	μS	1.0	
ECD_Total	μS	1.0	
Channel_Pressure	psi	1.0	

7. After verification of the configuration for the anions system, click **OK** to close the dialog box. The IC system is added to the timebase.

✤ To configure the cations system

- 1. Right-click the second IC system and select **Properties**. The Properties dialog box for the IC system used for cations analysis appears.
- 2. Change the Mode to Live.

- 3. Click the arrow next to **Module Serial No.** In the list, select the serial number of the system you are configuring for the cations analysis (see Figure 9).
 - **Figure 9.** General tab page of the ICS Properties dialog box for the cations system (ICS-1600 version shown)

Dionex ICS-1600 IC System
Solvents State Devices Inject Valve Error Levels Demo Chromatogram TTL Inputs Trend Calibration Diagnostics General Options Signals Head Type & Limits
Device Name: Pump_ECD_2 Mode
Use Live mode to control a physical module connected to the server. Simulated mode can be used to demonstrate the software support for the module and allows one to create methods and panels without having a physical module attached to the server.
OK Cancel Apply Help

4. Click the **Options** tab and verify that the options installed are enabled (see Figure 10).

Note If you plan to operate the Dionex ICS-1100 or ICS-1600 in the RFIC-ER mode, do not link to an ERC Controller at this time.

Figure 10. Options tab page of the ICS Properties dialog box for the cations system (ICS-1600 version shown)

Dionex ICS-1600 IC S	ystem		_	×
Solvents State TTL Inputs General	Devices Inje Trend Options	ct Valve Error Calibra Signals	r Levels Der ation Head	no Chromatogram Diagnostics Type & Limits
 ✓ Degas ○ Always (○ Always (○ Cycle ○ Monitor 	Off On On_: 0 ster	(0120 sec)	Off: 0	(05940 sec)
☐ <u>V</u> alve 2 RFIC-ER Link to ERC	Controller:	<none></none>		T
	ОК	Cancel	Apply	Help

- 5. Click the **Inject Valve** tab and verify that control of the valve is assigned correctly (see Figure 11).
 - Figure 11. Inject Valve tab page of the ICS Properties dialog box for the cations system (ICS-1600 version shown)

onex ICS-1600 IC	System		×
TTL Inputs	Trend	Calibration	Diagnostics
General	Options	Signals	Head Type & Limits
Solvents State	e Devices Inje	ct Valve Error Levels	Demo Chromatogram
Name		Controlled By	
Pump_Inject	/alve_2	ICS-1600	
Pump_Inject	/alve_2	ICS-1600	
Pump_Inject	/alve_2	ICS-1600	

- 6. Click the Signals tab and verify the settings (see Figure 12).
 - **Figure 12.** Signals tab page of the ICS Properties dialog box for the cations system (ICS-1600 version shown)

ex ICS-1600 IC System			×
TTL Inputs Tren	d	Calibration	Diagnostics
Solvents State Devices	Inject Va	lve Error Lev	vels Demo Chromatogram
General Options		Signals	Head Type & Limits
Name	Unit	Factor	
✓ ECD_1_2	μS	1.0	
ECD_Total_2	μS	1.0	
Channel_Pressure_Cat	psi	1.0	

7. After verification of the configuration for the cations system, click **OK** to close the dialog box. The IC system is added to the timebase.

✤ To configure the RS-232 driver

- 1. Right-click the RS-232 driver in the server configuration and select **Properties**. The dialog box for the RS-232 driver appears.
- 2. Verify the settings of the driver according to Figures 13 to 16.

Note The COM port used for communication with the titrator must be determined individually for each installation. Use the port noted after the installation of the USB serial adapter (see the example in Figure 2).

Figure 13. Example Device Configuration tab page of the Generic RS232 Driver dialog box

Note The actual COM port assignment may differ from the port shown in this figure.

Ge	eneric	RS232 Dri	ver					_	x
	Device		Properties	String Proper	ties Commands				
	Devie	ce Name:	GenericRS	232Driver					
	Co	mmunicati)M-Port:	on Details - COM5 Test Con	▼ nectio	Baudrate: Data length: Parity: Stop bit:	19200 8 None One		• • •	
					Handshake: Wait Time:	XOnXOff 200	in ms	•	
	Virtu	al mode				ОК	c	ancel	

Gen	eric R	S232 Driver				x
De	vice	Numeric Properties String	Properties Commands			
	lume	ric Property Configuration	n			
		Chromeleon Name	RS232 Identifier			Chr
	R01	Conductivity	R01	_	R17	R1
	R02	pН	R02		R18	R1
	R03	Acid_capacity_4_3	R03		R19	R1
	R04	Carbonate_hardness	R04		R20	R2
	R05	Slope	R05		R21	R2
	R06	Volume_standard	R06		R22	R2
	R07	Sensor_drift	R07		R23	R2
	R08	Target_position	R08		R24	R2
	R09	Mode	R09		R25	R2
	R10	Zero_point	R10		R26	R2
	R11	Response_pH4	R11		R27	R2
	R12	Response_pH7	R12		R28	R2
	R13	Total_volume	R13		R29	R2
	R14	Temp_cond	R14		R30	R3
	R15	Temp_pH	R15		R31	R3
	R16	R16	R16		R32	R3
<u>ب</u>	Virtual	mode		ОК	Cance	
						111

Figure 14. Numeric Properties tab page of the Generic RS232 Driver dialog box

Figure 15. String Properties tab page of the Generic RS232 Driver dialog box

Generic R	S232 Driver		
Device	Numeric Properties String Prop	perties Commands	
String	Property Configuration		
	Chromeleon Name	RS232 Identifier	Chromel
R33	START	R33	R49 R49
R34	ENDE	R34	R50 R50
R35	FILLED	R35	R51 R51
R36	WEITER	R36	R52 R52
R37	R37	R37	R53 R53

	1 6	U U
Generic RS232 Dri	ver	
Device Numeric	Properties String Properties Commands	
Commands Nar	ne Configuration	
Send String	SendS	
Send Floating	SendF	

Figure 16. Commands tab page of the Generic RS232 Driver dialog box

3. After verification of the configuration for the RS-232 driver, click **OK** to close the dialog box.

* To complete the Chromeleon configuration setup

- 1. When the timebase is complete, select File > Save Installation.
- 2. You can ignore the "No inject device installed on timebase" warning. This simply means that the timebase does not include an autosampler. Close the Server Configuration Check dialog box (see Figure 17).

Figure 17. Warning message when saving the server configuration

Server Configuration - Chromeleon Server Configuration	
File Edit View Server Help	
Server CH01WN6HWH6R1 Configuration Check	x
Checking timebase Dual_ICS_Titration Warning: No inject device installed on timebase Consistency check reports 0 error(s) and 1 warning(s).	*
Refresh	

3. Exit the Server Configuration program.

Connecting to the Panel Tabset

Before connecting to the panel tabset, the special panels for the coupled IC-titration system must be imported. The panels can be found on the *Chromeleon Tools for IC-Titration* CD-ROM.

* To import the coupled IC-titration panels

- 1. Start the Chromeleon client: Click **Start** on the Windows taskbar and select **All Programs** > **Chromeleon** > **Chromeleon**.
- 2. Create a new folder named "Panels" in the "Dual_ICS_Titration" folder: Right-click the "Dual_ICS_Titration" folder and select **New directory**. In the Directory name box, type **Panels**. Click **OK**.
- 3. Select the "Panels" folder; then select File > Import/Restore > Restore. Browse for the "IC_Titration_Panels.cmb" file on the *Chromeleon Tools for IC-Titration* CD-ROM and click OK (see Figure 18).

Figure 18. Importing the IC-titration panels

🎕 Chromele	🖪 Restore from "C:\Users\bsheldon\Documents\Mettler Dionex IC Titration\079660 C 📃 🗖 🗙	- O X
File Edit □ □ □ ▶ □ ●	Title: IC_Titration_Panels Created: 5/14/2012 4:54:57 PM by StMa1 Contents: Select all	-8× * /2
	Name Title ⊕ - I e e e e e e e e e e e e e e e e e e	
	Total size of selected objects: 835,302 Bytes Destination Original location: DIR::\IC-Titration\panels Other: DIR::\BSHELDONLT_local\Dual_ICS_Titration\Panels Browse OK Cancel Help	

✤ To connect to the panel tabset

- 1. In the Chromeleon client, select View > Default Panel Tabset.
- 2. Connect to Chromeleon Server. The Chromeleon panel tabset opens.

3. On the Chromeleon panel tabset, select Edit > Add Panel. Browse for the previously imported panels and select "T90_RS232_Panel." Click Open. See Figure 19 and Figure 20.

Figure 19. IC systems panel on the Chromeleon panel tabset (ICS-1600 version shown)

Chromeleon - [Panel Tabset	2] Oualification Control Batch Window Help	
		2
0 ቒ ● ■ ■ ► ≠ ₹	3 B	- 2
	Dual_ICS_Titration	
ICS-1600 Simultaneous Systems - D	Dual_ICS_Titration - BSHELDONLT Sequence Control Status	
Connected	De Browse	ral_IC S
IC S-1600 Pump- Pump - On 800 psi Pump Settings	Eli Look in: Tial panels for CD C C C C C C C C C C C C C C C C C C	wn
ICS-1600 Injector LoadPosition	Sig or 2 10. Name: T90_RS232_Panel Open Channel: Inje	ect
Injector Settings	5. Object of type: Control Panel	js
Temperature:	Temperature:	er 2
For Help, press F1	bsheldon Dual_ICS_Titratic	n OK //

Chromeleon - [Panel Tabset5]	Contractor States of Contractor	test of the local data and the	
In File East View Workspace Qualification Control Batch Win	ow <u>H</u> eip ≓ ⊗ ⊗ ⊠ ∎ ∎ ⊞ ⊠ ⊡ № Ⅲ №		- [¢]
	Dual_ICS_Titration	23 H	
ICS-1600 Simultaneous Systems - Dual_ICS_Titration - CHOLT-NB010 Sequence	Control Status Autosampler AS 2000 - Timebase: Dual_IC	S_Titration Computer name: CHOLT-NB010	
Mettler-Toledo T90	Audit Trail —		
Current Values Conductivity µS/cm pH-Value: Acid Capacity (pH 4.3) Carbonate Hardness	0023919 (Pur 8093319 (Pur 9142004 (Pur 9142004 (Pur	0. ECD) Please verify the solvent and waste level values1 7. ECD -2? Please verify the solvent and waste level values1 7. ECD Please verify the solvent and waste level values1 7. ECD Please verify the solvent and waste level values1 7. ECD_2? Please verify the solvent and waste level values1 7. ECD_2? Please verify the solvent and waste level values1 7. ECD_2? Please verify the solvent and waste level values1 7. ECD_2? Please verify the solvent and waste level values1 7. ECD_2? Please verify the solvent and waste level values1 7. ECD_2? Please verify the solvent and waste level values1 7. ECD_2? Please verify the solvent and waste level values1 7. ECD_2? Please verify the solvent and waste level values1 7. ECD_2? Please verify the solvent and waste level values1 7. ECD_2? Please verify the solvent and waste level values1 7. ECD_2? Please verify the solvent and waste level values1 7. ECD_2? Please verify the solvent and waste level values1 7. ECD_2? Please verify the solvent and waste level values1 7. ECD_2? Please verify the solvent and waste level values1 7. ECD_2? Please verify the solvent and waste level values1 7. ECD_2? Please verify the solvent and waste level values1 7. ECD_2? Please verify the solvent and waste level values1 7. ECD_2? Please verify the solvent and waste level values1 7. ECD_2? Please verify the solvent and values1 7. ECD_2? Please verif	
Sample Loops			
			~

Figure 20. Titration panel on the Chromeleon panel tabset

4. Select **Workspace** > **Save Workspace** As. Save as "IC_Titration_workingpanel" in the "Panels" folder (see Figure 21). If asked to save the panel, click **Yes**.

Figure 21. Saving the Chromeleon panel tabset for the coupled system

Save As	, AND COLOR		×
Save in: 🔄 Dual_ICS_Titration	•	£	* 📰 🏢
AUDIT Panels			
Norman IC Thetics werkings and			C. C
Name: IL_IItration_workingpanel		_	Save
<u>C</u> hannel:		–	Cancel
Object of type: Workspace		•	Help

- 5. Select Workspace > Autosave Workspace. Make sure that autosave is off.
- 6. Verify that Chromeleon is communicating with the IC systems by clicking the **Inject** button and then the **Load** button, on the panel. If communication is occurring, you will hear the valve actuate as it changes position. Repeat for the second IC system (left panel should be for the anions system, right panel for the cations system).

Installing and Plumbing the Columns and Suppressors

Please refer to Section 13 of the *Dionex ICS-1100 Ion Chromatography System and ICS-1600 Ion Chromatography System Installation Instructions* and the column and suppressor manuals. The manuals are provided on the Thermo Scientific Reference Library DVD (P/N 053891).

Note Both IC systems should be equipped with column heaters. For the cations system, install a microbore heat exchanger (P/N 060943) in the column heater and use red PEEK 0.125 mm (0.005 in) ID tubing instead of the standard black tubing for connections between the following components:

- Injection valve and column heater heat exchanger
- Guard column and separator column
- Separator column and detector cell

For reference, Figure 22 shows the flow schematic for the injection valves of both systems.



Figure 22. Configuration and plumbing of the injection valves. Valves are in the load position ("Valve_2" in position B)

Plumbing requirements

The following special plumbing is required for connections between the IC systems and for the connection to the liquid handler (see Figure 22):

- Use orange PEEK 0.51 mm (0.02 in) ID tubing for the following connections:
 - Liquid handler (4) to "InjectValve_2; (S)" (transfer line)
 - "InjectValve_2; (W)" to "Valve_2; (5)"
 - "Valve_2; (6)" to "InjectValve; (S)"
- Use black PEEK 0.25 mm (0.01 in) ID tubing for the following connections:
 - "InjectValve; (C)" to "Valve_2; (2)"
 - "Valve_2; (3)" to heat exchanger/column
 - "Pump ECD_1" to "InjectValve; (P)"
 - "Pump ECD_1_2" to "InjectValve_2; (P)"
- Use red PEEK 0.125 mm (0.005 in) ID tubing for the following connection:
 - "InjectValve_2; (C)" to heat exchanger/column
- Use green PEEK 0.76 mm (0.03 in) ID tubing for the following connection:
 - "InjectValve; (W)" to waste
- Use the following sample loops:
 - 25 μL loop on "InjectValve" (anions; large loop)
 - 10 μL loop on "Valve_2" (anions; small loop)
 - Approximately 1 µL on "InjectValve_2" (cations; prepare with 10 cm of red PEEK 0.125 mm (0.005 in) ID tubing)
- To connect the IC system transfer line (orange PEEK tubing) to the liquid handler
- 1. Locate the connector provided with the Mettler titrator and a fitting bolt (P/N 052330) and two-piece ferrule (P/N 062511) included in the ICS system bundle.
- 2. Observe that one side of the small tan ferrule is beveled and one side is flat (see Figure 23).

Figure 23. Small tan ferrule (enlarged)



Beveled side

Flat side

- 3. Slide the fitting bolt onto the tubing as shown in Figure 24.
- 4. With the flat side of the small tan ferrule facing toward the fitting bolt, slide the ferrule onto the tubing. Then, slide the clear cone ferrule onto the tubing with the cone toward the flat ferrule and fitting bolt (see Figure 24).



Figure 24. Fitting and connector for transfer line

- 5. Screw the connector into port 4 of the liquid handler.
- 6. Connect the fitting to the connector on port 4 of the liquid handler (see Figure 25).Figure 25. Connection of the liquid handler to the IC systems



Configuring the Local Datasource for IC-Titration Operation

The *Chromeleon Tools for IC-Titration* CD-ROM includes an "ICTitration" datasource with example program, sequence, and report definition files for use with IC-titration setup. You can use these example files as templates and modify them as needed for your system.

✤ To mount the IC template datasource

- 1. Start the Chromeleon client and go to the Browser.
- Select File > Mount Datasource, and select the drive with the *Chromeleon Tools for IC-Titration* CD-ROM (Drive D: in the example in Figure 26).

9 4 9	Chro	meleon - [CH0	1WN6HWH6R	1_local - Brows	er]															
E B	File	Edit View	Workspace	Qualification	Batch	Тоо	ls	Wind	ow	Help	þ									
Ľ		New		Ct	rl+N		П		7		۲					臣	1			
		New Director	y			-			Las	st Upd	ate									
		Open		Ct	rl+O			-	01/0	06/201	12 14	4:50:5			_				_	
		Close							21/0	06/201	12 10):34:4								
		Save		Ci	trl+S				01/0	06/201 06/201	12 14 12 11	1:51:5								
		Save As																		
		Export / Back	up		+															
		Import / Rest	ore		+															
		Electronic Sig	Inature		+															
		Preferences																		
		Datasources									_									
		Mount Datas	ource		•		Brov	vse												
		Batch Report		Ct	trl+R		Driv	e D:			M	ounts	the	data	sour	ce lo	cate	d on	drive	D:
		Report Signed	d Results		Ľ		*****				-									
		Print Table																		
		Print Preview																		
		Print Setup																		

Figure 26. Mounting the template datasource

3. Click **No** when asked if the datasource should be made accessible to the Chromeleon server. A datasource named "ICTitration" is now available in the Browser.

To run an IC-titration application, the sequence must include three user-defined columns (Mode, Target_Pos, and Vol_Std). To make these user-defined columns available in your local datasource, import them from the "ICTitration" datasource.

* To import the IC-titration user-defined columns into the local datasource

- 1. In the Browser, right-click the local datasource (datasources are indicated by the Chromeleon 🗱 icon). Select **Properties**.
- 2. Click the User-Defined Columns tab (see Figure 27).

- 3. Click Import Columns.
- 4. In the **Import user-defined Columns from foreign Datasource** dialog box, select the **ICTitration** datasource and click **OK**.
 - **Figure 27.** Importing the user-defined columns from the template datasource into your local datasource

🖃 🕰 ICTitration		Name
🕀 💼 final panels		TRNG-1_local
DEFAULT_IC_TITR	ATION_SEQ	TRINING2_local
🗄 👾 🎇 L-SURJBRIGGS2_local 👔	Dreparties of Datasource "training"	
🗄 🎇 L-SURJOHNBRIGG2_lo	Properties of Datasource training	
DOPO 6_10	General Access Control Statistics User-defined Columns	Availability
	Columna	
_	Properties:	
	<new column="" user-defined=""> Name:</new>	
	Value type:	
	Dimension or comment	
		fine d Columns from foreign Datasourse
	inport user-de	nned cotumns from foreign batasource
	Select Datasour	ce:
	LSUBJBBIGGS	2_local
	L-SURJOHNBR OQPQ 6 10	IGG2_local 4 Cancel
		Help
	Import Columns	
		, as a second se

- 5. The User-Defined Columns page for the local datasource now includes the Mode, Target_Pos, and Vol_Std columns. Figures 28 through 30 show the properties of each user-defined column.
- 6. Click OK.
- 7. Restart the Chromeleon Server.

General Access Control Statisti	cs User-defined Column	s Availability	
<u>C</u> olumns.	Properties:		_
Target_Pos	<u>N</u> ame:	Mode	_
Vol_Std <new column="" user-defined=""></new>	Value type:	Enumeration	-
	Dimension o <u>r</u> commen	t:	-
	Empty values are	possible	
	Default item:	Sample	
	Enumeration items:	Sample Std_An Std_Cat Sensor_Check IC_Direct IC_Direct_Re Titration_only	
Import Columns	<u>D</u> elete	Modify	

Figure 28. User-defined Columns page: Mode properties

Properties of Datasource "Default I General Access Control Statistics	C_titration" ; User-defined Columns	Availability	×
<u>Columns:</u> Mode Target Pos Vol_Std <new column="" user-defined=""></new>	Properties: <u>N</u> ame: Value type: Dimension or comment: <u>Empty values are por</u> Minimum: Maximum: Default value:	Target_Pos Integer No. ssible 1 27 1	
, Import Columns	<u>D</u> elete	Modify	
	OK Cancel	Apply H	elp

Figure 29. User-defined Columns page: Target_Pos properties

Alloue Target Pos Vol_Std <new column="" user-defined=""></new>	Name: Value type: Dimension of comment: Image: Empty values are point Minimum: Maximum: Default value:	Vol_Std Floating point mL ssible 0.10 10.00
Import Columns		<u>M</u> odify

Figure 30. User-defined Columns page: Vol_Std properties

* To copy the sequence template files to the local datasource

- 1. In the ICTitration datasource, select the "**Default_IC_Titration_SEQ**" sequence and copy it to your local datasource in the "Dual_ICS_Titration" folder. This template contains the program files, report template, and demo sequence.
- 2. To verify the sequence is connected to the "Dual_ICS_Titration" timebase, right-click the sequence and select **Properties**. The "Timebase" box should show "Dual_ICS_Titration." If the sequence is not connected, browse for the "Dual_ICS_Titration" timebase.
- 3. To verify the programs are connected to the "Dual_ICS_Titration" timebase, open each program file and select the **Control** menu. If the program is not connected, select **Control** > **Connect to Timebase**, and then select "**Dual_ICS_Titration**."
- 4. Repeat steps 1 through 3 for the "System_Test_SEQ."

Testing the IC Systems and Verifying the Anion "Correction Factor"

In this section, the basic functionality of the IC systems is tested (before the installation of the columns and suppressors) and the "correction factor" for the two different injection loop sizes on the anions system is determined. The correction factor is the ratio of the areas obtained for each loop.

✤ To test the systems and verify the correction factor

- 1. Connect "InjectValve_2; (port C)" via a backpressure coil to the inlet of the detector cell of IC-system 2 (cations); connect the outlet of the cell to a waste line.
- 2. Connect "Valve_2; (port 3)" via a backpressure coil to the inlet of the detector cell of IC-system 1 (anions); connect the outlet of the cell to a waste line.
- 3. Disconnect the transfer line from "InjectValve_2; (port S)" and use this port for manual injections.
- 4. Prime the pumps with ultrapure water and then set the flow rates on both systems to 1 mL/min.
- 5. Allow the system to equilibrate. The Total Conductivity displayed on the panel tabset should be <1 μ S.
- 6. In Chromeleon, select "System_Test_SEQ" and add four injections with the "large loop" program and four injections with the "small loop" program (see Figure 31).
 - **Figure 31.** System_Test_SEQ for verification of the anions loop "correction factor" with manual injections



7. Locate the nitric acid IQ standard (P/N 052820), provided in the ICS system ship kit. Manually inject the standard four times for each injection loop (see Figure 31). Be sure to inject the same standards for each loop and verify that each program (small loop and large loop) is controlling the correct valve. Discard the first of each injection series for each loop. Use the table below to determine the correction factor. The table, which is in Microsoft Excel® format, is provided on the *Chromeleon Tools for IC-Titration* CD-ROM.

At the same time, verify that you also get a signal on the cation system.

Injection 🔤	Area NO3 25ul 🖃	Area NO3 10uL 🔤
1		
2		
3		
Average		
Correction value		B9/C9

8. Open the template report in the "Default_IC_Titration_SEQ" sequence (*not* in the "System_Test_SEQ" sequence!).

Note In order to modify the formulas in the report templates, a Chromeleon Report Publisher license (client feature) is required. Alternatively, the Thermo Scientific Service Representative can provide an updated report template.

9. In cell G12 of the "Integration - Anions" sheet in the template report, modify the "2.5" to the correction value calculated (shown below), and press Enter:

=IF(C8<>"n. a. ", IF(C8>3000, IF(C4<>"standard", 2.5, 1), 1), 1) (see Figure 32)

Figure 32. Integration – Anions sheet in the template report

	A	B	С	D	E	F	G
1			Integration	Report - A	Anions ECD_1		
2				11			
3	Sample Nam	e:	Water 1			Inj. Vol.:	25.00
4	Sample Type	c .	unknown		Dil	lution Factor:	1.00
5	Program:	Du	al_IC_Titration			Operator:	n.a.
6	Inj. Date/Tim	e:	n.a.			Run Time:	n.a.
7							
8	Conductivity:		n.a.		Carbona	te Hardness:	n.a.
9	Temperature	Conductivity:	n.a.				1.0
10	pH-Value:		n.a.			Modus:	Sample
11	Temperature	pH:	n.a.				
12	Acid Capacit	y 4.3:	n.a.		Corr. factor S	Sample Loc <mark>o</mark> :	1.00
13						L L	
14	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
15	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
16	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
19			TOTAL:		0.000	0.0000	#VALUE!
20							
14	DEFAULT	TITRATION SE	0 #41	Water 1			ECD 1

10. In cell B10 of the "Ion balance" sheet in the template report, modify the "2.5" to the correction value calculated (shown below) and press **Enter**:

=I F (\$B\$20<=3000; B100; B100*2.5) (see Figure 33)

Figure 33. Ion balance sheet in the template report

	Α	В	С	D	E
1	lan balanaa		Mator 4		
2	ion balance		water		
3		0 / 11)	N	10	FOUR
4		Conc. (mg/L)	Factor Mr	mmol/L	mEQV/L
5	Na +	0.000	23.000	0.000	0.000
6	Ca ++	0.000	40.078	0.000	0.000
1	Mg ++	0.000	24.305	0.000	0.000
8	K+	0.000	39.100	0.000	0.000
9					
0	CI -	0.000	35.500	0.000	0.000
1	NO2 -	0.000	46.200	0.000	0.000
2	NO3 -	0.000	62.000	0.000	0.000
3	PO4	0.000	94.966	0.000	0.000
4	SO4	0.000	96.000	0.000	0.000
5	HCO3 -	n.a.	61.000	#VALUE!	#VALUE!
6	and the second				
7	KH	#VALUE!	°dH		
8	GH	0.000	°dH		
9					
0	Conductivity	n.a.			
1	EQV Sum Cations	0.00			
2	EQV Sum Anions	#VALUE!			
3	Delta Cat-An	#VALUE!			
4	Delta Ion balance %	#VALUE!		#VALUE!	

11. Click the lower right corner of cell B10 and drag the mouse down to cell B14 to apply the changes to all anions (see Figure 34).

	A	B	C	D	E	F
1						
2	Ion balance		Water 1			
3						
4		Conc. (mg/L)	Factor Mr	mmol/L	mEQV/L	
5	Na +	0.000	23.000	0.000	0.000	
6	Ca ++	0.000	40.078	0.000	0.000	
7	Mg ++	0.000	24.305	0.000	0.000	
8	K+	0.000	39.100	0.000	0.000	
9						
10	CI -	0.000	35.500	0.000	0.000	
11	NO2 -	0.000	46.200	0.000	0.000	
12	NO3 -	0.000	62.000	0.000	0.000	
13	PO4	0.000	94.966	0.000	0.000	
14	SO4	0.000	96.000	0.000	0.000	
15	HCO3 -	- n.e	61.000	#VALUE!	#VALUE!	
16						
17	KH	#VALUE!	°dH			
18	GH	0.000	°dH			
19						
20	Conductivity	n.a.				
21	EQV Sum Cations	0.00				
22	EQV Sum Anions	#VALUE!				
23	Delta Cat-An	#VALUE!				
24	Delta Ion balance %	#VALUE!		#VALUE!		

Figure 34. Ion balance sheet in the template report

12. In cell E5 of the "Summary_IC_Anions" sheet in the template report, modify the "2.5" to the correction value calculated (shown below) and press **Enter**:

=IF(D5<>"n. a. "; IF(D5>3000; IF(C5<>"standard"; 2.5; 1); 1); 1) (see Figure 35)

Figure 35. Summary_IC_Anions sheet in the template report

	C	D	E	F	G	Н
1	Sample Type	Conductivity	Corr.factor	Amount	Amount corrected	Amount
2				mg/l	mg/L	mg/l
3				Fluoride	Fluoride	Chloride
4				ECD_1		ECD_1
5	standard	n.a.	1.0	n.a.	n.a.	n.a
6	standard	n.a. 🕒	1.0	n.a.	n.a.	n.a
7	standard	n.a.	1.0	n.a.	n.a.	n.a
8	standard	n.a.	1.0	n.a.	n.a.	n.a
9	standard	n.a.	1.0	n.a.	n.a.	n.a
10	standard	n.a.	1.0	n.a.	n.a.	n.a
11	standard	n.a.	1.0	n.a.	n.a.	n.a
12	standard	n.a.	1.0	n.a.	n.a.	n.a
13	standard	n.a.	1.0	n.a.	n.a.	n.a
14	standard	n.a.	1.0	n.a.	n.a.	n.a
15	standard	n.a.	1.0	n.a.	n.a.	n.a
16	standard	n.a.	1.0	n.a.	n.a.	n.a
17	standard	n.a.	1.0	n.a.	n.a.	n.a
18	standard	n.a.	1.0	n.a.	n.a.	n.a
19	standard	n.a.	1.0	n.a.	n.a.	n.a
20	standard	n.a.	1.0	n.a.	n.a.	n.a
21	standard	n.a.	1.0	n.a.	n.a.	n.a
22	standard	n.a.	1.0	n.a.	n.a.	n.a
23	standard	n.a.	1.0	n.a.	n.a.	n.a
24	standard	n a	10			n :

13. Click the lower right corner of cell E5 and drag the mouse down to the last row to apply the changes to all injections (see Figure 36).

	C	D	E	F	G	Н
38	validate	n.a.	1.0	n.a.	n.a.	n.a.
39	validate	n.a.	1.0	n.a.	n.a.	n.a.
40	validate	n.a.	1.0	n.a.	n.a.	n.a.
41	validate	n.a.	1.0	n.a.	n.a.	n.a.
12	validate	n.a.	1.0	n.a.	n.a.	n.a.
13	validate	n.a.	1.0	n.a.	n.a.	n.a.
14	validate	n.a.	1.0	n.a.	n.a.	n.a.
15	unknown	n.a.	1.0	n.a.	n.a.	n.a.
16	unknown	n.a.	1.0	n.a.	n.a.	n.a.
17	unknown	n.a.	1.0	n.a.	n.a.	n.a.
18	unknown	n.a.	1.0	n.a.	n.a.	n.a.
49	unknown	n.a.	1.0	n.a.	n.a.	n.a.
50				n.a.		n.a.
51				n.a.		n.a.
52						
53						
54						
55						
56						
57						
58						
59						
50						

Figure 36. Summary_IC_Anions sheet in the template report

- 14. Right-click and select **Save Report Definition** to save the modified correction factor in the report template.
- 15. Disconnect the backpressure coils and reconnect the heat exchangers. Do not yet reconnect the liquid handler; manual injections will be required again.
- 16. Continue the installation as described in *Dionex ICS-1100 Ion Chromatography System and ICS-1600 Ion Chromatography System Installation Instructions*, Sections 14 to 24.
- 17. Prepare the following eluents:
 - 4.5 mmol/L Na₂CO₃; 1.4 mmol/L NaHCO₃ (AS22 standard eluent)
 - 25 mmol/L MSA

Configuring the Dionex ER Controller (ERC 10) (Optional)

Optionally, the IC systems can be configured with a Dionex ERC 10.

To configure the Dionex ERC 10

1. Follow the instructions in *Installing the RFIC-ER Startup Kit for Dionex ICS-1100 and ICS-1600 Ion Chromatography Systems* (Document No. 065295), Sections 1 to 6.

2. When testing for leaks, turn on the pumps and suppressors at the following flow rates and currents:

AS22-Fast	1.2 mL/min	31 mA
CS12A-5µm	0.5 mL/min	37 mA

- 3. Set up the Chromeleon server configuration as described in *Installing the RFIC-ER Startup Kit for Dionex ICS-1100 and ICS-1600 Ion Chromatography Systems*, Section 7.
- 4. Because two Dionex ERC 10 controllers are assigned to the same timebase, rename the second controller "Controller_Cat" and assign it to the cations system. Verify the correct assignment of both controllers by checking the serial numbers (see Figure 37).
 - Figure 37. Dionex ERC 10 Properties dialog box for anions system: Verify the correct assignment of the serial numbers

Device Nam	ne: Controller	
Mode	9	
V. DAG	Module Serial No:	•
	11101	731
	Moduleware version:	Download
C Simu	lated	
Use Live n Simulated the module	node to control a physical mod mode can be used to demons and allows one to create met hysical module attached to the	ule connected to the server. trate the software support for hods and panels without e server.

- 5. Exit the Server Configuration program. When asked whether to save the configuration changes, click **Save**.
- Click Start on the Windows taskbar and select All Programs > Chromeleon > Chromeleon to start the Chromeleon client.
- 7. In the Chromeleon client, select View > Default Panel Tabset.
- On the Chromeleon panel tabset, select Edit > Add Panel. Browse for the previously imported panels and select "Dual_ICS_RFIC_ER_Wellness." Click Open (see Figure 38).

	• • • • • • • • • • • • • • • • • • •	
		Dual_ICS_Titration
S-1	600 Simultaneous Systems - Dual_ICS_1 itration - CHUL1-NB010 Sequer	nce Control Status Autosampler AS 2000 - Timebase: Dual_ICS_Titration Computer name: CHULT-NBUTU HPIC-EH Dual
1	Chemistry Type Anion_Other ER1 column Capacity Consumed (%) 0.00 Capacity Remaining (%) 100.00 Reset ER1 ER2 column Volume Injected 0 µI Remaining Inj. Volume 130000 µI Injections Made 0 Remaining Inj. Colume Reset ER2	Eluent Operation Time 0 Remaining Time 672 Volume Injected 0 µI Remaining Inj. Volume 20000 Remaining Inj. Volume Injections Made 0 Remaining Injections 0 Reset EC ERC 10 Controller Connected I Reset Gas Volume: 0.00 mI Reboot ERC 1 Reset Gas Volume Condition Suppressor
2	Chemistry Type Anion_Other ER1 column Capacity Consumed (%) 0.00 Capacity Remaining (%) 100.00 Reset ER1 ER2 column	Eluent Operation Time 0 Remaining Time Remaining Time 672 Volume Injected 0 Remaining Inj. Volume Injections Made 0
-	Volume Injected 0 µl Remaining Inj. Volume Remaining Inj. Volume Injections Made 0 Remaining Injections 0 ResetER2	Remaining Injections 0 Reset EC ERC 10 Controller - Connected: IZ Mode: Connected: IZ Mode: Gas Volume: Reboot ERC 10 Reset Gas Volume Condition Suppressor

Figure 38. Dual RFIC-ER Wellness panel

- 9. Save the workspace as described on page 19.
- 10. Continue installation according to *Installing the RFIC-ER Startup Kit for Dionex ICS-1100 and ICS-1600 Ion Chromatography Systems*, Sections 8.2 to 10.
- 11. Select the following Chemistry Types:
 - AS9_HC_4mm for the anions system (system 1)
 - **Cation_Other** for the cations system (system 2)

Note Different chemistry types than the ones actually installed must be selected to comply with the flow rate settings.

Testing the IC Systems with Columns (Recommended)

In this section, the chemistry of the IC systems is tested (before connection to the titrator). This test can be performed after the systems are equilibrated.

- 1. If not yet done, disconnect the transfer line from "InjectValve_2; (port S)" and use this port for manual injections.
- 2. In Chromeleon, select "System_Test_SEQ" and add three injections with the "cation IQ" program and three injections with the "anion IQ" program (see Figure 39).

	e	A	Title		Timebase	Last Update		Operator	Siz		
2	anion IQ.pgm		column tes	t anion system	Dual_ICS_Titra	27.06.2012	11:11:1	StMa1	3 KB		
2	cation IQ.pgm		column test	t cation system	Dual_ICS_Titra	27.06.2012	11:11:3	StMa1	3 KB		
K	default_meth_IC_Tx.qnt					22.06.2012	13:43:3	ch03-msganac	15 KB		
8	Default_Report_IC_Tx.rdf					22.06.2012	13:39:5		563 K		
8	default_Sys_test.rdf					05.08.2011	02:05:5		183 K		
2	Dual_IC_Titration.pgm	1	program fo	r IC-Titration	Dual_ICS_Titra	21.06.2012	12:05:1	ch03-msganac	7 KB		
2	large loop.pgm		program fo	r loop correction factor deter	Dual_ICS_Titra	27.06.2012	11:07:3	StMa1	2 KB		
ĸ	meth1.qnt		145	and a second		22.06.2012	13:47:3	ch03-msganac	13 KB		
Å,	Sensor_Check.pgm		Chr	omeleon				X	1 KB		
4	small loop.pgm		prog	Jineleon	trans, stat. The	1.00	100.000010		2 KB		
1	Titration_Only.pgm	,	recol						1 KB		
No.	Name	Туре	*8	Message from tim Manually inject ca	ebase "dual_ics tion standard a	_titration": nd press OK	to con	tinue.		Status	Inj. Da
1	HNO3	Unknown	S							Finished	27.06
2	S HNO2		0								
2	I HNUS	Unknown	34							Finished	27.06
3	HNO3	Unknown	S							Finished Finished	27.06
3	HNO3	Unknown Unknown	s				[ок		Finished Finished Finished	27.06. 27.06. 27.06.
2 3 4 5	7 HN03 HN03 HN03 HN03 HN03	Unknown Unknown Unknown Unknown	5				[ОК		Finished Finished Finished Finished	27.06. 27.06. 27.06. 27.06.
2 3 4 5 6	7 HNO3 ⑦ HNO3 ⑦ HNO3 ⑦ HNO3 例 HNO3	Unknown Unknown Unknown Unknown Unknown	Si Si Si	0.10	1 20.0	11, á. Sillián 1		OK		Finished Finished Finished Finished Finished	27.06. 27.06. 27.06. 27.06. 27.06.
2 3 4 5 6 7	 ア HNO3 	Unknown Unknown Unknown Unknown Unknown	Si Si Sampre Sample	0.10	1 25.0	n.a. smain	00p	OK		Finished Finished Finished Finished Finished Finished	27.06. 27.06. 27.06. 27.06. 27.06. 27.06.
2 3 4 5 6 7 8	ア	Unknown Unknown Unknown Unknown Unknown Unknown	Sample Sample	0.10 0.10 0.10	1 25.0 1 25.0 1 25.0	n.a. small n.a. small	00p 00p	OK meth1 meth1		Finished Finished Finished Finished Finished Finished Finished	27.06 27.06 27.06 27.06 27.06 27.06 27.06
2 3 4 5 6 7 8	 ア HNO3 ア Cation 	Unknown Unknown Unknown Unknown Unknown Unknown Unknown	Sample Sample Sample Sample	0.10 0.10 0.10 0.10	1 25.0 1 25.0 1 25.0 1 25.0	n.a. small n.a. small n.a. small n.a. cation	00p 00p 00p	OK meth1 meth1 default_meth	h_JC_TX-	Finished Finished Finished Finished Finished Finished Finished Running	27.06. 27.06. 27.06. 27.06. 27.06. 27.06. 27.06. 27.06.
2 3 4 5 6 7 8 10	ア	Unknown Unknown Unknown Unknown Unknown Unknown Unknown Unknown	Sample Sample Sample Sample Sample	0.10 0.10 0.10 0.10 0.10	1 25.0 1 25.0 1 25.0 1 25.0 1 25.0	n.a. small) n.a. small) n.a. small) n.a. cation n.a. cation	00p 00p 1Q	OK meth1 meth1 default_meth	h_IC_Tx h_IC_Tx	Finished Finished Finished Finished Finished Finished Finished Running Single	27.06. 27.06. 27.06. 27.06. 27.06. 27.06. 27.06. 27.06.
2 3 4 5 6 7 8 10 11	ア HNO3 ア HNO3 P HN	Unknown Unknown Unknown Unknown Unknown Unknown Unknown Unknown	Sample Sample Sample Sample Sample Sample	0.10 0.10 0.10 0.10 0.10 0.10	1 25.0 1 25.0 1 25.0 1 25.0 1 25.0 1 25.0	n.a. small i n.a. small i n.a. small i n.a. cation n.a. cation n.a. cation	0000 0000 0000 100 100	OK meth1 meth1 default_met default_met	h_IC_TX h_IC_TX h_IC_TX	Finished Finished Finished Finished Finished Finished Running Single Single	27.06 27.06 27.06 27.06 27.06 27.06 27.06 27.06 27.06
2 3 4 5 6 7 8 10 11 12	ア HNO3 ア HNO3 P HN	Unknown Unknown Unknown Unknown Unknown Unknown Unknown Unknown	Sample Sample Sample Sample Sample Sample Sample	0.10 0.10 0.10 0.10 0.10 0.10 0.10	1 25.0 1 25.0 1 25.0 1 25.0 1 25.0 1 25.0 1 25.0 1 25.0	n.a. small i n.a. small i n.a. cation n.a. cation n.a. cation n.a. cation n.a. cation	00p 00p 00p 1Q 1Q 1Q	OK meth1 meth1 default_met default_met default_met	h_JC_TX h_JC_TX h_JC_TX h_JC_TX h_JC_TX	Finished Finished Finished Finished Finished Finished Running Single Single	27.06. 27.06. 27.06. 27.06. 27.06. 27.06. 27.06. 27.06.
2 3 4 5 6 7 8 10 11 12 13	m m m HNO3 m Cation m cation m anion m anion	Unknown Unknown Unknown Unknown Unknown Unknown Unknown Unknown Unknown	Sample Sample Sample Sample Sample Sample Sample Sample Sample	0.10 0.10 0.10 0.10 0.10 0.10 0.10 0.10	1 25.0 1 25.0 1 25.0 1 25.0 1 25.0 1 25.0 1 25.0 1 25.0 1 25.0	n.a. small n.a. small n.a. small n.a. cation n.a. cation n.a. cation n.a. anion n.a. anion	000p 000p 1Q 1Q 1Q 1Q	OK meth1 meth1 default_met default_met default_met default_met default_met	h_JC_TX h_IC_TX h_IC_TX h_IC_TX h_IC_TX h_IC_TX	Finished Finished Finished Finished Finished Finished Finished Single Single Single Single	27.06. 27.06. 27.06. 27.06. 27.06. 27.06. 27.06. 27.06.

Figure 39. System_Test_SEQ for testing the performance of the columns with manual injections

- 3. Manually inject the "Six Cation Standard II" (PN 046070) three times (Note: The injection loops of the anion system will be filled too; however, they are not injected.)
- 4. Prepare a 1:10 dilution of the "Seven Anion Standard II" (PN 057590).
- 5. Manually inject the diluted anion standard three times (**Note**: All injection loops of the IC systems will be filled; however, only the large loop of the anion system will be injected.)
- 6. Verify that RSDs are < 3% for both cations and anions.
- 7. After a successful test of the IC systems, reconnect the liquid handler to "InjectValve_2; (port S)."

Performing a Combined System Test

This test confirms that the entire system is performing properly and is giving the expected results. Tap water is used as the sample—the standards used previously are not sufficiently concentrated and buffered to work with the titration system. Tap water should show easily detectable amounts of the anions chloride, nitrate and sulphate and the cations sodium, magnesium and calcium. If these ions are not seen, check that the correct chromatography programs are being used, the eluents have been properly prepared, and that the system flow rate is correct.

To perform the combined system test

- 1. Fill three sample vials with 80 mL of normal tap water and place them on the Rondo 30 Sample Changer.
- 2. In Chromeleon, select "System_Test_SEQ" and add three sample injections with the "Dual_IC_Titration" program (see Figure 40).
- 3. On the One Click Terminal, start the titrator (see "Analysis Workflow" on page 39).
- 4. Start the sequence.

						_				_		
Name		A	Title			Timet	ase	Last Update	Operator	Siz	1	
2	anion IQ.pgm		column test	anion system	1	Dual	ICS_Titra	27.06.2012 11:11:1	StMa1	3 KB		
2	cation IQ.pgm		column test	cation system	n	Dual_	ICS_Titra	27.06.2012 11:11:3	StMa1	3 KB		
K.	default_meth_IC_Tx.qn	t						22.06.2012 13:43:3	ch03-msganac	23 KB		
	Default_Report_IC_Tx.	rdf						22.06.2012 13:39:5		563 K		
	default_Sys_test.rdf		n kontra Parto Male	100 M 100			CONSISTENCE.	05.08.2011 02:05:5		183 K		
1	Dual_IC_Titration.pgm		program for	r IC-Titration		Dual_	ICS_Titra	21.06.2012 12:05:1	ch03-msganac	7 KB		
4	arge loop.pgm		program for	r loop correcti	on factor dete	er Dual_	ICS_Titra	27.06.2012 11:07:3	StMa1	2 KB		
	meth1.qnt					-		22.06.2012 13:47:3	ch03-msganac	13 KB		
1	Sensor_Check.pgm		recording p	H-electrode p	arameters	Dual_	ICS_Titra	15.05.2012 09:18:0	StMa1	1 KB		
1	small loop.pgm		program to	r loop correct	on factor dete	Pual_	ICS_IIIra	21.06.2012 14:29:5	chu3-msganac	2 KB		
X	ntration_Only.pgm		recording ti	tration values		Dual_	ics_Itra	15.05.2012 09:18:2	Sunal	IKB		
No.	Name	Туре	*Mode	Vol_Std [mL]	Target_Pos [No.]	lnj. Vol	Cond	Program	Method		Status	Inj. Date/Time
1	HNO3	Unknown	Sample	0.10	1	25.0	n.a.	large loop	meth1		Finished	27.06.2012 11:14
2	HNO3	Unknown	Sample	0.10	1	25.0	n.a.	large loop	meth 1		Finished	27.06.2012 11:15
3	HNO3	Unknown	Sample	0.10	1	25.0	n.a.	large loop	meth1		Finished	27.06.2012 11:31
4	HNO3	Unknown	Sample	0.10	1	25.0	n.a.	large loop	meth 1		Finished	27.06.2012 11:33
5	HNO3	Unknown	Sample	0.10	1	25.0	n.a.	small loop	meth1		Finished	27.06.2012 11:34
6	HNO3	Unknown	Sample	0.10	1	25.0	n.a.	small loop	meth 1		Finished	27.06.2012 11:38
7	HNO3	Unknown	Sample	0.10	1	25.0	n.a.	small loop	meth 1		Finished	27.06.2012 11:39
8	HNO3	Unknown	Sample	0.10	1	25.0	n.a.	small loop	meth 1		Finished	27.06.2012 11:42
9	cation	Unknown	Sample	0.10	1	25.0	n.a.	cation IQ	default_meth_IC	Tx_	Finished	27.06.2012 11:50
10	cation	Unknown	Sample	0.10	1	25.0	n.a.	cation IQ	default_meth_IC	Tx	Finished	27.06.2012 11:59
11	cation	Unknown	Sample	0.10	1	25.0	n.a.	cation IQ	default_meth_IC	Tx	Finished	27.06.2012 12:08
12	anion	Unknown	Sample	0.10	1	25.0	n.a.	anion IQ	default_meth_IC	Tx	Finished	27.06.2012 12:21
13	anion	Unknown	Sample	0.10	1	25.0	n.a.	anion IQ	default_meth_IC	_Tx	Finished	27.06.2012 12:31
14		Valar	Cample	0.10		05.0		anian 10	de fault - H	-	Cinistent .	27.06.2012 13:09
	KNO3	Unknown	Sample	0.10	1	25.0	n.a.	Dual_IC_Titration	default_meth_IC	Tx_	Single	
	KNO3	Unknown	Sample	0.10	2	25.0	n.a.	Dual IC Titration	default meth IC	Tx	Single	
1	KNO3	Unknown	Sample	0.10	3	25.0	n.a.	Dual IC Titration	default meth IC	Tx	Single	

Figure 40. System_Test_SEQ for testing the performance of the combined system

- 5. For the IC part of the test, verify that RSDs are < 3% for the main peaks for both cations and anions.
- 6. Check for proper communication with the titrator. The results (conductivity, pH, acid capacity and carbonate hardness) transferred to the Chromeleon report should be the same as the results saved in the titrator. The results are displayed on the One Click Terminal after each sample and can also be found by clicking Results in the online view or the home view (see Figure 41).



Figure 41. Results of a sample series accessed from the One Click terminal Online screen or Home screen

Names and definitions of the titration parameters:

- R1 = conductivity
- R2 = pH value
- R3 = acid capacity
- R4 = carbonate hardness

Appendix

Contents

- Installing the UV Detector (Optional)
- Analysis Workflow
- Functions of the User-Defined Columns
- Troubleshooting
- Chromeleon Program Details

Installing the UV Detector (Optional)

A UV detector (Thermo Scientific Dionex ICS-Series VWD) can be added to the anions system. The UV detector is installed between the column outlet and the suppressor inlet. To install the module, refer to *Dionex ICS-Series Variable Wavelength Detector Operator's Manual* (Document No. 065141), provided on the Thermo Scientific Reference Library DVD (P/N 053891). After installation, assign the module to the "Dual_ICS_Titration" timebase. After adding the UV detector to the default panel tabset, save the workspace as described on page 19.

Note The commands for UV-detection are disabled by default in the programs provided on the *Chromeleon Tools for IC-Titration* CD-ROM. Enable them before use by removing the semicolons in the command lines (see "Chromeleon Program Details" on page 43).

Analysis Workflow

- Prepare the sample sequence in Chromeleon (Hint: Use a copy of the "Default_IC_Titration_SEQ" sequence)
- Manually start the T90 Titrator via the shortcut on the One Click Terminal (see Figure 42).



Figure 42. Starting the analysis workflow on the One Click Terminal

• If LabX (Mettler-Toledo's titration software) is not installed on the computer, a warning appears on the One Click Terminal. You can ignore this by clicking **OK** (see Figure 43)

Figure 43. Warning on One Click Terminal.



• The titrator now waits for commands from Chromeleon (see Figure 44)

Figure 44. Titrator ready for command	ds from Chromeleon
---------------------------------------	--------------------

		MET	TLER TOL	EDO		
Reset	VG30engli	sh			Tasks 🌑	
	Sample 1/12 No data display	a for curve available.		Auxiliary Time rema	instrument	1
	Results	Axes	Measured values	Samples	Suspend	
L m						

- Manually start the Chromeleon sequence on the PC
- Automatic steps:
 - The sample tube and conductivity sensor are rinsed in the rinse beaker.
 - The sample conductivity is measured and the value is transferred to Chromeleon.
 - The liquid handler dispenses 50 mL of sample into the titration beaker.
 - The liquid handler fills the IC sample loops.
 - The sample is injected and the chromatography started. The conductivity of the sample determines whether the small or large sample loop of the anion system is selected for injection.
 - The sample is titrated.
- During chromatography:
 - pH measurement and titration of the sample is performed
 - The titration beaker is rinsed with deionized water
 - The titration results are transferred to Chromeleon
 - Chromeleon waits for a titration end signal before proceeding to the next sample

- If the chromatography takes longer than titration, Chromeleon will hold the titrator in wait mode until the IC run is finished.
- Calculations are performed automatically and a single unified report is prepared.

Functions of the User-Defined Columns

The Mode, Target_Pos, and Vol_Std user-defined columns are essential for the IC-titration system to work.

Mode: Defines the type of analysis performed.

- Sample: Complete measurement of a sample (conductivity, titration, anions, cations).
- **Std_An**: A standard for calibration of the anions with IC is prepared by the liquid handler and injected (conductivity measured, injection on cations and large loop anions).
- **Std_Cat**: A standard for calibration of the cations with IC is prepared by the liquid handler and injected (conductivity measured, injection on cations only).
- Sensor_Check: Recording specific parameters of the pH-electrode.
- IC_Direct: Measurement of conductivity, anions and cations.
- IC_Direct_Re: Measurement of anions and cations.
- Titration_only: Measurement of conductivity and titration.

Target_Pos: Defines the position on the Rondo 30 Sample Changer

Vol_Std: Defines the volume of the standard concentrate used for automatic dilution with the liquid handler (total volume is defined at 80 mL).

- The default value is 0.1; a value is mandatory also for non-standard injections (although it has no influence on the injections).
- Dilutions are performed only when the "Std_An" or "Std_Cat" mode is selected. However, you can re-inject a diluted standard using the "IC_Direct_Re" mode (refer to the "Default_IC_Titration_SEQ") sequence.
- The positions for the standard concentrates on the Rondo 30 Sample Changer are defined: anions in position 29; cations in position 28.

Troubleshooting

Problem: The program stops unexpectedly.

Possible cause: The titrator is sending truncated commands and values to Chromeleon. For example, the program stops because it has not received the expected WEITER (continue) response from the titrator (see Figure 45).

Figure 45. Chromeleon waiting for the WEITER (continue) response from the titrator



To troubleshoot: Check the Audit Trail. If Chromeleon received a truncated response (for example, "WEIT" instead of "WEITER") increase the wait time from the default value of 200 ms to 500 ms in the device configuration properties of the Generic RS232 driver (see Figure 13).

Note The programs include several status symbols: Warten, Leer, Anfang, Start, Weiter, Ende. Do not change these words in any way; they must be kept as they are, exactly as spelled.

Chromeleon Program Details

This section provides listings of the customized programs provided with the system.

Note When editing the IC-titration programs, always use the Commands view of the Program Editor. Do not use the device tabs, accessed by clicking the device icons on the left side of the Program Editor window. Use of the device tabs can lead to unwanted changes in the programs.

In the program listing in this appendix, additional comments have been added to clarify the functions of some commands. These comments have the following format:

;Note:------;This style of comment provides additional details about commands

Comments that are part of the actual programs have the following format:

; This style of comment is part of the actual program.

Standard Program

; I ni ti al i zat	ion valves	
	Pump_I nj ectVal ve_2. State	LoadPosi ti on
	Pump_I nj ectVal ve. State	LoadPosi ti on
	Val ve_2. State =	A ; Load-Position
; IC setting	s general	
	Pump_ECD_2.Pressure.LowerLimit =	50 [psi]
	Pump_ECD_2.Pressure.UpperLimit =	3000 [psi]
	Pump_ECD_2.%A.Equate =	"25,0 mmol/L MSA"
	Pump_ECD.Pressure.LowerLimit =	50 [psi]
	Pump_ECD.Pressure.UpperLimit =	3000 [psi]
	Pump_ECD. %A. Equate =	"4,5 Na2CO3, 1,4 NaHCO3 mmol/L"
; IC Cations		
	<pre>Pump_ECD_2. Data_Collection_Rate =</pre>	5.0 [Hz]
	Pump_ECD_2. CellTemperature. Nominal =	35.0 [°C]
	Pump_ECD_2. ColumnTemperature. Nominal =	30.0 [°C]
	<pre>Pump_ECD_2. Suppressor_Type =</pre>	CSRS_2mm
	; Pump_ECD_2. H2SO4 =	0.0
	; Pump_ECD_2.MSA =	0.0
	; Pump_ECD_2.Other eluent =	0.0
	; Pump_ECD_2. Recommended Current =	0
	<pre>Pump_ECD_2. Suppressor_Current =</pre>	37 [mA]
	Channel_Pressure_Cat.Step =	0.20 [s]
	Channel_Pressure_Cat.Average =	Off
; IC Ani ons		
	<pre>Pump_ECD. Data_Collection_Rate =</pre>	5.0 [Hz]
	Pump_ECD.CellTemperature.Nominal =	35.0 [°C]
	Pump_ECD.ColumnTemperature.Nominal =	30.0 [°C]
	<pre>Pump_ECD. Suppressor_Type =</pre>	ASRS_4mm
	; Pump_ECD.Carbonate =	4.5
	; Pump_ECD.Bicarbonate =	1.4
	; Pump_ECD. Hydroxide =	0.0
	; Pump_ECD.Tetraborate =	0.0
	; Pump_ECD.Other eluent =	0.0
	; Pump_ECD.Recommended Current =	31

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<pre>Pump_ECD. Suppressor_Current =</pre>	31 [mA]
Channel _Pressure. Step =	0.20 [s]
Channel_Pressure. Average =	0ff

•			
; UV-Detec	ctor (Anions)		
	; UV. Data_Collection_Rate =	5.0 [Hz]	
	;TimeConstant =	0.60 [s]	
	;UV_VIS_1.Wavelength =	207 [nm]	
	Pump_ECD. FI ow =	1.20 [ml/	min]
	Pump_ECD_2. Flow =	0.50 [ml/	min]
;Note:			
In the follo, interface a	owing section, all variable values of the titrator re reset.	and the com	mands for communication with the titrator via the RS-232
, -0. 700			;6 seconds waiting time for Titrator to be ready
-0. 600	; Settings for RS-232 Variables, reset	t all values	
	WEITER =	"WARTEN"	;has to be reset to "WARTEN" in order to recognize response from Titrator
	FILLED =	"LEER"	;reset to "LEER" in order to monitor loading of the sample loops
	ENDE =	"ANFANG"	; reset to "ANFANG", to receive end-signal from Titrator
	GenericRS232Driver.Volume_standard =	0.010000	; reset to 0.01, to recognize response of the Titrator
	GenericRS232Driver.Sensor_drift =	0. 000001	; reset to 0.000001, to recognize response of the Titrator
	GenericRS232Driver.Target_position =	0. 000001	; reset to 0.000001, to recognize response of the Titrator
	GenericRS232Driver.MODE =	1. 000000	; reset to 1, to recognize response of the Titrator
	Conductivity =	0. 100000	; reset to 0.1, to recognize response of the Titrator
	pH =	0. 000001	; reset to 0.000001, to recognize response of the Titrator

Acid_capacity_4_3 =	0. 100000	; reset to 0.1, to recognize response of the Titrator
Carbonate_hardness =	0. 100000	; reset to 0.1, to recognize response of the Titrator
SI ope =	0.000001	; reset to 0.000001, to recognize response of the Titrator
Zero_Point =	0. 000001	; reset to 0.000001, to recognize response of the Titrator
Response_pH4 =	0. 000001	; reset to 0.000001, to recognize response of the Titrator
Response_pH7 =	0. 000001	; reset to 0.000001, to recognize response of the Titrator
Temp_cond =	0. 100000	; reset to 0.100000, to recognize response of the Titrator
Temp_pH =	0. 100000	; reset to 0.100000, to recognize response of the Titrator
SendS =	"START"	;Start command for first analysis
wait GenericRS232Driver.WEITER =	"WEI TER"	
sendS =	"START"	;Start command for first analysis
; Start Titrator by sending all paramet	ers	

:Note:-----

-0.550 -0.500

; Chromeleon uses four different RS-232 string types to consecutively send all parameters to the titrator and then waits for confirmation of each parameter from the titrator. The RS-232 string types define the type of injection (sample.mode); the volume of standard stock solution for automated IC standard dilution (sample.Vol_Std); the total volume of standards (sample.Vol_Total; fixed at 80 mL); and the position of the sample in the Rondo Sample Changer (sample.Target_Pos).

-0. 400	if sample.mode = "Sample"	
		SendF = 410.0
	elseif sample.mode = "Std_An"	
		SendF = 420.0
	elseif sample.mode = "Std_Cat"	
		SendF = 430.0
	elseif sample.mode = "Sensor_Check"	
		SendF = 440.0
	<pre>elseif sample.mode = "IC_Direct"</pre>	
		SendF = 450.0
	elseif sample.mode = "IC_Direct_Re"	

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		SendF = 4	70.0	
	elseif sample.mode = "Titration_only" endif	"SendF = 4	80.0	
-0. 350	SendS = wait GenericRS232Driver.MODE > 1	"START"	; confirmation of sent value	
-0. 300	GenericFloat0 = SendF = GenericFloat0	500+sampl	e.Vol_Std	
-0. 250	SendS = wait GenericRS232Driver.Volume_standa	"START" ard > 0.01	; confirmation of sent value	
-0. 200	SendF = 680		;sample.Vol_Total fix 80 mL	
-0. 150	SendS = wait GenericRS232Driver.Total_volume	"START" = 80.00	; confirmation of sent value	
-0. 100	Generi cLong1 = SendF = Generi cLong1	700+sampl	e.Target_Pos	
-0. 050	SendS = wait GenericRS232Driver.Target_posit	"START" i on >=1	; confirmation of sent value	
;Note:				
; Titrator se	ends signal (FILLED) to RS-232 interface who	en the IC sam	ple loops are filled.	
, -0. 010	if sample.mode = "Std_An"			
	elseif sample.mode = "Std_Cat"	wait Fill	ed = "FILLED"	
	elseif sample.mode = "Sample"	wait Fill	ed = "FILLED"	
	<pre>elseif sample.mode = "IC_Direct"</pre>	wait Fill	ed = "FILLED"	

,	IF	(sample.mode = "Sensor_Check")
	Branch	"Sensor_Check" ;go to short program "Sensor Check"
	ENDI F	
	IF	(sample.mode = "Titration_only")
	Branch	"Titration_only" ;go to short program "Titration Only"
	ENDI F	
0. 000	Pump_ECD_2.Autozero	
	Pump_ECD. Autozero	
	; UV. Autozero	
	;Wait	Ready
Note		
; Dependir	ng on the measured conductivity of the	e sample, either the small or large sample loop on the anion system will be injected.
; Cho	nice of sample loop ONLY FOR ANIONS	S; cations do not need dilution
	lf	(Conductivity > 3000) and (sample.type <> Standard) and (sample.mode <> "Std_Cat") and (sample.mode <> "Sensor_Check") and (sample.mode <> "Titration_only") ; selection only for "non-standards"
	Val ve_2. B	Duration=10.00 ; small sample loop anions
	el sei f	<pre>sample.mode <> "Std_Cat" and (sample.mode <> "Sensor_Check") and (sample.mode <> "Titration_only")</pre>
	Pump_InjectValve.InjectPositic	Duration=10.00 ; large sample loop anions

	endi f		
	lf	(sample.mode <> "; "Titration_only")	Sensor_Check") and (sample.mode <>
	Pump_I nj ectVal ve_2. I nj ectPosi ti on endi f	Duration=10.00 ; ca	ations always on same sample loop
	ECD_1_2. Acq0n		
	Channel_Pressure_Cat.AcqOn		
	ECD_1. Acq0n		
	Channel _Pressure. AcqOn		
	; UV_VI S_1. Acq0n		
	1 F	(sample.mode <> ": "IC_Direct_Re")and	Sensor_Check")and (sample.mode <> d (sample.mode <> "Titration_only")
	Log	Conducti vi ty; acqu	isition of conductivity value
	Log	Temp_cond ; acqui s	ition of temperature conductivity-meaurement
	endi f		
10.000	ECD_1_2. AcqOff		
	Channel_Pressure_Cat.AcqOff		
	ECD_1.Acq0ff		
	Channel_Pressure. Acq0ff		
	; UV_VI S_1. Acq0ff		
;Note:			
; After data next samp	a acquisition on the IC systems, Chromeleo ile. The values generated by the titrator are	waits for the response (paged.	"ENDE") from the titrator, confirming it is ready for the
;			
10. 100	wait GenericRS232Driver.ENDE =	"ENDE" ;waitf	or Titrator to be ready for next sample
	Log	pH ; acqui s	ition of pH-value
	Log	Temp_pH ; acqui s	ition of temperature pH-measurement
	Log	Acid_capacity_4_3	; acquisition of acid capacity value
	Log	Carbonate_hardnes	${f s}$; acquisition of carbonate hardness value
	End		

Thermo Scientific

Special Programs

Sensor Check

, 0. 000	Pump ECD 2.Autozero		
	Pump_ECD. Autozero		
	ECD_1_2. Acq0n		
	Channel_Pressure_Cat.AcqOn		
	ECD_1. Acq0n		
	Channel_Pressure. Acq0n		
			Log Generi cRS232Dri ver. Sensor_dri ft
		Log	SI ope
		Log	Zero_poi nt
		Log	Response_pH4
		Log	Response_pH7
0.60	ECD_1_2. AcqOff		
	Channel_Pressure_Cat.AcqOff		
	ECD_1.AcqOff		
	Channel_Pressure.Acq0ff		
	End		

Titration Only

;Note:			
; No chror	matography data is recorded; titration varia	ables are logged.	
, 0. 000	Pump_ECD_2.Autozero		
	Pump_ECD. Autozero		
	ECD_1_2. Acq0n		
	Channel_Pressure_Cat.AcqOn		
	ECD_1. Acq0n		
	Channel _Pressure. AcqOn		
0. 10	Log	Conducti vi t	y ; acquisition of conductivity value
	Log	Temp_cond	;acquisition of temperature conductivity-measurement
	Log	рН	; acqui si ti on of pH-val ue
	Log	Temp_pH	;acquisition of temperature pH-measurement
	Log	Acid_capacity_4_3 ; acquisition of acid capacity value	
	Log	Carbonate_hardness ; acquisition of carbonate hardness value	
0. 60	ECD_1_2. Acq0ff		
	Channel_Pressure_Cat.AcqOff		
	ECD_1. AcqOff		
	Channel_Pressure. Acq0ff		
	End		