



UltiMate 3000 Series

Thermostatted Column Compartments TCC-3x00

Operating Instructions



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Revision: 1.2
Date: February 2008

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Declaration of Conformity

Product: Thermostatted Column Compartment
Types: TCC-3000, TCC-3100, and TCC-3200(B)

Dionex GmbH herewith declares conformity of the above products with the respective requirements of the following regulations:

- Low-Voltage Equipment Directive 73/23/EEC
changed by 93/68/EEC
- EMC Directive 2004/108/EG

The electrical safety of the products was evaluated based on the following standard:

- EN 61010-1: 2002
Safety requirements for electrical equipment for measurement, control and laboratory use
Part 1: General Requirements

The Electromagnetic Compatibility (EMC) of the products was evaluated based on the following standards:

- DIN EN 61326: 2004
Electrical equipment for measurement, control and laboratory use
EMC Requirements

This declaration is issued for the manufacturer

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by the President, Dr. Peter Jochum
February 15, 2008

Certificate



Certificate no.

CU 72031463 02

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Certified Product: Thermostatted HPLC Column Compartment

License Fee - Units

Change:

Upgrade of standard for all models: see above

Addition:

Model Designation: TCC 3000, TCC 3100, TCC 3200,
ICS-3000 TC

Rated Voltage: AC 100/120/220/240V, 50-60Hz

Rated Power: 150VA

Appendix: 1

Licensed Test mark:



Signatures

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1 Introduction

1.1 How to Use This Manual

The layout of this manual is designed to provide quick reference to the sections of interest to the reader. However, in order to obtain a full understanding the thermostatted column compartment, Dionex recommends that you review the manual thoroughly before beginning operation of the module.

Almost all descriptions in the manual apply to all models in the UltiMate 3000 Thermostatted Column Compartment series. Therefore, the term "the column compartment" or "the TCC" is used throughout the manual. If some detail applies to only one model or version, the model or version is identified by name.

Notes: The device configuration may vary (for example, one or two column switching valves); therefore, not all descriptions necessarily apply to your particular instrument.

The descriptions in this manual refer to firmware version 2.30 and Chromeleon 6.80 Service Pack 4.

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1.2 Safety Information




The CE Mark label and cTUVus Mark safety label on the instrument indicate that the instrument is compliant with the related standards (→ pages I and I).

1.2.1 Symbols on the Instrument and in the Manual

The table shows the symbols used on the instrument:

Symbol	Description
	Alternating current—Courant alternatif
	Power supply is on (–) — L'instrument est mis sous tension (–) and Power supply is off (O)— L'instrument est mis hors tension (O)
	Surface becomes hot during operation—La surface devient chaude lors du fonctionnement.
	Refer to the <i>Operating Instructions</i> to prevent risk of harm to the operator and to protect the instrument against damage. Référez-vous à ce manuel pour éviter tout risque de blessure à l'opérateur et/ou protéger l'instrument contre tout dommage.
	Label according to the "Measures for Administration of the Pollution Control of Electronic Information Products" (China RoHS) guideline Étiquette "Measures for Administration of the Pollution Control of Electronic Information Products" (China RoHS)
	WEEE (Waste Electrical and Electronic Equipment) label—For more information, see the WEEE Information section in the manual binder. Étiquette WEEE (Waste Electrical and Electronic Equipment) —Pour plus d'informations, référez-vous au chapitre WEEE Information dans ce manuel.

At various points throughout the manual, messages of particular importance are indicated by certain symbols:

-  **Tip:** Indicates general information, as well as information intended to optimize the performance of the instrument.
-  **Important:** Indicates that failure to take note of the accompanying information could cause wrong results or may result in damage to the instrument.
-  **Important:** Indique que ne pas tenir compte de l'information jointe peut conduire à de faux résultat ou endommager l'instrument.



Warning: Indicates that failure to take note of the accompanying information may result in personal injury.



Avertissement: Indique que ne pas tenir compte de l'information jointe peut entraîner des blessures corporelles.

1.2.2 General Safety Precautions

When working with analytical instrumentation, you should know the potential hazards of using chemical solvents.




Tips: Before initial operation of the TCC, make sure that you are familiar with the contents of this manual.
Observe any warning labels on the device and see the related sections in these *Operating Instructions*.
For the general safety precautions in French, see Consignes Générales de Sécurité (→ page 5).

- To avoid the possibility of personal injury or damage to the instrument, observe the following general safety precautions when operating the instrument or carrying out any maintenance work:
- Install the HPLC system in a well-ventilated laboratory. If the mobile phase includes volatile or flammable solvents, do not allow them to enter the workspace.
- For minimum interference effects, all components of the analytical system should be connected to the same mains output (same phase).
- The column switching valves are primed with 2-propanol. During initial operation of the TCC, make sure that the solvents used are miscible with 2-propanol. Otherwise, follow the appropriate intermediate steps.
- To prevent damage to the instrument when lifting or moving, always lift the unit by the bottom sides or sides. Lifting the TCC by the bottom front or by the front panel door may damage the door.
- The front panel tilts downward. Do not place any heavy objects on the open front panel door. This may damage the door.
- Do not touch any metal parts inside the column chamber while the temperature set point is $> 50\text{ }^{\circ}\text{C}$. Wait for the chamber to cool down, for example, before changing a column or before performing any maintenance procedures.
- When operating the HPLC system, always set a lower pressure limit for the system pump. This prevents damage resulting from leakage or from running the pump dry.

- When connecting the capillaries, make sure that the connectors are free from contaminants. Even minute particles may cause damage to the system, for example, the column.
- After operation, rinse out buffers and solutions that form peroxides.
- Before switching from buffer to organic solution, rinse the analytical system thoroughly with de-ionized or HPLG-grade water.
- When switching to another solvent, ensure that the new solvent is miscible with the one contained in the pump. Otherwise, the analytical system can be damaged; for example, by flocculation.
- If the mobile phase includes volatile or flammable solvents, avoid open flames and sparks.
- If a leak occurs, turn off the instrument immediately, stop the pump flow, and remedy the situation.
- When the panels are removed, dangerous electrical connections will be exposed. Disconnect the TCC from all power sources before removing the panels.
- Always replace blown fuses with the original spare fuses from Dionex (→ page 94).
- Replace faulty power cords and communication cables.
- Many organic solvents and buffers are toxic. Know the toxicological properties of all mobile phases that you are using.
- The toxicological properties of many samples may not be well known. If you have any doubt about a sample, treat it as if it contains a potentially harmful substance.
- Wear goggles when handling mobile phases or operating the instrument. An eye-wash facility and a sink should be close to the unit. If any mobile phase splashes on the eyes or skin, wash the affected area and seek medical attention.
- Dispose of waste mobile phase in an environmentally safe manner that is consistent with all local regulations. Do not allow flammable or toxic solvents to accumulate. Follow a regulated, approved waste disposal program. Never dispose of flammable or toxic solvents through the municipal sewage system
- Use only standard solvents (HPLC grade) and buffers that are compatible with all parts that may be exposed to solvents (→ page 95).
- In an UltiMate 3000 system, some components are made of PEEK. While this polymer has superb chemical resistance to most organic solvents, it tends to swell when in contact with trichloromethane (CHCl_3), dimethyl sulfoxide (DMSO), or tetrahydrofuran (THF). In addition, it is attacked by concentrated acids, such as, sulfuric acid and nitric acid or a mixture of hexane, ethyl acetate, and methanol. (Swelling or attack by concentrated acids is not a problem with brief flushing procedures.)

- Do not use PEEK tubing that is stressed, bent, or kinked.
- Wear goggles when handling fused silica tubing (during, installation, cutting, etc.).
- Before interrupting operation for several days or more or when preparing the TCC for transport, observe the precautions for shutting down the TCC (→ page 74).
- Use original Dionex spare parts only. Substituting non-Dionex parts or using non-Dionex accessories may impair the performance of the instrument.
- Do not use the module in ways other than those described in this manual.

1.2.3 Consignes Générales de Sécurité

 **Veillez noter:** Avant de commencer à utiliser l'instrument, assurez-vous que vous vous êtes familiarisés avec le contenu de ce manuel.

Observez les étiquettes d'avertissement sur l'appareil et référez-vous aux sections correspondantes dans ce mode d'emploi.

Veillez observer les consignes générales de sécurité suivantes lorsque vous utilisez l'instrument ou que vous procédez à des opérations de Service:

- Installez le système HPLC dans un laboratoire bien ventilé. Si la phase mobile contient des solvants volatils ou inflammables, empêchez qu'ils ne pénètrent dans l'espace de travail.
- Afin d'éviter au maximum les interférences, tous les éléments du système analytique doivent être raccordés à la même ligne secteur (même phase).
- Les vannes de colonne sont stockées sous 2-propanol. Au cours démarrage de l'instrument, assurez-vous que les solvants utilisés soient miscibles avec le 2-propanol. Sinon, suivez les étapes intermédiaires appropriées.
- Lorsque vous soulevez ou l'instrument, tenez-le toujours par le dessous ou par les côtés de l'unité. Soulever l'instrument par la partie avant inférieure ou par le panneau avant peut endommager la porte.
- Ne placez aucun objet lourd sur la porte ouverte du panneau avant. Ceci pourrait endommager la porte.
- Ne touchez à aucune partie en métal à l'intérieur du compartiment de colonne tant que le point de réglage de température est $> 50^{\circ}\text{C}$. Attendez que le four refroidisse, par exemple, avant de changer une colonne ou avant de procéder à tous travaux de maintenance.
- Réglez toujours une limite de pression minimum pour le système HPLC. Ceci prévient les dommages résultant de fuites ou du fonctionnement à sec de la pompe.

- Lorsque vous connectez les capillaires, assurez-vous que les raccords sont exempts de tout contaminant. Même d'infimes particules peuvent causer des dommages au système (ex. colonne).
- Après utilisation, purgez le système des tampons et des susceptibles de former des peroxydes.
- Lorsque vous passez d'une solution saline à un solvant organique, effectuez un rinçage intermédiaire du système HPLC à l'eau dé-ionisée ou qualité HPLC.
- Lorsque vous passez à un autre solvant, assurez-vous que le nouveau solvant soit miscible avec celui qui se trouve dans le système HPLC. Dans le cas contraire, le système HPLC peut être endommagé; par exemple, par des floculations!
- Si la phase mobile contient des solvants volatils ou inflammables, évitez les flammes nues et les sources d'étincelles à proximité.
- Si une fuite se produit, arrêtez immédiatement l'instrument, stoppez le débit de la pompe et remédiez au problème.
- Quand les capots de protection de l'appareil sont démontés, vous êtes exposés à des connexions électriques sous haute tension deviennent accessibles. Débranchez le passeur d'échantillon de toute source d'alimentation électrique avant de retirer les capots. Ne démontez les capots de protection que si cela est explicitement demandé au cours de ces instructions.
- Remplacez toujours les fusibles grillés par des fusibles de rechange d'origine Dionex (→ page 94).
- Remplacez les cordons d'alimentation électrique et les câbles de communication défectueux.
- De nombreux solvants organiques et solutions salines sont toxiques. Informez-vous des propriétés toxicologiques de toutes les phases mobiles que vous utilisez.
- Les propriétés toxicologiques de nombreux échantillons peuvent être mal connues. Au moindre doute concernant un échantillon, traitez-le comme s'il contenait une substance potentiellement dangereuse.
- Portez des lunettes de protection lorsque vous manipulez des phases mobiles ou que vous utilisez l'instrument. Une installation permettant de se laver les yeux ainsi qu'un lavabo doivent se trouver à proximité du système. Si une phase mobile, quelle qu'elle soit, entre en contact avec vos yeux ou votre peau, rincez abondamment la zone affectée à l'eau, puis.
- Débarrassez-vous de tous les déchets de phase mobile de manière écologique, conformément à la réglementation en vigueur au niveau local. Empêchez impérativement l'accumulation de solvants inflammables et/ou toxiques. Suivez un programme d'élimination des déchets réglementé et approuvé. Ne jetez jamais de solvants inflammables et/ou toxiques dans le système municipal d'évacuation des eaux usées.

- Utilisez uniquement des solvants (qualité HPLC) et des solutions salines compatibles avec les matériaux exposés phase mobiles (→ page 95).
- Dans un système UltiMate 3000, certaines composantes sont en PEEK. Bien que ce polymère présente une excellente résistance chimique à la plupart des solvants organiques, il a tendance à gonfler lorsqu'il est en contact prolongé avec du chloroforme (CHCl_3), du diméthyle sulfoxyde (DMSO) ou du tétrahydrofurane (THF). De plus, il est attaqué par des acides concentrés tels que l'acide sulfurique et l'acide nitrique ou d'un composé du hexane, éthyle acétate et méthanol. (Ces acides peuvent cependant être utilisés dans le cadre de procédures de nettoyage, à condition que l'exposition soit brève.)
- N'utilisez pas de tubes PEEK écrasés, pliés ou abîmés.
- Avant d'interrompre le fonctionnement pendant plusieurs jours ou plus, observez les précautions figurant en Shutting Down the TCC (→ page 74).
- Utilisez des pièces de rechange d'origine Dionex. Effectuer des remplacements par des pièces ne provenant pas de Dionex ou utiliser des accessoires ne provenant pas de Dionex peut affecter les performances de l'instrument.
- N'utilisez pas l'instrument de manière autre que celles décrites dans ce manuel.

1.3 Intended Use

The TCC is designed to perform equally well as a dependable system for routine analyses or as a sophisticated research instrument for use in HPLC (high performance liquid chromatography) applications, especially as part of the UltiMate 3000 system. However, it can also be used with other HPLC systems if adequate control inputs and outputs are available. A PC with USB port is required.

The TCC is controlled by the **Chromeleon** Chromatography Management System. As part of the UltiMate 3000 system, the TCC can also be controlled by other data systems, such as Analyst[®] (Applied Biosystems/MDS Sciex), Compass[™]/ HyStar[™] (Bruker Daltonics), or Xcalibur[™] (Thermo Scientific). To do so, installation of the DCMS^{Link} (Dionex Chromatography Mass Spectrometry Link) software is required in addition to the installation of the data system.

Please note that the TCC may only be operated with the accessories originally supplied with the instrument (→ page 97) and within its technical specifications (→ page 95).

Use only standard solvents (HPLC grade or LC-MS grade: 0.2 µm, filtered) and buffers that are compatible with components in the flow path of the instrument. Note the special properties of the solvents, such as the viscosity, boiling point, UV absorption (UV/VIS detector), and refractive index (refractive index detector).

All TCC versions except TCC-3200B

Buffer concentration: Typically up to 1 mol/L (< 0.1 mol/L chloride ions).

pH range: 1 through 13.

If there is a question regarding appropriate usage, contact Dionex before proceeding.

Dionex is not liable for any damage, material or otherwise, resulting from inappropriate or improper use of the instrument.

1.4 Federal Communications Commission (FCC) Note

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the U.S. FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his expense.

2 Overview

2.1 Unit Description

The TCC is a modern high-quality instrument designed for HPLC analysis, especially as part of the Dionex UltiMate 3000 system. The design has been optimized for minimum dead volume and maximum efficiency.

- Thermoelectric elements heat or actively cool the column chamber and all internal components to the desired temperature. Using a heat exchanger, they allow fast temperature changes and ensure independence from the ambient temperature, even if the temperature set point is below the ambient temperature.
- The TCC allows compartment cooling by max. 18K from the ambient temperature. The lower temperature limit is +5 °C.
- The columns can be warmed up to max. +85 °C. An increase in temperature from 20 °C to 50 °C is typically realized in 15 minutes.
- Temperature control allows keeping the column temperature constant. If the ambient temperature changes during the analysis, the increased heating or cooling ensures that the column temperature remains constant. The maximum deviation is ± 0.1 °C.
- The column chamber provides room for six columns of different length (maximum length: 30 cm). An electronic column identification module allows GLP-compliant documentation of the column type and all important column parameters (→ page 19).
- Depending on the configuration, the TCC is equipped with one or two column switching valves (→ page 11), for example, for applications that require different columns at frequent intervals at similar temperatures.
- If necessary, an eluent preconditioner can be installed in the column chamber to bring the solvent to the column temperature before the solvent enters the column (→ page 20). This avoids temperature gradients on the column.
- Various safety and monitoring features are provided for optimum system performance and reliability (→ page 21).
- The TCC can be fully controlled by the Chromeleon Chromatography Management System, providing a high degree of system integration.
- All surfaces in the column chamber are made of materials that provide maximum resistance to the most commonly used HPLC solvents.

2.2 Operating Principle

The fundamental requirement for a column compartment for liquid chromatography applications is the ability to maintain the preset temperature as precisely as possible. However, for temperature equalization, temperature stability is more important than the absolute precision of the setting. The TCC contains advanced electronic circuitry that maintains the selected temperature with a precision of ± 0.1 °C.

The thermo-optimized design of the TCC reduces the time required to equilibrate the temperature between the column and the solvent.

Peltier elements in the TCC heat up and cool down the columns. The heat exchanger inside the column chamber helps to bring the air and all of the components installed in the chamber (including the column switching valves) to the desired temperature.

If necessary, an eluent preconditioner can be installed in the column chamber.

All this ensures that

- The temperature of the stationary phase remains constant over the total column length.
- The column and the solvent have the same temperature during the analysis.

Under these conditions, the analytical separation is performed at the nominal temperature. This minimizes fronting and tailing of peaks, as well as retention time variations.

2.3 TCC Configurations

2.3.1 Overview

The TCC is available in the following configurations:

TCC	Description	Part No.
TCC-3000	Thermostatted column compartment Basic version with no column switching valve	5722.0000
TCC-3100 1x 2P-6P	Thermostatted column compartment with <i>one</i> 2-position, 6-port switching valve (stainless steel) The valve is installed on the left side in the column chamber.	5722.0010
TCC-3100 1x 2P-10P	Thermostatted column compartment with <i>one</i> 2-position, 10-port switching valve (stainless steel) The valve is installed on the left side in the column chamber.	5722.0020
TCC-3200 2x 2P-6P	Thermostatted column compartment with <i>two</i> 2-position, 6-port switching valves (stainless steel)	5722.0015
TCC-3200 2x 2P-10P	Thermostatted column compartment with <i>two</i> 2-position, 10-port switching valves (stainless steel)	5722.0025
TCC-3200B 2x 2P-10P	Same as TCC-3200 2x 2P-10P, however, with biocompatible switching valves (→ page 12).	5723.0025
TCC-3200 2x 6P-7P	Thermostatted column compartment with <i>two</i> 6-position, 7-port switching valves (titanium) To operate this model with Chromeleon, Chromeleon 6.60 or later (plus the appropriate Service Pack) is required.	5722.0030

Together with a dual low-pressure gradient pump (DGP-3600) of the UltiMate 3000 system

- The TCC with 2-position, 6-port switching valves is the appropriate choice for applications, such as matrix separation or concentration of components (→ Fig. 2, page 13).
- The TCC with 2-position, 10-port switching valves allows increasing the sample throughput by overlapping injections with offline re-equilibration of two matched chromatographic columns. During this process, offline re-equilibration is performed for one chromatographic column, while the next sample is simultaneously injected and analyzed on the other column (→ Fig. 3, page 13).

The TCC with 6-position, 7-port switching valves allows connecting up to six different columns, and thus is the appropriate choice, for example, for method development (→ Fig. 4, page 14).

2.3.2 Biocompatible TCC Version

The TCC-3200TB is the biocompatible device version of the TCC series. Except for the column switching valves and the connected components, the biocompatible TCC is identical to the device versions with stainless steel valves. Therefore, almost all descriptions for these TCC versions apply also to the biocompatible TCC. If some detail applies to only one version, the version will be identified.

To avoid damage to the switching valve, use *only* the PEEK fitting nuts and ferrules from the TCC accessories kit or use original Dionex spare parts. Do *not* use metal fittings and ferrules for the connection.

1. Slide the fitting nut and ferrule onto the capillary.
2. Insert the assembly into the valve port.
3. Push the capillary all the way into the port, and then tighten the connection until the ferrule grabs the capillary.

To ensure proper connection, a short part of the capillary must stick out of the ferrule. Therefore, remove the capillary from the valve to verify this. In addition, check that the ferrule grabbed the capillary. When pulling the ferrule gently, you should not be able to move the ferrule on the capillary.



*Fig. 1: Capillary with fitting nut and ferrule
for connection to the biocompatible valve*

2.3.3 Column Switching Valve

The TCC can hold one or two column switching valves. The following valve models are available:

- 2-position, 6-port column switching valve
- 2-position, 10-port column switching valve
- 6-position, 7-port column switching valve

The valves are installed in the column chamber, where they are brought to the desired temperature together with the columns. Column selection is via Chromeleon (→ page 66). For information about how to connect the capillaries to the valve, see section 4.5 (→ page 44).

Fig. 2 through Fig. 4 show example flow schematics for the three valve models.

- Fig. 2 shows a typical flow schematics for a 2-position, 6-port valve when it is connected for an application that requires two different columns at frequent intervals at similar temperatures.

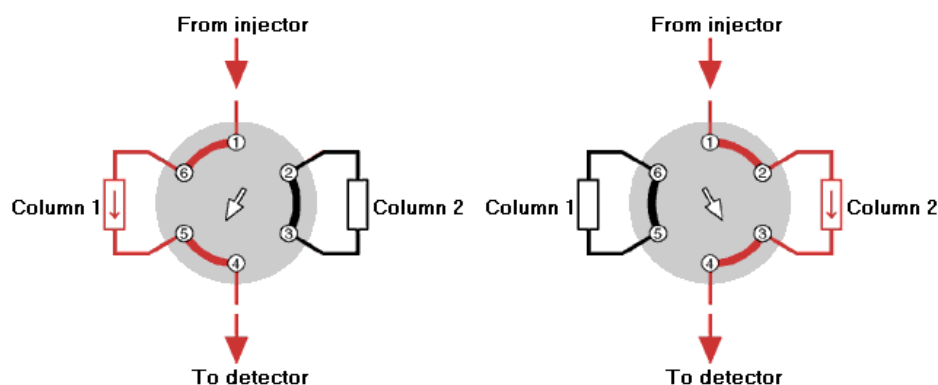


Fig. 2: Typical example for column switching with a 2-position, 6-port column switching valve

- Fig. 3 shows a flow schematics for a 2-position, 10-port column switching valve when it is connected for an application with overlapping injection with offline re-equilibration of the column. In position 10-1, column 1 analyzes while column 2 re-equilibrates. In position 1-2, column 2 analyzes, while column 1 re-equilibrates

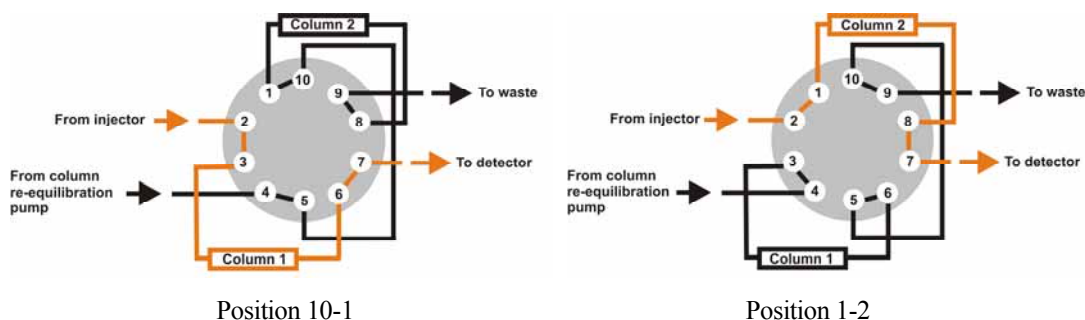


Fig. 3: Example for column switching with a 2-position, 10-port column switching valve

- Fig. 4 shows a flow schematics for two 6-position, 7-port valves when they are connected for an application with several columns, for example, for method development.

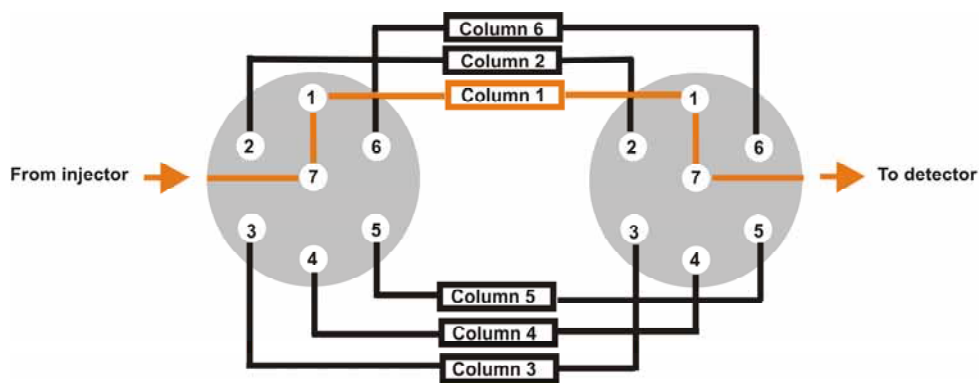


Fig. 4: Example for 6 columns on a 6-position, 7-port column switching valve

2.4 TCC Interior Components

Fig. 5 illustrates the interior of the TCC. The components installed in your TCC may vary, depending on your TCC configuration and your application.

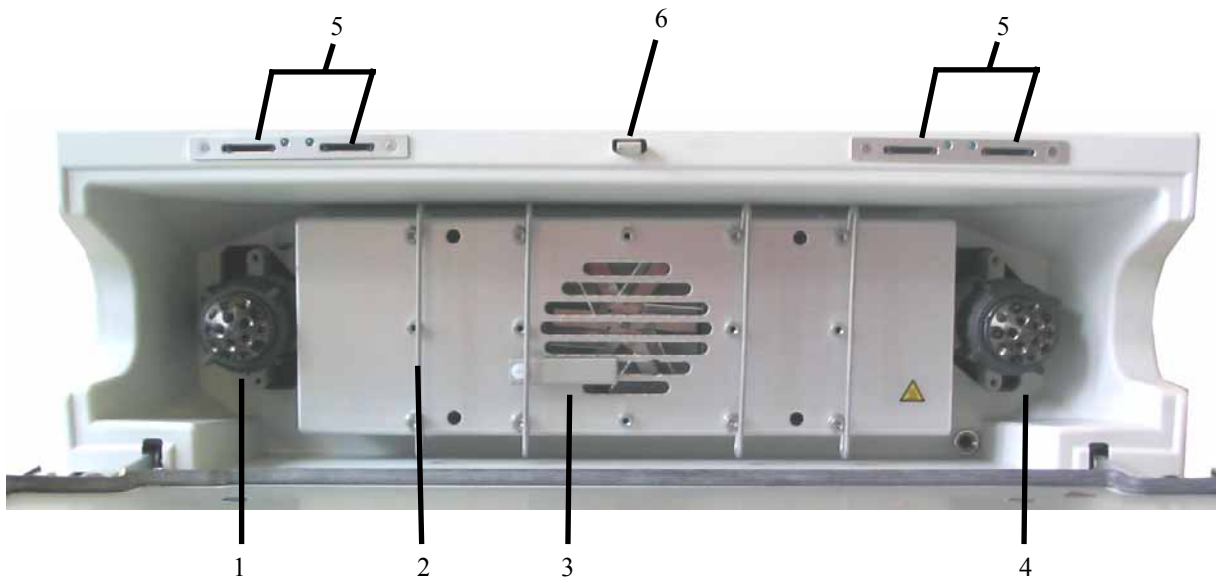


Fig. 5: TCC interior view (example configuration)

No.	Description
1	Column switching valve It depends on the TCC configuration whether a valve is installed in this position (→ page 11).
2	Column bracket (→ page 42)
3	Temperature sensor
4	Column switching valve It depends on the TCC configuration whether a valve is installed in this position (→ page 11). With a TCC-3100, the valve is installed in this position.
5	Slots for the column ID chip cards (→ page 68)
6	Locking mechanism for the front panel door (→ page 40)

2.5 Front Panel Elements



Fig. 6: Front panel view (example)

No.	Front Panel Element	Description
1	Display	Shows information about the TCC, for example: <ul style="list-style-type: none"> - General information upon power-up (→ page 51) - Status screen (→ page 52) - Various function keys and menus (→ pages 59 and 60) - Messages (→ page 78)
2	Standby button	Switches the TCC to Standby mode (the LED is lighted). To cancel Standby mode and resume operation, press the Standby button again (the LED is not lighted). Note: To allow the TCC to change the mode, press and hold the Standby button for at least 1 second.
3	LEDs	
	Power	The LED is blue when the TCC is on.
	Connected	The LED is green when the TCC is connected in Chromeleon.
	Status	The LED is green when the TCC has reached the target temperature and no error has been detected. The LED is orange when the TCC has not yet reached the target temperature or when the door is open. The LED is red when an error has been detected. The related message appears on the display.

2.6 Rear Panel

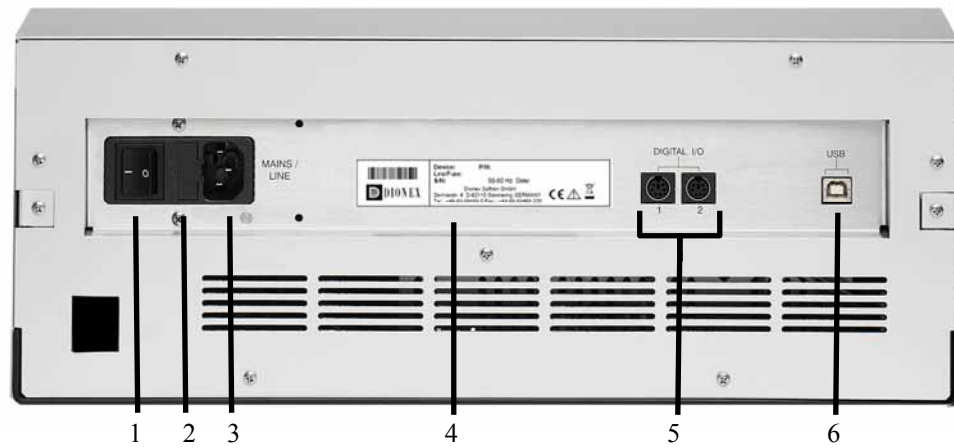


Fig. 7: Rear panel view

No.	Description
1	Power switch (→ page 18)
2	Fuse holder (→ page 18)
3	Main power receptacle (→ page 26)
4	Type label
5	Digital I/O for communication with external devices (→ page 18)
6	USB (Universal Serial Bus) port for connection to the Chromeleon computer (→ page 18)

2.6.1 Power Switch

The power switch on the rear panel is the main power switch for the TCC. Turn on the power switch before initial operation of the TCC and leave it on. For routine on/off control, use the standby button on the front of the TCC (→ page 16). Press and hold the button for one second to allow the TCC to change the mode. Turn off the main power switch when instructed to do so, for example, before performing a service procedure or when interrupting operation for longer periods (one week or more). In this case, also observe the precautions on page 74.

2.6.2 Fuse Holder

The fuse holder contains two slow-blow fuses rated at 2 A. For information about how to change the fuses, see page 94.

2.6.3 USB Connector

The Chromeleon Chromatography Management System can use a USB connection to control the TCC. Data is transferred digitally via the appropriate USB cable (→ page 26). To ensure trouble-free operation, all USB cables should be ordered from Dionex.

For information about how to connect the TCC to the Chromeleon computer, see sections 3.4.1 and 3.4.2 (→ page 26).

2.6.4 Digital I/O Ports

The 6-pin Mini-DIN ports on the rear panel can be used in Chromeleon to exchange digital signals with external devices. To connect an external device to the TCC, use the 6-pin Mini-DIN signal cable (part no. 6000.1004) provided in the TCC accessories kit. For information about how to connect the digital I/O, see page 27.


2.7 Gas and Humidity Sensors

The TCC contains two sensors to detect any gas or humidity that may accumulate inside the TCC. When a certain concentration of gas or humidity is reached while the door of the column chamber is closed, the **Status** LED on the front panel door changes to red. In addition, a message appears on the front panel display and in the Chromeleon Audit trail, and a beep alerts you, depending on the sensitivity settings for the gas and humidity sensors (→ page 69).

When a sensor reports an increased concentration of gas or humidity, follow these steps:

1. Find and eliminate the leak (wearing appropriate protective clothing).
Beeping stops for the current alarm when you open the front panel door.
2. Ventilate the interior of the TCC thoroughly before closing the front panel door.
3. If the sensor is not activated again, resume operation.

The **Status** LED remains red as long as the sensor is exposed to gases or humidity. To remove the message from the display, select **Clear** on the navigation bar (→ page 61).

 **Tip:** Check the TCC components for leaks every day. Tighten or replace leaking connections if necessary.

2.8 Column Identification System (Column ID)

The TCC is fitted with an electronic column identification system (column ID) that lets you store column-specific information on a column-ID chip card. This information provides a GLP-compliant overview of the column status. The chip card is connected to the column for the column life cycle. Column identification is supported for four columns simultaneously.

The information on the column ID chip card is continuously updated and can be reviewed at any time in Chromeleon, as long as the column and chip card are installed in the TCC. For more information, see page 68.

2.9 Eluent Preconditioner

An eluent preconditioner brings the solvent to the column temperature before the solvent enters the column. This avoids temperature gradients on the column.



Fig. 8: Eluent preconditioner

The following eluent preconditioners are available from Dionex as an option for the TCC:

Description	Part No.*
2 µL eluent preconditioner (stainless steel)	6722.0530
7 µL eluent preconditioner (stainless steel)	6722.0540
11 µL eluent preconditioner (stainless steel)	6722.0550

* All parts required for the installation plus detailed installation instructions are included in the shipment.

The decision which eluent preconditioner is appropriate for the respective application depends on various factors, such as, the flow rate and the temperature difference between the ambient temperature and the column temperature.

Examples

- With a flow rate of 1 mL/min and a temperature difference of 10 K, install an eluent preconditioner with a volume of 2 µL or 7 µL.
- If you want to increase the flow rate to 2 mL/min or if the temperature difference is more likely to be 30 K, Dionex recommends installing an eluent preconditioner with a volume of 11 µL.

The eluent preconditioners can be installed at different positions in the column chamber. A maximum of six preconditioners can be installed at the same time.



Fig. 9: Eluent preconditioner installed the column chamber (example)

2.10 Chromeleon Software

The TCC can be controlled by the Chromeleon Chromatography Management System. To control the TCC, an appropriate Chromeleon version and a **Timebase Class 1** Chromeleon license are required.

Two modes of software control are available:

- **Direct Control**

With direct control, you select operating parameters and commands in the **Commands** (F8) dialog box or on a control panel. Direct commands are executed as soon as they are entered. For routine operation, most parameters and commands are available also on a control panel. For more information about direct control, see page 54.

- **Automated Control**

With automated control, you create a program (or PGM File). This is a list of control commands, executed in chronological order, for automated operation of the TCC.

Programs can be created automatically with the help of a software wizard or manually by editing an existing program. For more information about automated control, see page 57.

2.11 System Wellness, Predictive Performance, and Diagnostics

System Wellness monitors the health of the TCC. Therefore, the TCC supports several performance and reliability features that can help you detect small problems before they turn into big ones:

- Internal monitoring of all mechanical operations
- Automatic self test upon power-up
- Gas and humidity sensors (→ page 19)
- Electronic column identification system (column ID) (→ page 19)

When an error is detected, the **Status** LED on the front panel changes to red and a message appears on the front panel display (→ page 78).

When the TCC is operated with Chromeleon, additional functions for estimating the lifetime of consumables and monitoring and recording service and (re)qualification information (= predictive performance) are available (→ page 71). To check the performance of certain TCC components and the overall performance of the instrument, Chromeleon also supports diagnostic functions for the TCC (→ page 72).

3 Installation

3.1 Facility Requirements

- Make sure that the installation site meets the power and environmental specifications listed in the Technical Information section (→ page 95).
- Install the TCC in the laboratory on a stable surface that is free of vibrations.
- Make sure that the surface is resistant to solvents.
- Avoid locations with extreme changes in temperature (such as direct sunlight or drafts) and high humidity.
- Allow sufficient clearance behind and to the sides of the TCC for power connections and ventilation. Do not place any objects between the TCC and the device located under the TCC in the system stack.

3.2 Unpacking

All electrical and mechanical components of the TCC are carefully tested before the instrument is shipped from the factory. After unpacking, please inspect the module for any signs of mechanical damage that may have occurred during transit.

i Tips: Immediately report any shipping damage to both the incoming carrier and Dionex. Shipping insurance will compensate for the damage only if reported immediately.

Keep the original shipping container and the packing material. They provide excellent protection for the TCC in case of future transit. Shipping the instrument in any other packaging automatically voids the product warranty.

4. Place the shipping container on the floor and remove the accessories kit and the power cord.
5. Grasp the TCC by the sides. Slowly and carefully, pull the instrument out of the shipping container and place it on a stable surface.

⚠ Important: To prevent the TCC from falling, only lift by the bottom sides. Do not lift the unit by the packaging material or the front panel door.

⚠ Important: Afin d'empêcher l'instrument de tomber, saisissez-la par les côtés. Ne soulevez l'instrument à l'aide du matériau d'emballage ou par la porte du panneau avant.

6. Remove the foam spacers, and then remove the polythene packaging.
7. Remove the foam insert from the door latch. The insert secures the front panel door during shipment.
8. Before connecting the TCC to the power source, wait approximately 4 hours to allow the instrument to come to room temperature and to allow any condensation that might have occurred during shipping to evaporate. After 4 hours, check the TCC. If condensation still exists, allow the TCC to continue to warm up (without connecting it to the power source) until the condensation is completely gone.

⚠ Important: When lifting or moving the TCC, always lift by the bottom sides or sides of the unit. Lifting the TCC by the bottom front or the front panel may damage the door.

⚠ Important: Lorsque vous soulevez ou l'instrument, tenez-le toujours par le dessous ou par les côtés de l'unité. Soulever l'instrument par la partie avant inférieure ou par le panneau avant peut endommager la porte.

3.3 Positioning the TCC in the UltiMate 3000 System

If the TCC is part of an UltiMate 3000 system, for example, for analytical HPLC applications, Dionex recommends stacking the individual modules, for example, as shown in Fig. 10 and interconnecting them on the rear panel as shown in Fig. 11. However, the arrangement of the system modules depends on the application.

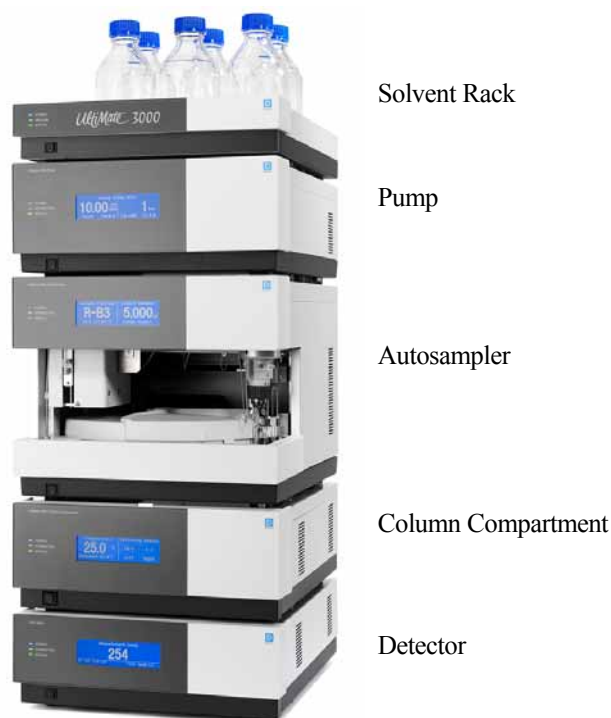


Fig. 10: Example for an UltiMate 3000 system

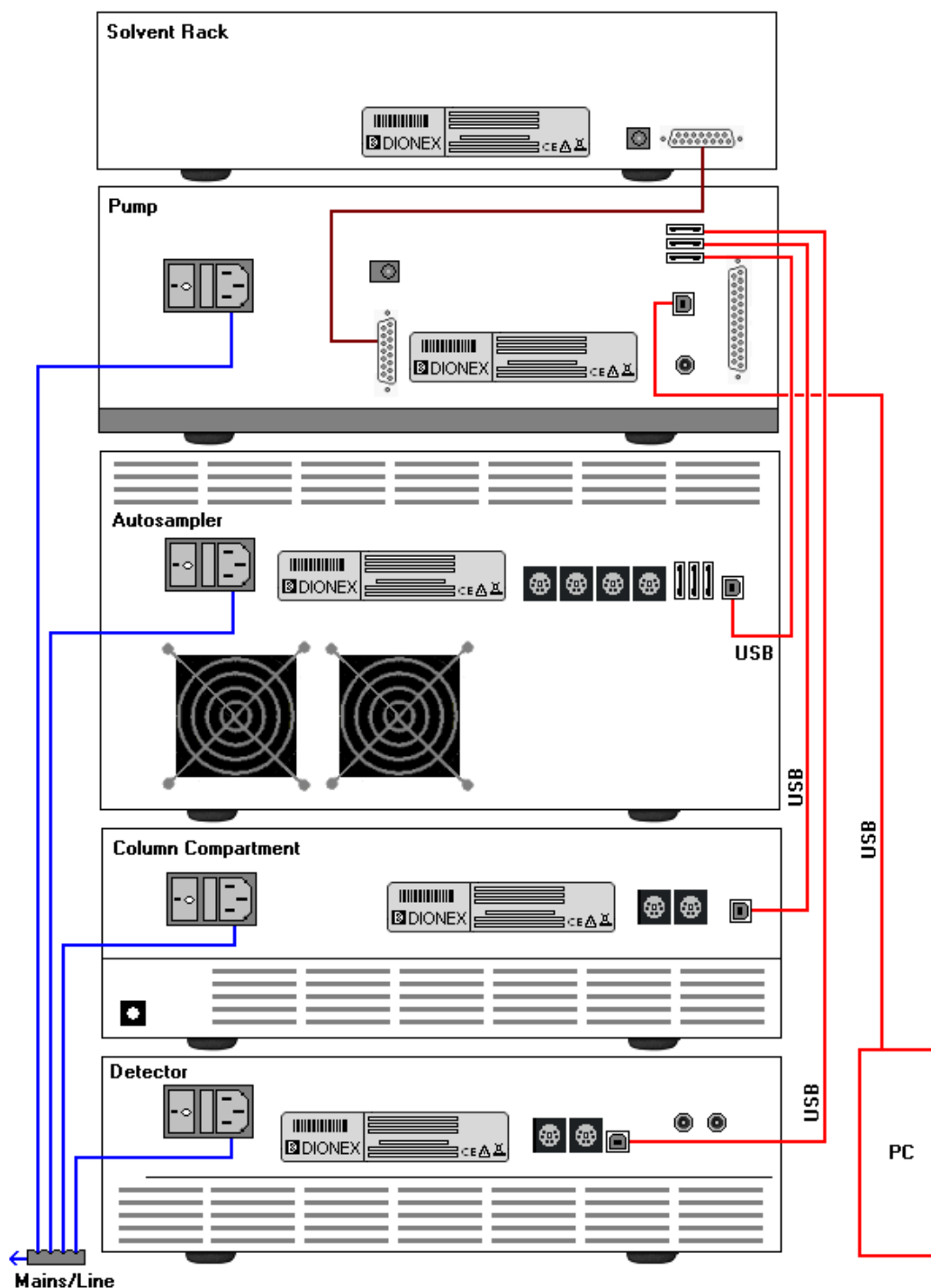


Fig. 11: Example for the rear panel connections on an UltiMate 3000 system (here with VWD-3x00)

- Tip:** Apart from the Solvent Rack, all modules of the UltiMate 3000 system can be connected separately to the computer. However, Dionex recommends interconnecting all modules, and then connecting the system to the Chromeleon computer via only one connection. To do so, use the USB hub on the pump or autosampler.

3.4 Connecting the TCC

3.4.1 General Information

If you want to operate the TCC with Chromeleon

Verify that Chromeleon is installed on the computer and that the license code is entered **before** you connect the TCC to the USB port on the Chromeleon computer and turn on the TCC power. Only if you install Chromeleon first, the USB driver for the TCC is automatically loaded and the Windows operating system can detect the TCC when the power is turned on.


3.4.2 Connecting the USB Cable

Connect the TCC to the Chromeleon computer via the USB ports on the rear panel (→ Fig. 7, page 17). Select one of the following alternatives:

- Connect the TCC directly to the USB port on the computer.
- Connect the TCC to the internal USB port on another module in the UltiMate 3000 system that is connected to the computer.

The following cables are available:

USB Cable	Part No.	
USB type A to type B cable (1 m)	6035.9035	} Shipped with the TCC.
USB type A to type B cable (0.5 m)	6720.8910	

 **Tip:** The USB standard limits the USB cable length to 5 meters. Each USB device can be separated from the computer or next USB hub by no more than 5 meters.

3.4.3 Connecting the Power Cord

Use the power cord shipped with the TCC to connect the instrument to the main power source. Connect the power cord from the main power receptacle on the rear panel (→ Fig. 7, page 17) to the power source that is connected to a true ground. No manual adjustment is required to adapt the line voltage to local voltage requirements.

3.4.4 Connecting the Digital I/O

To connect an external device to the digital I/O ports on the rear panel (→ Fig. 7, page 17), use the 6-pin mini-DIN cable (part no. 6000.1004) from the TCC accessories kit.

1. Plug the 6-pin connector of the mini-DIN cable into the **Digital I/O port 1 (or 2)**.
2. For each relay output or digital input to be used, connect the appropriate signal wire and ground wire to the corresponding connectors on the external device (→ documentation provided with the external device).
3. When configuring the TCC in the Chromeleon **Server Configuration** program (→ page 29), make the following settings:
 - On the **Relays** page, select the corresponding relay output (→ page 37).
 - On the **Inputs** page, select the corresponding digital input (→ page 37).

The port numbering on the rear panel corresponds to the numbering of the relays and digital inputs in Chromeleon.

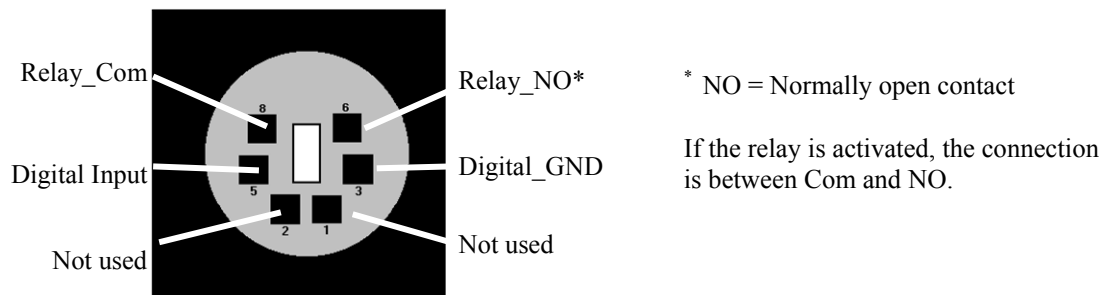


Fig. 12: Digital I/O (view from the rear)

	Description
Digital Input ↔ Digital_GND	0 to +5V
Relay_Com ↔ Relay_NO	Switching voltage: 100V DC; switching current: 0.25 A Carry current: 0.5 A; Switching capacity: 3 W Contact resistance: max. 200 mOhm

Fig. 13: Digital I/O

The table lists the functions assigned to the connector pins. It also provides information about the core colors and core labels for each pin:

Pin	Signal Name	Signal Level	Core Color	Core Label
1	Not used		Pink	Analog High
2	Not used		Gray	Analog Low
3	Digital_GND	0V	Green	Digital GND
5	Digital Input	0 to +5V	Yellow	Digital Input
6	Relay_NO	100V _{DC} /0.25A/3W	Brown	Digital Output
8	Relay_Com		White	Dig./Out (GND)
			Black	Shield


Fig. 14: 6-pin Mini DIN port (Digital I/O) and cable

3.5 Setting Up the TCC in Chromeleon


This section provides brief instructions for setting up Chromeleon. For details about any of these steps, see the Chromeleon Help.

i **Tip:** When the TCC is connected to the Chromeleon computer, verify that the Chromeleon software is installed **before** turning on the TCC power for the first time. Only then, the Windows operating system will detect the TCC automatically when the TCC power is turned on.

3.5.1 Loading the USB Driver for the TCC

1. Turn on the computer power, if it is not already on.
2. If this is a local computer, log on to the Windows operating system (Vista, XP, or 2000) as a local administrator. If this is a network computer, log on as a user with local computer administrator privileges.
3. Start the Chromeleon **Server Monitor** program by double-clicking the Chromeleon Server Monitor icon  on the Windows taskbar.

If the Server Monitor icon is not on the taskbar, click **Start** on the taskbar, point to **Programs** (or **All Programs**, depending on the operating system), point to **Chromeleon**, and then click **Server Monitor**.

4. Click **Start** to start the server.
5. Click **Close** to close the Server Monitor window. The Server Monitor icon  appears on the taskbar.

i **Tip:** Clicking the **Quit Monitor** button quits (exits) the Server Monitor program, but does not stop the server. To stop the server, click **Stop**.

6. Turn on the main power switch on the rear panel of the TCC.
7. *Windows Vista* will automatically detect the new TCC and perform the USB installation.

If Windows Vista fails to detect the TCC and launches a wizard instead, this indicates that you connected the TCC to the computer and turned on the power for the first time **before** you installed Chromeleon. To resolve the problem:

- a) Click **Cancel** to exit the wizard.
- b) Turn off the TCC and unplug the USB cable from the computer.

- c) Install Chromeleon.
- d) Reconnect the USB cable to the computer and turn on the power to the TCC. Vista will now detect the TCC and install the USB software for the TCC automatically.

8. *Windows XP and 2000*

will automatically detect the new TCC and launch the **Found New Hardware Wizard**, which guides you through the USB installation. Select the following options:

- a) If asked whether Windows can connect to Windows Update to search for software, select **No, not this time**.
- b) Accept the default option (**Install the software automatically**) and click **Next>**.
- c) Click **Finish** when the wizard reports that the software for the TCC has been installed.

If Windows XP or 2000 fails to detect the TCC and a message box asks for a USB configuration file (cmwdmusb.inf), this indicates that you connected the TCC to the computer and turned on the power for the first time **before** you installed Chromeleon.

To resolve the problem:

- a) Click **Cancel** in the Windows message box.
- b) Turn off the TCC and unplug the USB cable from the computer.
- c) Install Chromeleon.
- d) Reconnect the USB cable to the computer and turn on the power to the TCC. Windows will now automatically detect the TCC and launch the **Found New Hardware Wizard**.

3.5.2 Installing the TCC

After the USB software for the TCC has been installed (→ page 29), install and configure the TCC in Chromeleon:

1. Start the Chromeleon **Server Monitor** if it is not already running (→ page 29).
2. Start the Chromeleon **Server Configuration** program by clicking **Start** on the taskbar. Point to **Programs** (or **All Programs**, depending on the operating system), point to **Chromeleon**, and then click **Server Configuration**.
3. If necessary, click the plus sign beside the server name to display the items underneath.
4. Select the timebase to which the TCC will be assigned, or create a new timebase (on the **Edit** menu, click **Add Timebase**).
5. Open the **Add device to timebase** dialog box. To do so, click **Add Device** on the **Edit** menu or right-click the timebase and click **Add Device** on the menu.
6. On the **Manufacturers** list, click **Dionex HPLC: UltiMate 3000** and on the **Devices** list, click **TCC-3x00 Column Compartment**.
7. A wizard guides you through the installation. Chromeleon connects to the TCC and transfers the settings from the instrument firmware to Chromeleon, setting the options on the wizard pages accordingly.
8. On each wizard page, verify that the settings are correct and select additional settings if needed. For a description of the wizard pages, see section 3.5.3.1 (→ page 32).
9. Click **Finish** to complete the installation of the TCC.
10. On the **File** menu, click **Save Installation** and then close the Server Configuration program.

3.5.3 Configuring the TCC

3.5.3.1 Initial Installation

During the installation, Chromeleon connects to the TCC and transfers the settings from the instrument firmware to Chromeleon, setting the options on the wizard pages accordingly. Verify that the default settings are correct and make additional settings if needed. You may reopen the configuration pages later again to change the settings (→ page 35).

i **Tip:** Changing the settings for a specific application in the **Commands** dialog box, in a program file (PGM), or on a control panel, will not change the default settings on the configuration pages.

For additional information about a page, click **Help**.

General Page

The **General** page displays the general instrument parameters.

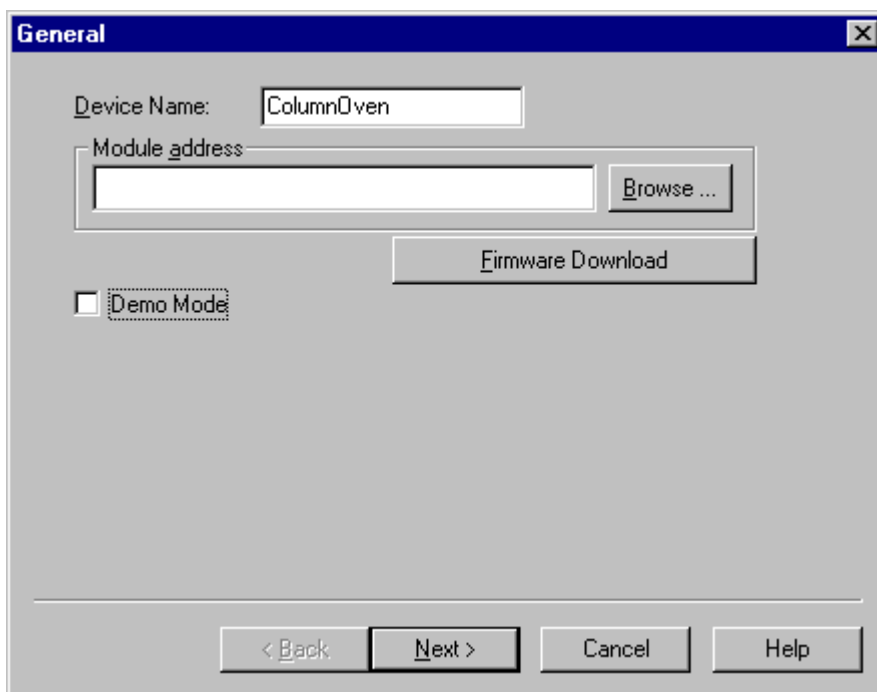


Fig. 15: General page

- **Device Name**
Displays the name used to identify the TCC the installation environment and in the Chromeleon client program. To control the TCC with the existing control panels, accept the default name. If you enter a different name, you may have to re-link the controls on the control panels and edit the device name in the program files.

- **Demo Mode**

Verify that check box is cleared. In the Demo Mode, Chromeleon simulates the functions of the TCC. If the Demo Mode is enabled, the **Module Address** input field will be unavailable. If you exit this page without having entered a module address, the Demo Mode will be enabled automatically.


- **Module address**


To enter the module address of the TCC, click **Browse** and then double-click the TCC that you want to use. The address is automatically entered in the **Module Address** field.

- **Firmware Download**

Clicking this button updates the TCC firmware with the version available in Chromeleon. (The button appears dimmed if the Demo Mode is enabled.)

A message displays the version of the currently installed firmware version and of the version that will be downloaded from Chromeleon. Click **OK** to start the download. Note that the Chromeleon server needs to be in **running idle** mode for the download. The download, which can take several minutes, is complete when **Download finished successfully** appears in the **Messages Server** window in the Chromeleon Server Configuration program. (The message appears also in the Chromeleon Audit Trail.)

 **Important:** During the download, make sure that communication between the TCC and Chromeleon is not interrupted and do not turn off the instrument. Otherwise, the entire firmware may be lost. If the download is not successful, contact Dionex Service.

 **Important:** Au cours du téléchargement, assurez-vous que la communication entre l'instrument et Chromeleon n'est pas interrompue et n'arrêtez pas l'instrument. Dans le cas contraire, l'ensemble des logiciels pourrait être perdu. Si le téléchargement échoue, contactez le service après-vente Dionex.

When you leave the **General** page during initial installation of the TCC (with the Demo Mode being disabled), Chromeleon attempts to connect to the TCC and to retrieve the settings from the TCC firmware, and then sets the options on the corresponding pages of the installation wizard accordingly. Confirm the related message with **OK**.

Components Page

This page shows which valve models are installed. In addition, you can select for which columns column identification is used.

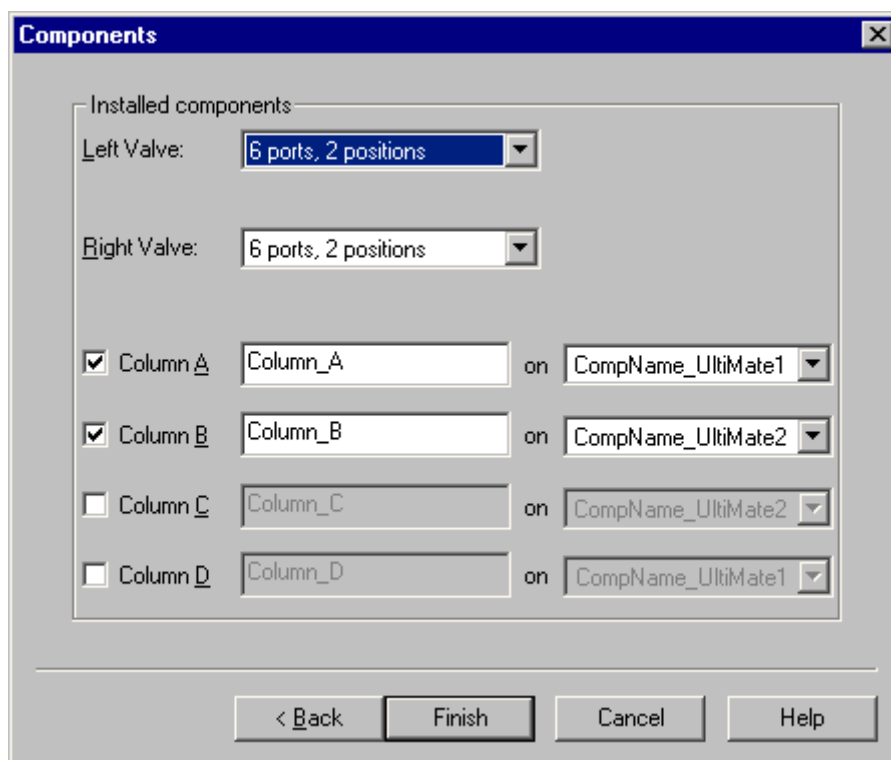


Fig. 16: Components page

- **Installed components**

The section shows which column switching valves are installed. Check and change the setting if necessary.

- **Column A through Column D**

The TCC is fitted with a column identification system (→ page 19). Select the columns for which you want to enable column identification. The entry field behind the column displays the name used to identify the column in the installation environment and in the Chromeleon client. To control the column compartment with the existing control panels, accept the default name. If you enter a different name, you may have to re-link the controls on the control panels and edit the column name in the program files.

The information about the column is continuously updated and can be reviewed at any time in Chromeleon (→ page 68).

- **On**

Select the timebase to which the related column is assigned. The default setting is the timebase in which the column thermostat is installed. To change the setting, click the arrow next to the **on** field and select a different timebase from the list. The list shows all timebases for that server.

3.5.3.2 Changing the Basic Configuration or Selecting Advanced Settings

You can later change the basic configuration settings or select advanced settings. To do so, follow the steps below

1. Start the **Server Configuration** program (→ page 31).
2. Right-click the **TCC-3x00 Column Compartment** in the timebase and select **Properties** on the menu.
3. In addition to the pages of the installation wizard (→ page 32), configuration pages for advanced settings are available (→ page 36). Select the additional settings or change the basic settings as needed.

Besides, Chromeleon provides two more buttons on the **General** page. They allow you to match the configuration of the TCC with the settings in Chromeleon:

Button	Description
Retrieve configuration from module	Click this button to transfer the current valve configuration to Chromeleon. The settings on the Components pages will be updated accordingly. This is necessary only if you connect a different TCC or if automatic matching was not performed correctly when the wizard was started.
Send configuration to module	Click this button to transfer the valve configuration settings from the Chromeleon Components page to the TCC.

4. To save the changed configuration, click **Save** on the **File** menu and then close the **Server Configuration** program.

Configuration Page

Use this page to determine whether Chromeleon shall record the temperature as a separate channel and select the pressure unit.

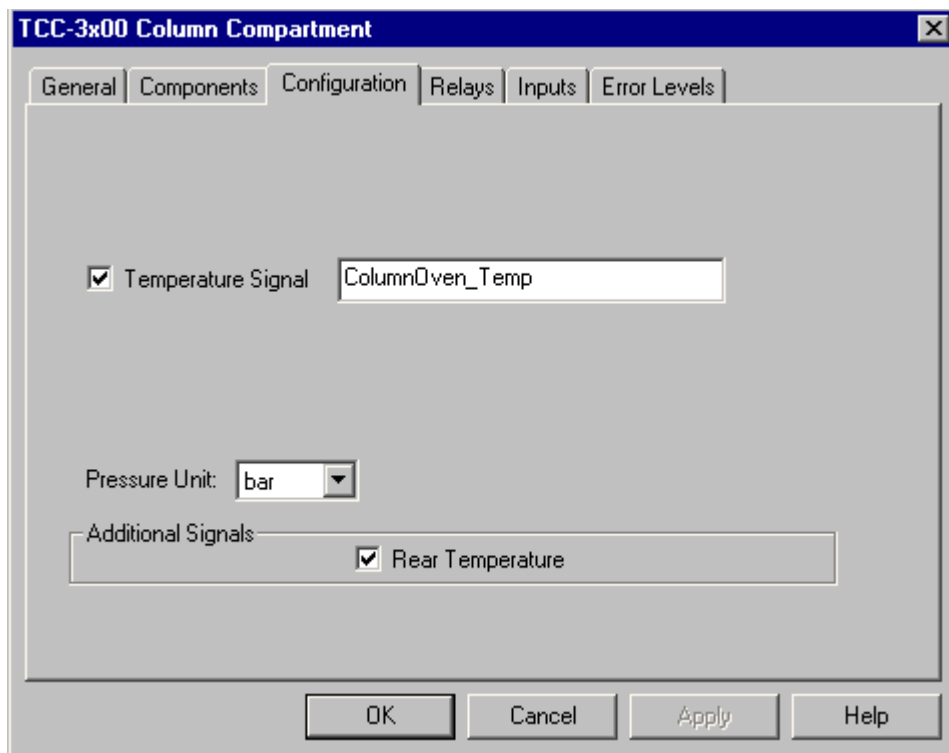


Fig. 17: Configuration page

- **Temperature Signal**
The check box is selected by default. Accept this setting if you want to record the temperature as a separate channel. For details, see page 73.
Accept the default name (**ColumnOven_Temp**) under which the temperature signal is identified in the installation environment and in the Chromeleon client. If you change the default name, you may have to re-link the corresponding controls of the related control panels.
- **Pressure Unit**
Select the pressure unit to be used for storing the pressure values on the column ID chip card.
- **Rear Temperature**
The check box is selected by default. Accept this setting. If the check box is cleared, you cannot run the diagnostics test for the thermal unit in Chromeleon (→ page 72).

Relays Page

The **Relays** page lists all available relays. Select a check box to enable the corresponding relay. If a check box is cleared, the relay will not be available in Chromeleon. To change the relay name or timebase assignment, double-click the relay name (or press the **F2** button) and make the changes in the **Devices Configuration** dialog box.

Inputs Page


The **Inputs** page lists all available remote inputs. Select a check box to enable the corresponding remote input. If a check box is cleared, the input will not be available in Chromeleon. To change the input name or timebase assignment, double-click the input name (or press the **F2** button) and make the changes in the **Devices Configuration** dialog box.


Error Levels Page

The **Error Levels** page classifies the severity of any errors that occur. It is generally not necessary to change the default settings.

4 Preparation for Operation (Startup)

4.1 Overview of Actions

 **Important:** The column switching valves are filled with 2-propanol when the TCC is shipped from the factory. During initial operation, make sure that the solvents used are miscible. Otherwise, use an appropriate intermediate solvent.

 **Important:** Les vannes de colonne sont stockées sous 2-propanol. Au cours du démarrage de l'instrument, assurez-vous que les solvants utilisés soient miscibles avec le 2-propanol. Sinon, suivez les étapes intermédiaires appropriées.

After you have unpacked, positioned and connected the TCC as described in sections 3.1 through 3.4, prepare the TCC for operation. Follow the sequence of steps below:

1. Install the separation columns (→ page 42).
2. *Optional*
Install an eluent preconditioner (→ page 20) as described in the installation instructions shipped with the preconditioner.
3. *TCC-3100 and TCC-3200*
Establish the fluid connections between the columns and switching valves, as required by your application (→ page 44).
4. Connect the TCC to the other components of your UltiMate 3000 system, as required by your application.
5. Connect drain tubing for discharging liquid leaks that might have accumulated in the interior to the port at the bottom right of the TCC (→ page 47).
6. *If you want to operate the TCC with Chromeleon*
Set up the TCC in Chromeleon if it is not already set up (→ page 29).
7. Turn on the TCC power (→ page 51).
8. Turn on and set the temperature for column thermostating if applicable (→ page 67).
9. Activate column identification if necessary (page 68).
10. Check and change the sensitivity settings for the gas and humidity sensors if necessary (→ page 69).
11. Adjust the brightness and contrast of the front panel display if necessary (→ page 69).
12. Before using the TCC for sample analysis, equilibrate the entire system (→ page 49).

4.2 Opening the Front Panel Door

The front panel tilts downward to provide easy access to the components in the column chamber. To open the front panel door, press the release button on top of the door. If the door lock is not released immediately, press the front panel against the enclosure.

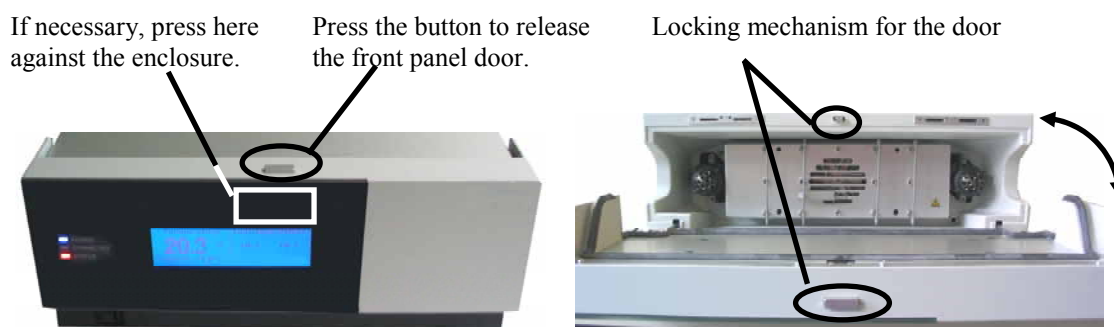


Fig. 18: Tilting the front panel door downward

To close the column chamber, tilt the front panel upward until you hear the locking mechanism engage.

⚠ Important: Do not place any heavy objects on the open front panel door. This may damage the door. When lifting or moving the TCC, always lift the unit by the bottom sides or the sides. Lifting the TCC by the bottom front or by the front panel may damage the door.

⚠ Important: Ne placez aucun objet lourd sur la porte ouverte du panneau avant. Ceci pourrait endommager la porte. Lorsque vous soulevez ou l'instrument, tenez-le toujours par le dessous ou par les côtés de l'unité. Soulever l'instrument par la partie avant inférieure ou par le panneau avant peut endommager la porte.

4.3 General Precautions for Connecting Capillaries

When connecting capillaries, observe the following general precautions:

- To connect the capillaries to the column switching valve, install *only* the ferrules and fitting nuts provided in the accessories kit.
When connecting capillaries to the biocompatible valve, refer to page 12 for details.
- Make sure that the connectors are free from contaminants. Even minute particles may cause damage to the system.
- Reuse used fitting nuts and ferrules only for the same capillary connection. This is to avoid increased dead volume.
- Different fitting systems are used in an UltiMate 3000 system. Therefore, install the capillaries and fittings only at the positions for which they are intended.
- You can thread the capillaries out of the TCC interior at any position between the enclosure and the front panel door to ensure that the connections are as short as possible.
- Place the capillaries in such a manner that they do not open a small path for ambient air into the column chamber (that is, place the capillaries preferably in a 90-degree angle related to the door seal and in parallel to the closed front panel door). A path in the door seal will prevent a proper seal and thus, impair the heating and cooling performance of the TCC. When cooling, an improper seal may lead to a considerable amount of condensing water.

4.4 Installing a Separation Column



Warning:

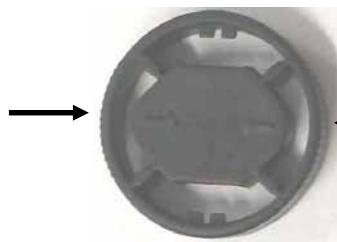
Before carrying out any work in the column chamber, wait for the column chamber to cool down. Do not touch any metal parts inside the column chamber while the temperature set point is $> 50\text{ }^{\circ}\text{C}$.



Avertissement: Avant de procéder à toute modification dans le compartiment de colonne, attendez que celui-ci refroidisse. Ne touchez aucune partie en métal à l'intérieur du four, tant que l'affichage de la température est $> 50\text{ }^{\circ}\text{C}$.

Four column brackets are installed in the column chamber at the factory. Attach the columns to the brackets using the special column clips from the TCC accessories kit.

1. The column clip consists of two pieces.
To remove the ring from the bottom part, slightly press the ring in the direction of the arrows, which are printed on the ring.



Press the ring in the direction indicated by the arrows on the ring.

Fig. 19: Two-piece column clip

2. Attach the bottom part of the clip to the bracket and turn it 90° clockwise.

Attach the bottom part of the clip to the bracket and turn it 90° clockwise.



Fig. 20: Installing the bottom part

3. *If you want to use column identification*

Attach the column ID chip card to the column. Two chip cards are provided in the TCC accessories kit. Wrap the ribbon around the column, pass the shank of the rivet through a hole, and press down to unite the two parts.



Fig. 21: Clipping the column ID onto the column

4. Press the column into the clip and reinstall the ring.



Fig. 22: Installing a column in the clip

5. Connect the capillaries to column. Observe the precautions on page 41.
For information about the connections on the column switching valves, see section 4.5
(→ page 44)
6. Activate column identification if applicable (→ page 68).

4.5 Connecting the Capillaries to the Column Switching Valve



Warning:

Before carrying out any work in the column chamber, wait for the column chamber to cool down. Do not touch any metal parts inside the column chamber while the temperature set point is $> 50\text{ }^{\circ}\text{C}$.



Avertissement:

Avant de procéder à toute modification dans le compartiment de colonne, attendez que celui-ci refroidisse. Ne touchez aucune partie en métal à l'intérieur du four, tant que l'affichage de la température est $> 50\text{ }^{\circ}\text{C}$.

1. Remove the plastic cap that protects the switching valve during shipment.
2. Connect the capillaries to the valve, using an appropriate tool. For example configurations, see sections 4.5.1 and 4.5.3. When connecting the capillaries, also observe the precautions on page 41.
3. Thread the capillaries out of the interior at any position between the enclosure and the front panel door. Make sure that the connections are as short as possible. Place the capillaries in such a manner that they do not open a small path for ambient air into the column chamber (that is, place the capillaries preferably in a 90-degree angle related to the door seal). A path in the door seal will prevent a proper seal and thus, impair the heating and cooling performance of the TCC. When cooling, an improper seal may lead to a considerable amount of condensing water.

4.5.1 Connections on a 2-position, 6-port Column Switching Valve

Fig. 23 shows a typical example for the connections on a 2-position, 6-port column switching valve.




Port	Connect the capillary
1	from the autosampler or pump
2	to column B or to an eluent preconditioner
3	from the outlet of column B
4	to the detector
5	from the outlet of column A
6	to column A or to an eluent preconditioner

Fig. 23: Connections on a 2-position, 6-port column switching valve

If you have connected the inlet capillary of a column to position 6 of a 2-position, 6-port switching valve, you must use position 5 for the outlet capillary of this column. The same applies to valve positions 2 and 3.

4.5.2 Connections on a 2-position, 10-port Column Switching Valve

Fig. 24 shows the connections on a 2-position, 10-port column switching valve for tandem operation. For tandem mode, the UltiMate 3000 system must include one dual gradient pump or two single gradient pumps with identical flow rates, two columns, and one 2-position, 10-port column switching valve. Running the UltiMate 3000 system in this configuration allows increasing the sample throughput considerably, typically by 50 to 100%. (For more information about tandem operation, see the Chromeleon Help.)



Port	Connect the capillary
1	to the detector
2	from the outlet of column B
3	to the waste
4	to port 9 of the column switching valve
5	to the inlet of column B
6	from the autosampler or right pump of a DGP-3600
7	to the inlet of column A
8	from the left pump fo a DGP-3600
9	to port 4 of the column switching valve
10	from the outlet of column A

Fig. 24: Connections on a 2-position, 10-port column switching valve

To realize the setup shown in Fig. 23 with a 10-port column switching valve, follow the steps below:

1. Connect the capillaries to the same ports as on the 6-port valve (identical port numbers).
2. The 6-port valve has a direct fluidic connection between ports 1 and 6. To achieve this fluidic connection for the 10-port valve, install an additional capillary between ports 7 and 10 (inner diameter of the capillary: 0.13 mm for micro setups, 0.25 mm for analytical setups).
3. Ports 8 and 9 are not used for this setup. Dionex recommends connecting these ports with an additional capillary or closing them with a plug.

4.5.3 Connections on a 6-position, 7-port Column Switching Valve

Fig. 25 shows an example for the connections on a 6-position, 7-port column switching valve.



Port	Connect ...
1	Column 1
2	Column 2
3	Column 3
4	Column 4
5	Column 5
6	Column 6
7	Valve inlet capillary or valve outlet capillary

Fig. 25: Connections on a 6-position, 7-port column switching valve

4.6 Connecting the Drain Tubing

To discharge liquid leaks that might have accumulated in the interior, the TCC has a drain port at the bottom right of the instrument.



Fig. 26: Drain port

1. Connect drain tubing to the drain port.
2. Place the free end of the tube in an appropriate waste container. Observe the following:
 - ◆ When the TCC is part of an UltiMate 3000 system, for example, as shown in Fig. 10 (→ page 24) you may connect the drain tubing of the system modules with the connecting pieces from the instrument accessories kits.

Connect the drain tubing from the Solvent Rack to the pump and from the pump to the autosampler as shown in Fig. 27 a.

Dionex recommends connecting the drain tubing from the TCC as shown in Fig. 27 b. This is to avoid that the gas sensor in the TCC is influenced by the drain tubing from the other modules. As an alternative, you may direct the drain tubing from the drain port of the TCC separately to the waste container.

Connect the drain tubing from the detector as shown in Fig. 27 c.

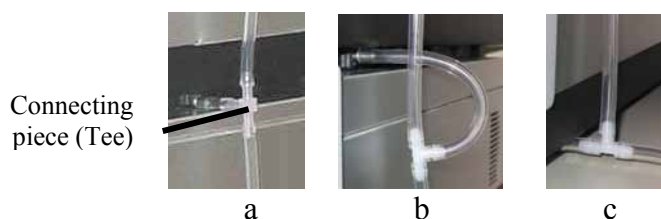


Fig. 27: Connected drain tubing

- ◆ For the system stack in Fig. 10, Dionex recommends cutting the tubing, which is provided in the instrument accessories kits, to the following lengths:

Tubing from	Length (mm)
Solvent Rack to pump	215
Pump to autosampler	332
Pump or autosampler to Tee	30
Autosampler to the TCC	217
TCC to Tee	133
TCC (Tee) to detector	73

- ◆ The drain tubes must remain below the drain port. If the drain tube is above the drain port, the liquid may flow back into the interior and cause damage to the instrument. Also, be careful not to use tubing that is bent.



Wrong



Correct

Fig. 28: Drain tubing

- ◆ When routing the drain tube from the bottom device in the UltiMate 3000 system stack to the waste container, use an elbow to guide the tube over the edge of the workbench. This is to avoid that the liquid flows back into the interior of the device. (An elbow is included in the TCC accessories kit.)

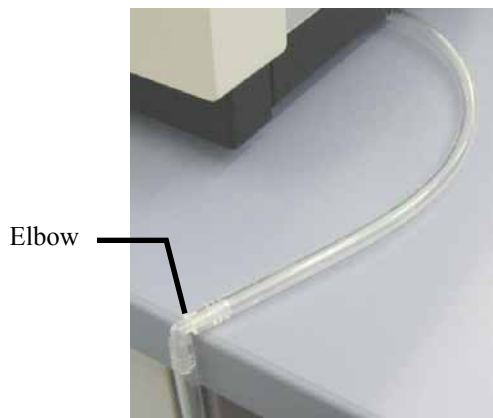


Fig. 29: Routing the drain tube to waste

4.7 Equilibrating the System

Before using the TCC for sample analysis, equilibrate the UltiMate 3000 system:

1. Pump the starting solvent through the entire system until the system is free of any other liquid composition.
2. Heat or cool all temperature-controlled devices, such as the TCC, to the temperature required for the application.
3. Set the detector wavelengths and turn on the lamps. (Wavelength calibration is performed automatically.)
4. Monitor the pump pressure and verify that the reading is correct for the application and is stable.
5. Monitor the detector signal and verify that the baseline signal is at the expected reading for your application and is stable.

Perform system equilibration in Chromeleon or select the required commands and parameters on the front panel menus of the instruments.

To equilibrate the system from Chromeleon

- Select and perform the operating commands and parameters from the **Commands** dialog box (→ page 54).
- Create and run an equilibration program to automate the process (→ page 57).
- Use the SmartStartup Wizard to create and run the equilibration program (see below).

To create the equilibration program with the SmartStartup Wizard

The SmartStartup Wizard in Chromeleon guides you through the process of creating and running an equilibration program.

1. To open the wizard, select **SmartStartup** on the **Batch** menu.
2. Follow the instructions as they appear on each page of the wizard. For additional information about a page, click **Help**.
3. After you finish the wizard, Chromeleon
 - ◆ Generates an equilibration program and sequence.
 - ◆ Opens the equilibration control panel for the instruments in the timebase (→ Fig. 30, page 50).
 - ◆ Opens the **Start Batch on** dialog box.

Click **Start** to begin equilibration.

The equilibration panel shows the equilibration status of each instrument in the system.

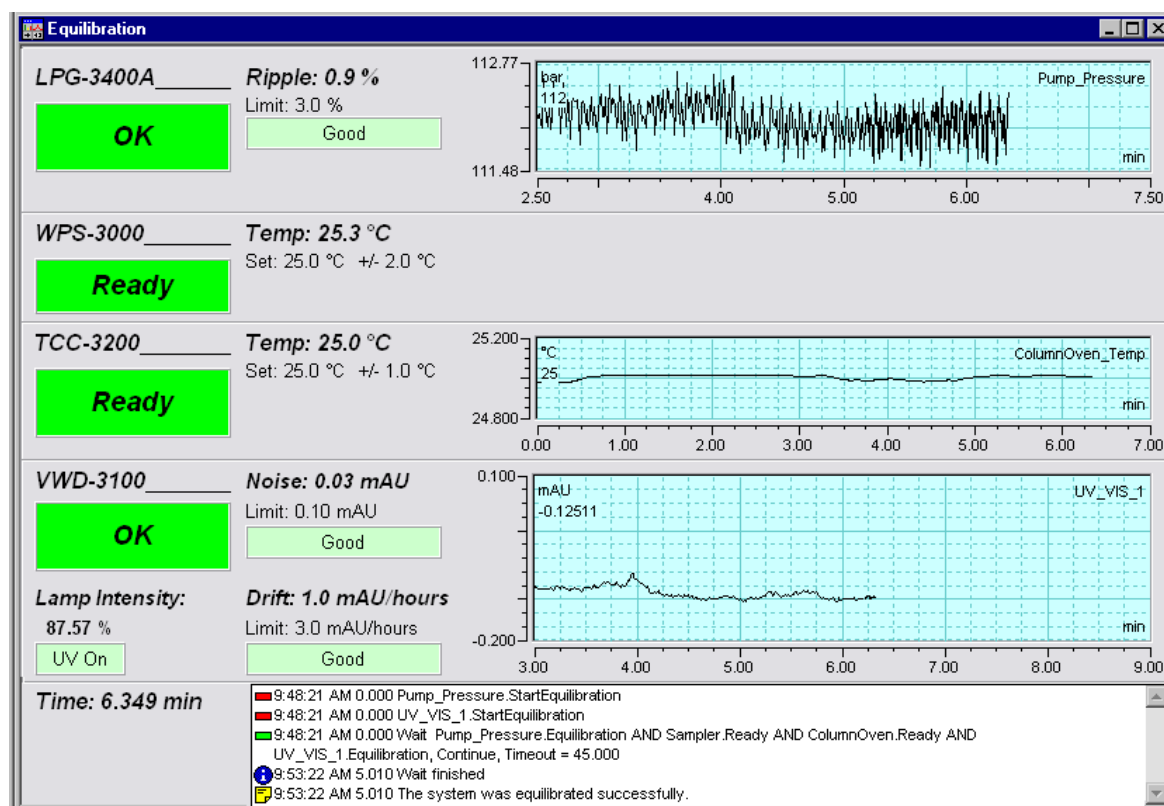


Fig. 30: Equilibration panel

To equilibrate the system from the front panel menus

Select and perform the operating commands and parameters on the front panel menus of the instruments. For information about the TCC menus, see section 5.4.2 (→ page 60). For information about the menus of other system modules, see *Operating Instructions* for the module.

5 Operation and Maintenance

The TCC can be controlled by the Chromeleon Chromatography Management System. For details, see section 5.3 (→ page 53).

In addition, function keys and menus are available on the front panel display to facilitate operation during, for example, initial installation of the TCC, diagnostics, and maintenance. They allow you to perform certain actions directly from the TCC display:

- Executing certain commands (turning temperature control on and off)
- Setting parameters (leak sensor mode, target temperature for column thermostating)
- Viewing diagnostic information
- Viewing and changing the TCC configuration

For details, see section 5.4.2 (→ page 60).

5.1 Power-Up

To start the TCC for the first time, turn on the main power switch on the rear panel of the TCC. The following sequence of events occurs when the TCC is powered up:

- For a short time, general information about the TCC appears on the front panel display: device type, serial number, bootloader and firmware versions.
- The TCC runs a series of internal tests. During these self-diagnostics, all of the main components are checked. When testing is complete and has been successful, the initial screen changes to the status screen (→ page 52).
- If an error is detected, the TCC is not ready for analysis. The **Status** LED on the front panel changes to red and a message appears on the front panel display. If the TCC is operated with Chromeleon, the message is also logged in the Chromeleon Audit Trail. Turn off the TCC, take appropriate remedial action (→ page 77), and turn on the TCC again.

For routine operation, leave the main power switch on. For routine on/off control, use the standby button on the front of the TCC (→ page 16). Press and hold the button for one second to allow the TCC to change the mode. Turn the main power switch off when instructed to do so, for example, before performing a service procedure.

5.2 Status Screen

If the self-test was successful, the initial screen changes to the status screen. The instrument type determines the appearance of the screen.



Fig. 31: Status screen (here for a TCC-3200 with two 2-position, 10-port switching valves)

The status screen shows the following information:


- Temperature (in °C)
which is the actual temperature for column thermostating
- Target temperature (in °C) for column thermostating
- Fluid connection in the switching valves

You can adapt the screen brightness and contrast to your requirements if necessary (→ page 70).

5.3 Operation with Chromeleon

Before you begin, verify that

1. The Chromeleon software is installed on the computer and the license code is entered.
2. The TCC is connected to the Chromeleon computer via a USB connection.

 **Tip:** Verify that Chromeleon is installed on the computer and that the license code is entered **before** you connect the TCC to the USB port on the Chromeleon computer and turn on the TCC power. Only then, the USB driver for the TCC is automatically loaded and the Windows operating system can detect the TCC when the power is turned on.


3. The TCC is set up in Chromeleon, as described in section 3.5 (→ page 29).

Before you can operate the TCC with Chromeleon, you have to connect the timebase in which the TCC is installed to the Chromeleon client program (→ page 53).

Two modes of software control are available:

- Direct control with the parameters and commands in the **Commands** dialog box (F8 box) or on a control panel (→ page 54)
- Automated control with a control program (PGM) (→ page 57)

5.3.1 Connecting to Chromeleon

1. Start the Chromeleon **Server Monitor** if it is not already running (→ page 29).
2. Start the Chromeleon client by clicking the Chromeleon icon  on the desktop.

If the Chromeleon icon is not on the desktop, click **Start** on the taskbar, point to **Programs** (or **All Programs**, depending on the operating system), point to **Chromeleon**, and then click **Chromeleon**.

3. Connect the Chromeleon client to the timebase in which the TCC is installed. For details about how to do this from the **Commands** dialog box, see page 54. For details about how to do this on a control panel, see page 55.

When the TCC is correctly connected to Chromeleon:

- The **Connected** LED on the front panel is green.
- Front panel input related to the measurement is disabled to prevent changes to the operating parameters. (Operating parameters are set to read-only.) Parameters that do not interfere with the measurement, such as, the screen brightness and contrast can still be changed.

- Functions for estimating the lifetime of consumables and monitoring and recording service and (re)qualification information are provided (→ page 71).
- Diagnostic tests are provided to check the performance of certain TCC components and the overall performance of the instrument (→ page 72).
- The **Standby** button on the front panel remains active.


Before turning off the TCC by the main power switch, always **disconnect** the module in Chromeleon.

5.3.2 Direct Control

With direct control, you select operating parameters and commands in the **Commands** (F8) dialog box. Direct commands are executed as soon as they are entered. For routine operation, most parameters and commands are available also on a control panel.

To open the Commands dialog box for the TCC

1. Open a control panel (any panel is possible). To open a control panel, open the Chromeleon Browser and double-click a control panel in the **Dionex Templates/Panels** folder.
2. Connect the control panel to the timebase in which the TCC is installed. On the **Control** menu, select **Connect to Timebase**, and then select the timebase on the **Timebase** tab. For information about the **Timebase** dialog, click **Help**.

 **Tip:** The **Control** menu is visible only when a control panel is already open.

3. Press the F8 key or select **Command** on the **Control** menu..
4. To see the parameters and commands that are available for the TCC, click the plus sign beside **ColumnOven**.

The commands and parameters available in the dialog box vary, depending on the

- ◆ Chromeleon version
- ◆ options selected in the **Properties** dialog for the TCC (→ page 32).
- ◆ display filter level (**Normal**, **Advanced**, or **Expert**)

5. Change the display filter level if necessary. Right-click in the commands list and select the filter level on the menu.

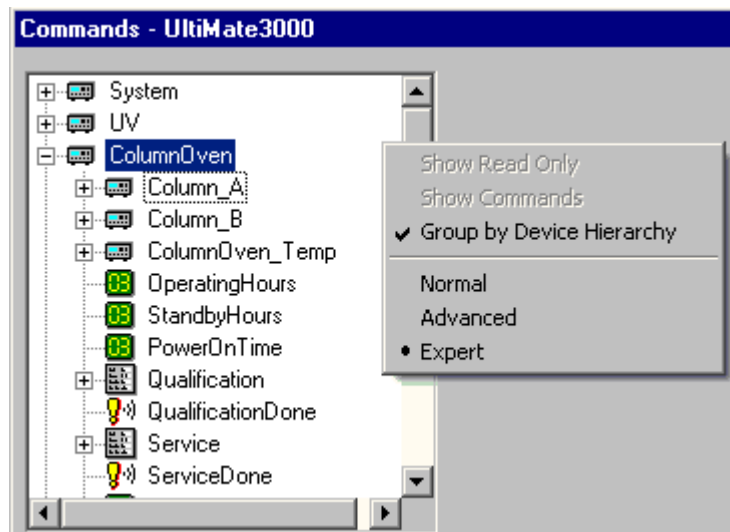


Fig. 32: Commands dialog box

6. Verify that the TCC is connected to Chromeleon. If it is not, select **Connect** to connect the TCC.

For a list of the commands and properties that are supported for the TCC, see the Chromeleon Help. In addition to the TCC commands and parameters, the **Commands** dialog box provides access to all of the commands and parameters available for all devices that are installed in the selected timebase.

To open a control panel

1. On the **View** menu, click **Default Panel Tabset** or click the corresponding icon on the toolbar , and then connect to the Chromeleon server.

Chromeleon creates centralized control panels, called panel tabsets (→ Fig. 33, page 56), for all timebases available on the Chromeleon server. A panel tabset provides control panels for the individual instruments in a timebase and, in addition, one or more panels for performing system-wide functions, for example, creating and running sequences. For more information about panel tabsets, see the Chromeleon Help.

2. On the **Panel Tabset** for your timebase, click the **Col. Comp.** page (→ Fig. 33).
3. Verify that the TCC is connected to Chromeleon (the LED next to the **Connect** button is green). If it is not, click **Connect**.

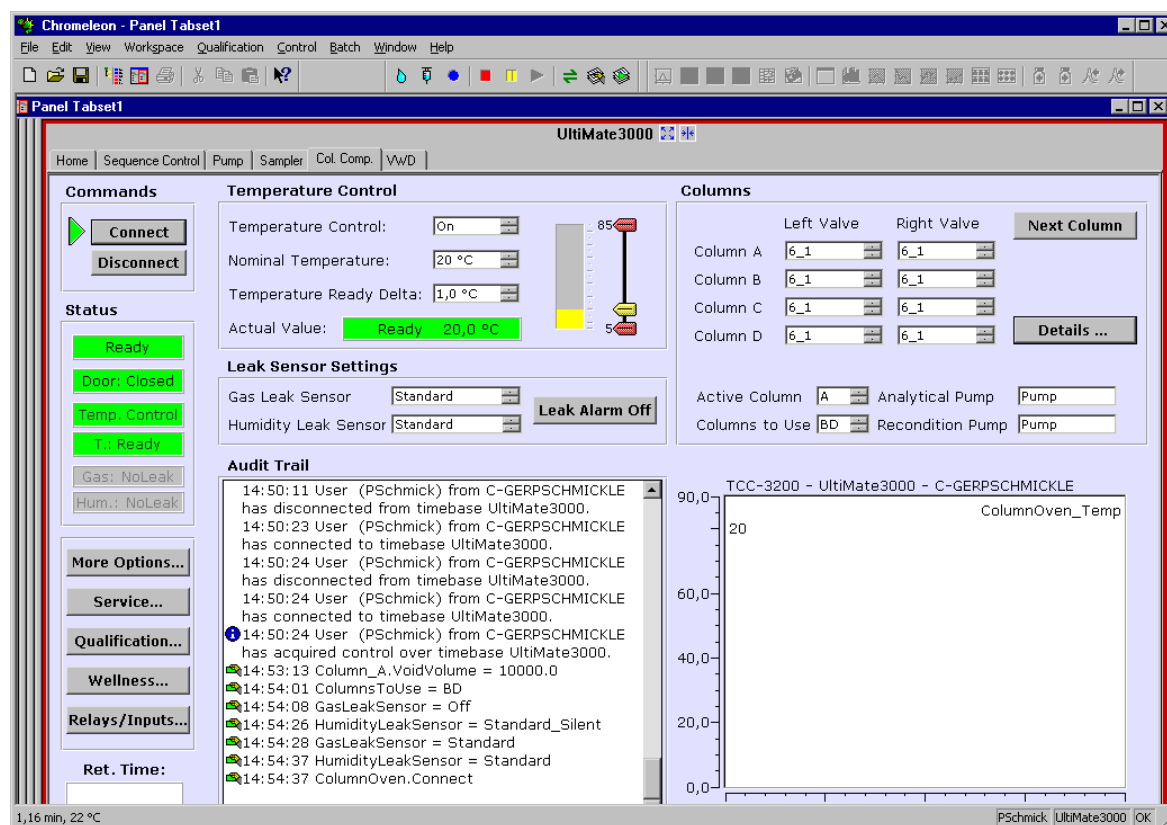


Fig. 33: TCC Control Panel on the Panel Tabset

The control panel provides access to the operating parameters and commands required for routine operation of the TCC. Additional functions are available in the **Commands** dialog box. To open the **Commands** box from the panel tabset, select **Command** on the **Control** menu.

5.3.3 Automated Control

With automated control, you create a program file (PGM) for automated operation of the TCC. Programs can be created automatically with the help of a software wizard or manually by editing an existing program.

In addition to programs for sample analysis, you can also create programs for special purposes, for example, programs to ensure that the system automatically restarts operation as desired after a power failure or programs to automate system shutdown (→ page 75). For more information about these programs, see the Chromeleon Help.

To create a program with the Program Wizard

1. On the **File** menu, select **New**, and then select **Program File**.

The wizard guides you through program creation. On each wizard page, make the desired settings or accept the default values. For additional information about a page, click **Help**.

2. After you finish the wizard, Chromeleon automatically creates the corresponding program.
3. To start the program, follow the steps on page 58.

To create a program manually

1. Open an existing program.

Select and double-click the program you want to open.

—Or—

On the **File** menu, select **Open**. In the dialog box, select **Program** on the **Object of Type** list and select the program.

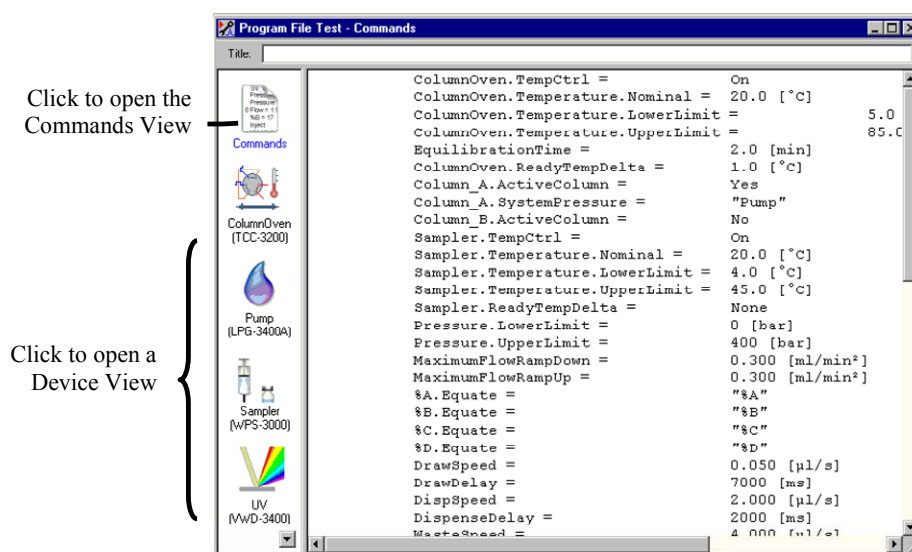


Fig. 34: Chromeleon program file (here: program shown in the Commands view)

2. Change the settings in the program as desired.

The easiest way to edit a program is to do this in the Device Views (→ Fig. 34). Click a device icon and change the settings on the device pages. Editing the program in the Device Views ensures correct command syntax.

If you cannot edit a certain parameter in the Device View, click **Commands** to open the Commands View. The Commands View shows the entire program, listing the control commands in chronological order. Edit the parameter of interest or enter a new parameter. For more information, see the Chromeleon Help.

3. To start the program, follow the steps below.

To start a program

Program for sample analysis

1. Create a sample list (sequence). A sequence must include the program and a method for evaluating the sample data (for example, for peak identification, area determination, and amount determination).
2. Assign the program and method to each sample on the list.
3. Add the sequence to the batch and start the batch.

For information about each of the above steps, see the Chromeleon Help.

Other programs

Add the program to the batch and start the batch.

5.4 Display Screens (Function Keys and Menus)

Via the function keys and menus that are available on the front panel display, you can make several settings or execute certain commands directly from the TCC. For information about the function keys, see section 5.4.1 and page 61. For information about the menus, see section 5.4.2 (→ page 60).

5.4.1 Showing the Function Keys

Four white spots on the front panel mark the positions of four function keys: **Menu**, **Temp**, **Valve**, and **Leak**. To show the keys, select the position of the utmost left spot on the front panel display with the Dionex menu pen (part no. 6300.0100). The menu pen is included in the TCC shipment.



Fig. 35: Showing the function key menus

The function keys replace the information in the bottom line of the status screen. If no key is selected, the bottom line of the status screen is restored after about 5 seconds.

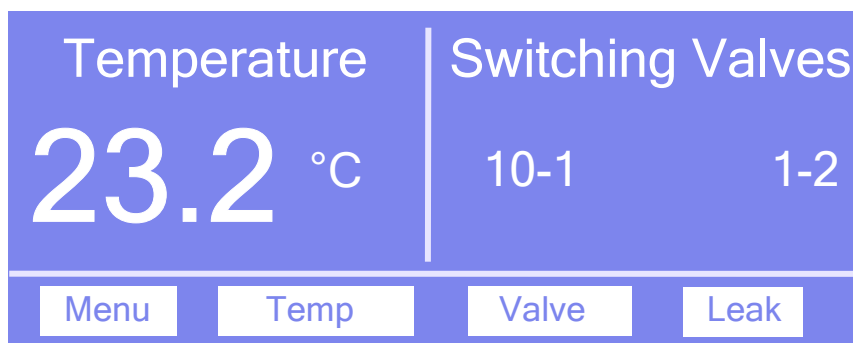


Fig. 36: Function keys

To open the ...	Select ...
Main menu (→ page 62).	Menu
Temperature control menu (→ page 63).	Temp
Valve control menu (→ page 63).	Valve
Leak control menu (→ page 63).	Leak

When the TCC is connected in Chromeleon, front panel input related to the measurement is disabled to prevent changes to the operating parameters. (Operating parameters are set to read-only.) Parameters that do not interfere with the measurement, such as, the screen brightness or contrast can still be changed.

5.4.2 TCC Menus

Fig. 37 shows an overview of the TCC menus. For information about the general menu layout and structure, see section 5.4.2.1. For information about the commands and parameters that are supported by the menus, see sections 5.4.2.2 through 5.4.2.5 (→ page 62 and following pages).

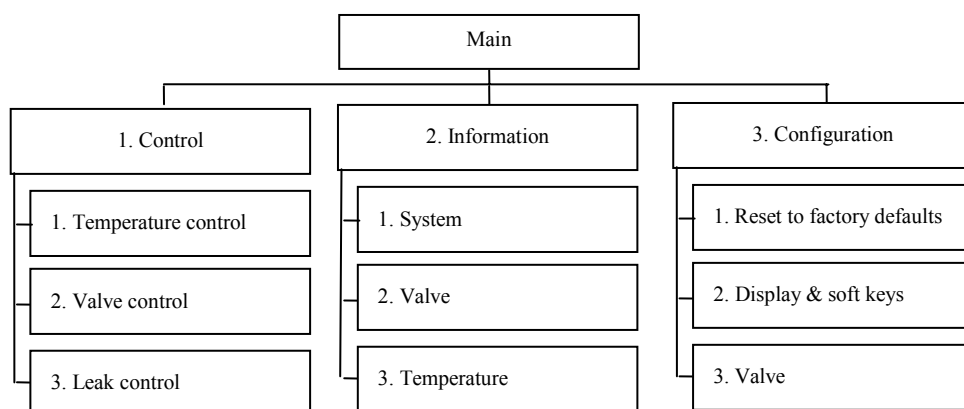


Fig. 37: Menu structure

5.4.2.1 General Menu Layout and Structure

In general, the menu layout is as follows:

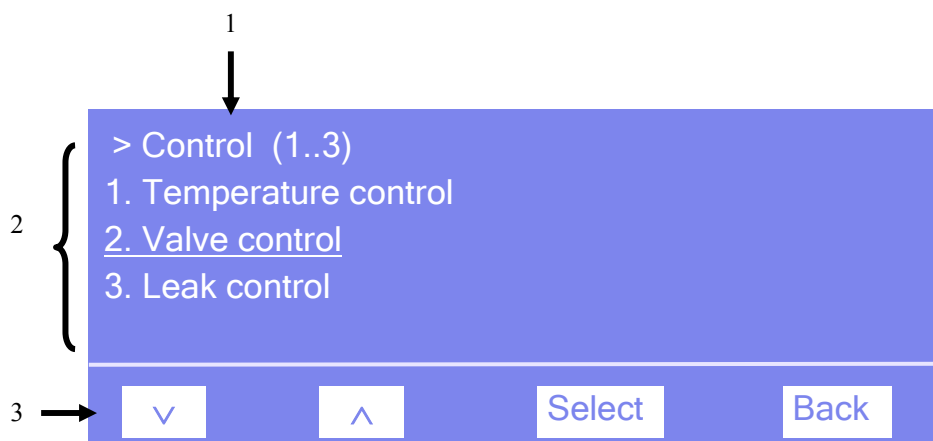


Fig. 38: Menu layout (here Control menu)

No.	Description
1	Reports the menu name and the number of items on the menu list.
2	The menu items appear on a list and are numbered consecutively. The selected item is underlined.
3	Navigation bar

Select an item with the arrow up or down key—the selected item is underlined. Confirm your selection with **Select**. **Back** returns you to the previous menu level.

The selected menu item or parameter determines which keys appear on the navigation bar:

To ...	Select...
Return to the previous entry on a list. If the list contains 5 or more items, you can use the arrow up key to scroll up through the list, after reaching the first line (→ Key autorepeat , page 65).	^
Increment numerical values.	^
Toogle between two operating states, for example, on and off.	^ or v
Proceed to the next entry on a list. If the list contains 5 or more items, you can use the arrow down key to scroll down through the list, after reaching the forth line (→ Key autorepeat , page 65).	v
Proceed to the next figure in a number. Any decimal point is skipped.	>
Confirm the selection and activate the input field if applicable. If an item is read-only, the Select key will not be available.	Select
Return to the previous menu level.	Back
Toogle between two operating states, for example, on and off.	Toggle
Confirm the selection or input.	OK
Cancel the action and restore the last value.	Cancel
Note: Depending on the selected option, specific keys may replace these general keys.	

If an error is found, one or more messages appear on the front panel display. In this case, the **Prev**, **Next**, and **Clear** keys appear on the navigation bar.

To ...	Select ...
Return to the previous message.	Prev
Proceed to the next message.	Next
Remove the message from the display.	Clear

5.4.2.2 Main Menu

The **Main** menu provides top-level access to the menu structure. To open the **Main** menu, show the function keys and select **Menu** (→ page 59).

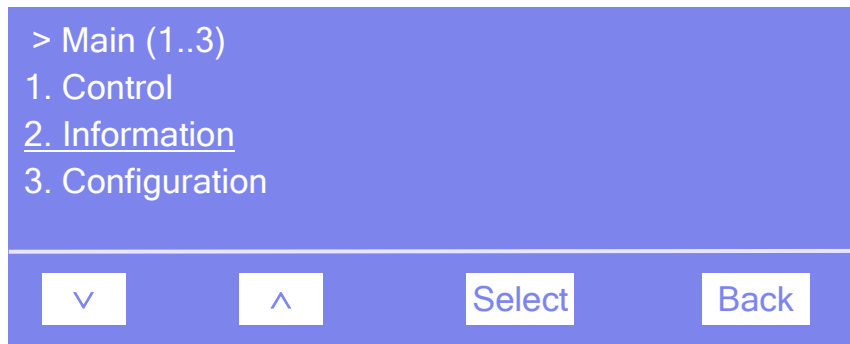


Fig. 39: Main menu

For information about the menus, see the following sections:

- Control Menu (→ page 63)
- Information Menu (→ page 64)
- Configuration Menu (→ page 65)

5.4.2.3 Control Menu

On the **Control** menu, you can make the settings for temperature control and valve control. In addition, you can activate leak detection and specify the sensitivity of the gas and humidity sensors.

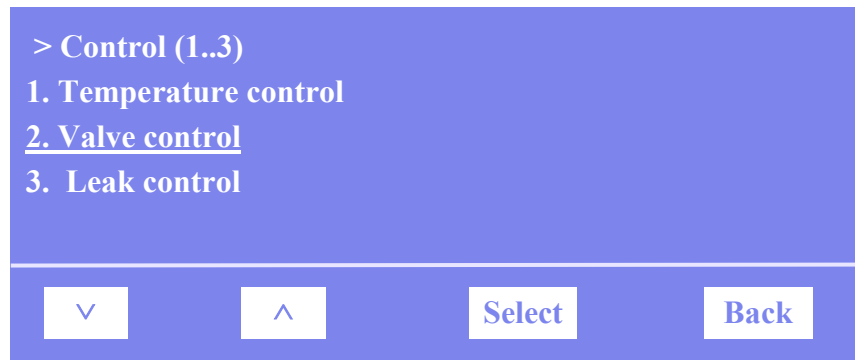


Fig. 40: Control menu

To ...	Select ...
Determine the setpoint temperature and turn temperature control on or off.	Temperature control
Determine the fluid connections for the related valve.	Valve control
<p>Determines whether leak detection is performed and how you are alerted in case of an alarm:</p> <p>Low, standard, or high—activates leak detection and sets the sensitivity with which the sensor responds to gas or humidity. When the sensor responds, a message appears on the front panel display and an acoustic beep sounds.</p> <p>Low silent, standard silent, or high silent— activates leak detection and sets the sensitivity with which the sensor responds to gas or humidity. When the sensor responds, a message appears on the front panel display, but <u>no</u> beep sounds.</p> <p>Off—deactivates leak detection.</p>	Leak control

5.4.2.4 Information Menu

The **Information** menu provides information for diagnostic purposes (read-only).

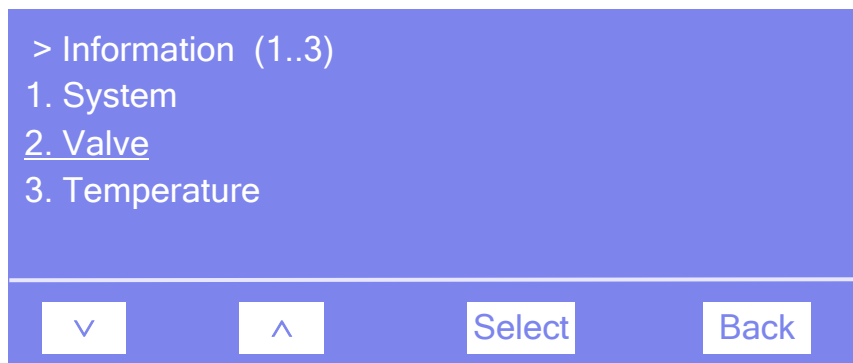


Fig. 41: Information menu

To ...	Select ...
See general information about the TCC, for example, firmware version, serial number, and operating hours.	System
See general information about the switching valves, for example, configuration and switching cycle counter	Valve
See information about the temperature, for example working load and cooling load, or hours that the TCC was operated in a certain temperature range.	Temperature

5.4.2.5 Configuration Menu

The **Configuration** menu provides information about the configuration of the TCC and allows you to make the required settings or change the settings.

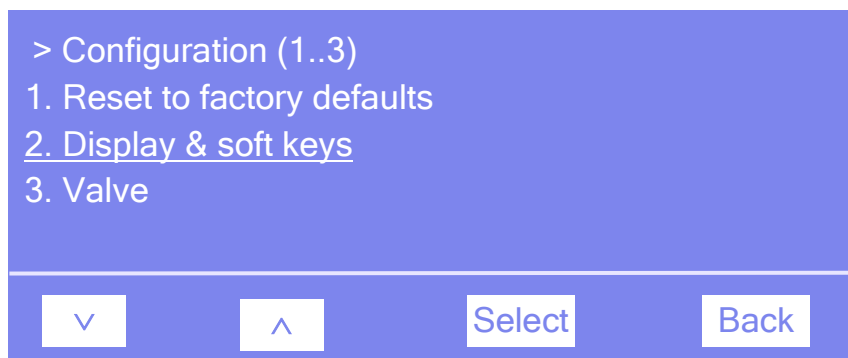


Fig. 42: Configuration menu

To ...	Select ...
Restore the Dionex standard settings. In the Reset to factory defaults? dialog box, select OK to confirm the restore or select Cancel to keep your settings.	Reset to factory defaults
Set the display and function key parameters: Brightness — sets the screen brightness. Contrast — sets the screen contrast. Key sound — sets whether an acoustic beep sounds when you select a function key. Key autorepeat —sets whether the arrow up and arrow down keys can be used to page through the items on a menu list if the list contains 5 or more entries: On —yes or Off —no.	Display & function keys
The menu is reserved for Dionex Service for configuration of the related column switching valve.	Valve

5.5 Operational Settings

5.5.1 Selecting the Column

For a TCC with one or two column switching valves, column programming is performed in Chromeleon. The number of column switching valves, the valve model, and the application determine which commands and properties are used.

The following commands and properties are available in the **Commands** dialog box:

To ...	Select ...
Set in which position the valve shall be switched to direct the flow onto the column.	ColumnX_LeftValve <i>and</i> ColumnX_RightValve (where X = A, B, C, or D)
Specify which columns are alternately used for the injections.	ColumnsToUse
Specify the column on which the current injection is performed.	CurrentColumn
Switch valve to the other column for the next injection.	NextColumn

The related commands and properties are available also on the panel tabset for the TCC and in the program wizard.

For more information, see the Chromeleon Help.

5.5.2 Turning On Column Thermostatting

You can turn column thermostatting on and off and set the desired temperature in Chromeleon or on the front panel display.

To turn on column thermostatting from Chromeleon

1. In Chromeleon, open the **Commands** dialog box.
2. Select **ColumnOven** and **Temperature**.
3. Under **Nominal**, enter the desired temperature. Entering a temperature sets **TempCtrl** to **On** if it is not yet running.

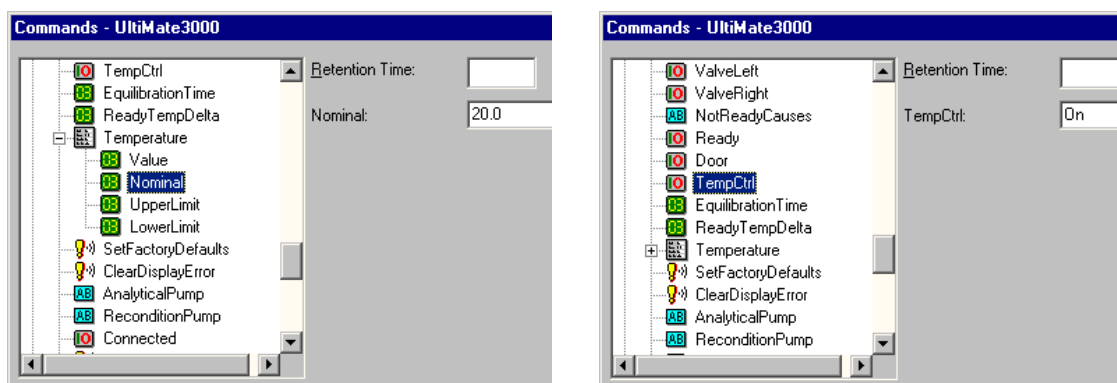


Fig. 43: Turning on column thermostatting

Set **TempCtrl** to **Off** if you do not want to use column thermostatting for a certain application.

If you want to work with column thermostatting later again, set **TempCtrl** to **On**. When you change the temperature setting under **Nominal**, Chromeleon sets **TempCtrl** automatically to **On** again.

To turn on column thermostatting from the front panel display

1. Show the function keys and select **Menu**.
2. Select the **Control** menu.
4. Select **Temperature setpoint** and enter the desired temperature.
5. To turn on column thermostatting, select **Temperature control** and **On**.

Set **Temperature control** to **Off** if you want to work without column thermostatting.

5.5.3 Activating Column Identification (Column ID)

1. Verify that the column ID chip card is attached to the column (→ page 43).
2. Insert the chip card, with the Dionex logo facing up, into one of the four chip card readers. Four chip cards can be used at the same time. When the chip card is installed correctly, the LED next to the slot is green.



Fig. 44: Inserting a column ID card chip card in a chip card slot

3. In the Chromeleon **Server Configuration** program, verify that the columns to be monitored are selected on the **Components** page for the TCC (→ page 34). If a column check box is cleared, no information will be available for the column in Chromeleon.
4. The information on the column ID chip card (see below) is continuously updated and can be reviewed at any time in Chromeleon, as long as the column and chip card are installed in the TCC.
 - ◆ Open the **Commands** dialog box for the TCC and select **Column_A** (**B**, **C**, or **D**).
 - ◆ Open the panel tabset for the TCC and click **Details** in the **Columns** section.

Column Properties

The chip card provides the following types of information:

- **Primary column properties**

The primary column properties are used for column identification. The information is entered once by the column manufacturer or user and will not be changed during the lifetime of the column. The primary column properties are, for example, the batch number, product ID, serial number, and the date of manufacture.

- **Secondary column properties**

Secondary properties are entered by the user and can be changed whenever required. The secondary column properties are, for example, the manufacturer, packing material and particle size of the column, but also temperature, pressure, and pH limits.

- **Operational column properties**

Chromeleon determines and updates the operational information upon each injection. The operational column properties are, for example, the date of the first injection, the date of the last injection, the maximum flow rate while the column is in use, or the total volume of sample that has been injected onto the column. Operational column properties are read-only.

For a complete list of column properties and for more information about the column identification system, see the Chromeleon Help.

5.5.4 Adjusting the Sensitivity of the Gas and Humidity Sensors

You can adjust the sensitivity of the gas or humidity sensor in Chromeleon or on the front panel display.

To adjust the sensitivity from Chromeleon

1. In Chromeleon, open the **Commands** dialog box for the TCC.
2. Select **GasLeakSensor** or select **HumidityLeakSensor**.
3. Select one of the following alternatives:
 - a) To activate leak detection, select
 - ♦ **Low, Standard, or High.**
When the sensor responds, a message appears on the front panel display and in Chromeleon *and* an acoustic beep sounds.
 - ♦ **Low_Silent, Standard_Silent, or High_Silent.**
When the sensor responds, a message appears on the front panel display, but *no* beep sounds.
 - b) To deactivate leak detection, select **Off**.

To adjust the sensitivity on the front panel display

1. Show the function keys and select **Menu**.
2. Select the **Control** menu, and then select **Gas leak mode** or **Humidity leak mode**.
3. Select **Low, Standard, or High**, or select **Low silent, Standard silent, or High silent**, or select **Off**. (For details about these settings, see above.)

5.5.5 Adjusting the Screen Brightness or Contrast

You can adjust the screen brightness or screen contrast on the front panel display or from Chromeleon.

To adjust the settings from Chromeleon

1. In Chromeleon, open the **Commands** dialog box for the TCC.
2. Select **Brightness** and change the value for the screen brightness as appropriate.
Select **Contrast** and change the value for the screen contrast as appropriate.

To adjust the settings on the front panel display

1. Show the function keys and select **Menu**.
2. Select the **Configuration** menu and select **Display & soft keys** (→ page 65).
3. Select **Brightness** and change the value for the screen brightness as appropriate.
Select **Contrast** and change the value for the screen contrast as appropriate.

5.5.6 SmartStartup and SmartShutdown

The **SmartStartup** wizard (→ page 49) assists you in automating regular routine tasks. With SmartStartup, the different modules of the UltiMate 3000 system are turned on automatically and in a controlled manner. For example, the sample compartment and all components inside are brought to the desired temperature. In addition, SmartStartup can purge the pump of the HPLC system automatically, heat or cool the carousel of a thermostatted autosampler to the desired temperature, flush the column, and perform system equilibration. Important module parameters are monitored. When the modules operate within these limits, the sample sequence, which was set up before, can be started automatically. SmartStartup can be used at any time.

If you have to interrupt system operation, use the **SmartShutdown** wizard to create a program to set the HPLC system into standby mode or to automate shutdown of the system (→ page 75).

5.6 Special Chromeleon Functions

This section provides a short overview of some special functions that Chromeleon supports for the TCC. All of these functions are available in the **Commands** dialog box (unless otherwise noted). In addition, some functions are available also on the control panel for the TCC. For additional information about a function, see the Chromeleon Help.

5.6.1 Predictive Performance

Predictive Performance provides various functions for estimating the lifetime of consumables and monitoring and recording service and (re)qualification information.

Commands Dialog Box

Open the **Commands** dialog box and enter the limits for the predictive performance parameters. For a complete list of available commands and parameters, see the Chromeleon Help.

To keep the predictive performance information up-to-date, Dionex recommends the following actions:

After you have ...	Perform the following command ...
Replaced the rotor seal of the left valve	LeftRotorSealChanged
Replaced the rotor seal of the right valve	RightRotorSealChanged
Serviced the TCC (for example, annual maintenance)	ServiceDone
Performed instrument qualification	QualificationDone

These commands reset the related counters and update the information when the action was performed.

Control Panel

On the control panel for the TCC, click **Wellness**, **Qualification**, and **Service** to see the related predictive performance commands and parameters on separate panels. On these panels, you can enter the limits and reset the counters. In addition, wellness bars provide visual indicators of qualification and service periods (Chromeleon 6.80 and later). The color-coding of the wellness bars provides information about the status:

Color	Description
Green	OK.
Yellow	The value will soon reach the specified limit and/or the related component needs servicing or should be replaced soon.

Color	Description
Orange	(Only for monitoring Qualification properties) The value has reached the specified limit. However, a Grace Period has been specified during which the component may still be operated.
Red	The value has reached the specified limit or the specified grace period has expired. Replacement, servicing, or qualification of the component is overdue. The component can no longer be operated and it is not possible to start a batch.

In addition, a message appears in the Chromeleon Audit Trail when a limit has been reached.

5.6.2 TCC Diagnostics

Chromeleon 6.80 Service Pack 2 and later support Diagnostics functions for the TCC. These tests allow you to check the performance of certain device components as well as the overall performance of the instrument.

1. On the **Control** menu, select **Diagnostics**. (The **Control** menu is visible only when a control panel is open.)
2. The **Diagnostics** dialog box lists the available tests for all devices that are installed in the current timebase. Select a test for the TCC. For information about how to run the tests, see the Chromeleon Help.

To check the ...	Run the ...
Gas sensor for correct functioning.	Gas Sensor Test
Heating and cooling performance of the TCC. During this test, the thermal elements, their thermal connections, and the device fan are checked. You can run the test only if the Rear Temperature check box is selected on the Configuration page (→ page 36) for the TCC. (To verify, right-click the TCC in the Chromeleon Server Configuration, select Properties on the menu, and open the Configuration page.) If the check box is cleared, the test will not appear on the diagnostics tests list.	Thermo Unit Test

If a test fails, check the Chromeleon Diagnostics Messages section for a short description of possible causes along with recommended courses of action (→ page 81).

5.6.3 Recording the Temperature Signal

On the **Configuration** page (→ page 36), the **Temperature Signal** check box is selected by default (→ page 36) when the TCC is installed and configured in Chromeleon. With this setting, Chromeleon generates the appropriate channel for recording the temperature signal. Dionex recommends recording the temperature signal in the Chromeleon program. If a problem occurs, the temperature signal channel can provide helpful information to identify and eliminate the source for the problem.

The channel is available in the **Commands** dialog box for the TCC.

5.6.4 Operational Qualification und Performance Qualification

Operational Qualification and Performance Qualification allow you to check and document the performance of the HPLC system. All materials required for performing qualification and detailed instructions are available from Dionex on request.

5.7 Shutting Down the TCC

Observe the following precautions before interrupting the operation or before shipping the TCC:

- For longer periods of inactivity and when using saliferous buffers, rinse the fluid connections with de-ionized water. This avoids salt crystallization, which may impair the instrument performance.
- For longer periods of inactivity or when shipping the TCC, make sure that there is no water in the fluid passages. This is, for example, to avoid failure of the sealing surfaces of the column switching valve when the temperature falls below 0 °C.
- Ship the unit only in the original shipping container and observe the packing instructions (→ Service Return Form section in this manual binder). Shipping the unit in any other packaging automatically voids the warranty. For more information, see the warranty statement in the terms of sale.

If you are running Chromeleon, you can set the TCC and HPLC system into the standby mode or automate system shutdown (see sections below).

Standby Program

A standby program sets the HPLC system into standby mode. The application can be reactivated very quickly afterward. The main program steps:

- The pump flow is automatically reduced at the end of the program.
- The temperature of all temperature-controlled modules in the system is reduced.

Shutdown Program

A shutdown program automates shutdown of the HPLC system. The main program steps are:

- The pump flow is automatically stopped at the end of the program.
- Certain system components and functions are turned off (for example, detector lamps, temperature control).

To create a standby or shutdown program

Select one of the following alternatives:

- Select and perform the operating commands and parameters from the **Commands** dialog box.
- Create and run a corresponding program to automate the process (→ page 57).
- Use the SmartShutdown Wizard to create and run the program (→ page 75).

To create the program with the SmartShutdown wizard

1. To open the wizard, click **SmartShutdown** on the **Batch** menu.
3. Follow the instructions as they appear on each page of the wizard. For additional information about a page, click **Help**.
4. After you finish the wizard, Chromeleon
 - ◆ creates the program and saves it in the timebase for which you create the program.
 - ◆ opens the **Start Batch on** dialog box.

Select the program and click **Start** to run the program.


For more information about the SmartShutdown wizard, see the Chromeleon Help.

5.8 Routine and Preventive Maintenance

The TCC is made of high-quality components and materials to minimize maintenance requirements. All surfaces are resistant to weak acids, alkali, and organic solvents. Nevertheless, immediately wipe up all liquids spilled onto the TCC surface, using lint-free cloth or paper. If surfaces are exposed for longer periods, these liquids can cause damage.

Perform the maintenance procedures listed in the table at regular intervals to ensure optimum performance and maximum uptime of the TCC. The exact maintenance schedule for the TCC will depend on a number of factors.

Frequency	What you should do...
Daily	Inspect the TCC for leaks. Tighten leaking capillary connections. If necessary, replace the fittings and ferrules.
Periodically	Clean the column chamber, using a lint-free cloth. Use paper to absorb any humidity in the column chamber. The cleaner the column chamber is, the better the sensors are at detecting excessive gas or humidity.
	Inspect the seal installed in the front panel door. A defective door seal impairs the performance of the instrument. If the seal is defective, contact your Dionex service representative.
	Inspect the column switching valve for indications of leakage (→ page 87).
	Check the drain tube connected to the drain port on the bottom right of the TCC (→ page 47). Verify that the tubing is unclogged and is routed below the drain port. Check the volume of the liquid in the waste container and empty as needed.
	After using saliferous buffers, rinse the fluid connections with de-ionized water.
Annually	Have a Dionex service representative check the TCC once a year to prevent, for example, contamination and excessive wear.

 **Tip:** Chromeleon supports functions for estimating the lifetime of consumables and diagnostic tests to check the performance of certain TCC components (→ pages 71 and 72).

6 Troubleshooting

6.1 Overview


The following features help you to identify and eliminate the source for problems that may occur during the operation of the TCC or an UltiMate 3000 system.

Status Indicators

The status indicators on the front panel provide a quick visual check of the operational status of the TCC. They indicate whether the TCC is turned on, connected in Chromeleon, and operating properly (→ page 16).

Error Messages

If a fault or error is detected during the operation of the TCC, a message is generated on the user interface. Check the Messages on the Front Panel Display section for recommended courses of action (→ page 78). If the TCC is operated by Chromeleon, the error is also logged in the Chromeleon Audit Trail.

 **Tip:** For information about operating problems that might occur during the operation of an UltiMate 3000 system, see Operating Problems (→ page 82).

Diagnostics Tests

If the TCC is connected in Chromeleon, Chromeleon provides several diagnostic tests allowing you to check the performance of certain device components (→ page 72). If a test fails, check the Chromeleon Diagnostics Messages section (→ page 81) for a short description of possible causes along with recommended courses of action.

If you are unable to eliminate a problem following the instructions given here, contact Dionex Service.

6.2 Messages on the Front Panel Display

Each time a fault or error occurs during the operation of the TCC, the **Status** LED on the front panel changes to red and a message appears on the front panel display. In this case, the **Prev**, **Next**, and **Clear** keys appear on the navigation bar.

To ...	Select ...
Return to the previous message.	Prev
Proceed to the next message.	Next
Remove the message from the display.	Clear

These keys are active also when the TCC is connected in Chromeleon.

When the TCC is operated with Chromeleon

- The error is also logged in the Chromeleon Audit Trail.
- Messages on the front panel display can be also removed via the **ClearDisplayError** command in Chromeleon.

The table lists TCC-related messages and suggests appropriate remedial actions. In addition to the messages listed in the table, other messages may appear. In this case, please note the exact wording of the message and contact Dionex Service if you are unable to eliminate the problem.

Message	Remedial Action
Chip card communication error!	The chip card is not installed properly or the chip card board is defective. Verify that the chip card is installed properly.
Compartment temperature sensor communication error!	Turn the TCC off and on again by pressing the power switch on the rear of the TCC and retry.
Error while programming flash! (This message may be extended by additional text.)	Turn the TCC off and on again by pressing the power switch on the rear of the TCC and retry.
Flash object error! (This message may be extended by additional text.)	Turn the TCC off and on again by pressing the power switch on the rear of the TCC and retry.
Gas leak alarm!	<p>The gas sensor detected an increased concentration of gas in the column chamber. Eliminate the cause. Tighten leaking connection and vent the column chamber.</p> <p>The gas sensor may be influenced by the drain tubing from other modules in the UltiMate 3000 system. In this case, connect the drain tubing for the TCC as shown in Fig. 27 b (→ page 47). As an alternative, connect separate drain tubing to both the TCC and the system module stacked upon the TCC.</p>

Message	Remedial Action
Gas leak sensor error!	Turn the TCC off and on again by pressing the power switch on the rear of the TCC and retry.
Humidity leak alarm!	The humidity sensor reports an increased concentration of humidity in the column chamber. Eliminate the cause. Tighten leaking connection and vent the column chamber (→ page 19).
Humidity leak sensor error!	Turn the TCC off and on again by pressing the power switch on the rear of the TCC and retry.
I2C bus error! (This message may be extended by additional text.)	Turn the TCC off and on again by pressing the power switch on the rear of the TCC and retry.
Leak temperature sensor communication error!	Turn the TCC off and on again by pressing the power switch on the rear of the TCC and retry.
Left chip card communication error!	The left chip card (slot A or B) is not inserted properly or the chip card board is defective. Verify that the chip card is installed properly.
Left MSV communication error!	Turn the TCC off and on again by pressing the power switch on the rear of the TCC and retry.
Left MSV controller error!	Turn the TCC off and on again by pressing the power switch on the rear of the TCC and retry.
Left MSV error!	Contact Dionex Service if the messages appears more often.
Left MSV error! Retrying... or Left MSV position error!	The left switching valve cannot be switched to the desired position. Switching is repeated automatically. If this is not successful, the Left MSV position error! message appears. Check whether the spanner has been tightened too firmly. In this case, the valve cannot switch.
MSV communication error!	Turn the TCC off and on again by pressing the power switch on the rear of the TCC and retry.
Rear temperature sensor communication error!	Turn the TCC off and on again by pressing the power switch on the rear of the TCC and retry.
Right chip card communication error!	The right chip card (slot C or D) is not inserted properly or the chip card board is defective. Verify that the chip card is installed properly.
Right MSV communication error!	Turn the TCC off and on again by pressing the power switch on the rear of the TCC and retry.
Right MSV controller error!	Turn the TCC off and on again by pressing the power switch on the rear of the TCC and retry.
Right MSV error!	Contact Dionex Service if the messages appears more often.
Right MSV error! Retrying.... or Right MSV position error	The right switching valve cannot be switched to the desired position. Switching is repeated automatically. If this is not successful, the Right MSV position error! message appears. Check whether the spanner has been tightened too firmly. In this case, switching errors may occur.

If communication between Chromeleon and the TCC cannot be established, related messages may appear in the Chromeleon Audit Trail.

Message	Remedial Action
TCC-3x00@USB-01610103 - Device not found on the USB.	The USB connection between the TCC and the Chromeleon server may be interrupted. Check the USB connection. The power supply to the TCC may be interrupted. Check the power supply connection of the TCC.
Error opening TCC-3x00 @USB-01610103 – The System cannot find the file specified	The USB connection between the TCC and the Chromeleon server may be interrupted. Check the USB connection. The power supply to the TCC may be interrupted. Check the power supply connection of the TCC.
Error issuing control request to TCC-3x00@USB-01610103	The USB connection between the TCC and the Chromeleon server may be interrupted. Check the USB connection. The power supply to the TCC may be interrupted. Check the power supply connection of the TCC. Remove the autosampler specified in the message from the server configuration or else, select a different TCC from the list of available TCCs in the server configuration program (via Properties and Browse).
Error reading from TCC-3x00 @USB-01610103 Data error (cyclic redundancy check)	Check the USB connection. The connection to the next hub must not exceed 5 m. The overall connection length, including the hub connections must not exceed 30 m. Replace any defective USB cable or hub.
Error reading from TCC-3x00 @USB-01610103	The USB connection between the TCC and the Chromeleon server may be interrupted. Check the USB connection. The power supply to the TCC may be interrupted. Check the power supply connection of the TCC.

6.3 Chromeleon Diagnostics Messages

If the TCC fails a diagnostics test, perform the instructions given here. If the detector still fails the test, contact Dionex Service.

Gas Sensor Test failed

Test Result	Possible Cause	Remedial Action
Error gas leak detected!	<p>The gas sensor detected an excessive gas in the column chamber.</p> <p>The gas sensor may be influenced by the drain tubing from other modules in the UltiMate 3000 system.</p>	<p>Eliminate the cause. Tighten leaking connection and vent the column chamber.</p> <p>In this case, connect the drain tubing for the TCC as shown in Fig. 27 b (→ page 47). As an alternative, connect separate drain tubing to both the TCC and the system module stacked upon the TCC.</p>
Error, gas leak sensor error!	The gas sensor is defective.	Repeat the test.
Error, gas leak sensor not ready!	The temperature set point has not been reached. The thermal unit may be defective.	Repeat the test.
Error, no gas leak detected.	During the test the gas sensor should have detected excessive gas in the column chamber. The gas sensor may be defective.	Repeat the test.

Thermo Unit Test failed

Test Result	Possible Cause	Remedial Action
Poor heating (or cooling) performance.	The door seal may not seal tight or is defective. The thermal elements may be defective.	Repeat the test.
Rear temperature stabilisation not reached within 20 minutes.	The door seal may not seal tight or is defective. The thermal elements may be defective.	Repeat the test.
Suitable temperature not reached.	The door seal may not seal tight or is defective. The exhaust fan is not working properly. The thermal unit may be defective.	Repeat the test.
Temperature not stable at 22 °C withing 40 minutes.	The thermal unit may be defective.	Repeat the test.
Timeout waiting for temperature to reach (exceed, approach) room temperature during heating (or cooling) phase.	The thermal unit may be defective.	Repeat the test.

6.4 Operating Problems

The table provides information about common operating problems that might occur with an UltiMate 3000 system and lists probable causes, as well as remedial actions. For more information, also see the manuals for the other modules of an UltiMate 3000 system.

Problem	Probable Cause	Remedial Action
No information appears on the front panel display.	<p>The instrument is not connected to the mains.</p> <p>The power is turned off.</p> <p>The instrument is in standby mode.</p> <p>The screen brightness or contrast is not adjusted correctly.</p> <p>The fuses blow.</p> <p>Replacement fuse blows immediately.</p> <p>An error occurred in the electronic system.</p>	<p>Connect the power cord.</p> <p>Turn on the power.</p> <p>Press the Standby key on the front panel.</p> <p>Adjust the brightness or contrast on the Configuration menu or in Chromeleon. (→ page 70).</p> <p>Replace the fuses (→ page 94).</p> <p>Contact Dionex Service.</p> <p>Contact Dionex Service.</p>
The instrument does not work correctly when controlled by Chromeleon.	<p>There is no connection between the instrument and the Chromeleon computer.</p> <p>The USB port on the computer is not ready for operation.</p>	<p>Check the USB cable and the connection to the computer.</p> <p>Check the USB port on the computer.</p>
The system has very high backpressure.	<p>One or more capillaries in the system are blocked or damaged by bending.</p> <p>The eluent preconditioner is blocked.</p> <p>A valve (if installed) is blocked</p>	<p>Check the capillaries in the system, remove the blockage, or replace the capillaries.</p> <p>Rinse both the capillary of the eluent preconditioner and the eluent preconditioner itself, using an appropriate solvent. If necessary, replace the eluent).</p> <p>Check the valve for indications of blockage. It might be necessary to replace the valve.</p>
The system has very high backpressure at the column and pump.	The column is contaminated or blocked.	Rinse or replace the column.

Problem	Probable Cause	Remedial Action
The temperature does not change for some time although the temperature set point has not been reached.	<p>The ambient temperature is too high or the set point is lower than the specified difference to the ambient temperature.</p> <p>The ventilation slots on the instrument are obstructed.</p> <p>The front panel door of the TCC is not completely closed.</p> <p>The capillaries are placed in such a manner that ambient air can enter the column chamber.</p> <p>The door seal is damaged.</p>	<p>Reduce the ambient temperature (for example, by ventilating the room).</p> <p>Make sure that the ventilation slots are not obstructed in any way.</p> <p>When closing the door, make sure that the locking mechanism locks the door.</p> <p>Make sure that the capillaries rest flat on the edge of the housing (→ page 41).</p> <p>Contact Dionex Service.</p>
Leakage at the eluent preconditioner.	The fittings are not tightened correctly.	<p>Tighten the fittings on the eluent preconditioner inlet and outlet.</p> <p>→ "The system has very high backpressure" on page 82.</p>
Impaired performance of the eluent preconditioner.	<p>The flow path is not correct.</p> <p>The eluent preconditioner is not installed correctly, that is, the thermal contact is imperfect.</p> <p>The calibration of the TCC is incorrect.</p> <p>The eluent preconditioner is defective.</p>	<p>Check and correct the flow path, if necessary.</p> <p>Reinstall the eluent preconditioner.</p> <p>Contact Dionex Service.</p> <p>Replace the eluent preconditioner.</p>

7 Service

7.1 General Notes

The following sections describe all procedures for the TCC that the user may perform. All other maintenance and service procedures must be performed by Dionex personnel.

Observe the following precautions:

- Observe all warning notes when carrying out maintenance or repair work.
- Do not touch any metal parts inside the column chamber while the temperature set point is $> 50\text{ }^{\circ}\text{C}$. Wait for the chamber to cool down before performing any service procedures in the column chamber.
- Keep in mind that the fluid components of the TCC may be filled with toxic solvents. Therefore, purge the TCC with an appropriate solvent and put on protective clothing before starting maintenance work.
- Use original Dionex spare parts only. Substituting non-Dionex parts may impair the TCC performance, thereby voiding the product warranty. For more information, see the warranty statement in the terms of sale.
- Before you return any instrument to Dionex for repair, contact Dionex Service or your local distributor. An RMA number (Return Material Authorization number) is required in order to track your instrument. Always use the original packaging and observe the packing instructions (→ Service Return Form section in the manual binder) when shipping the TCC. Shipping the instrument in anything other than the original packaging will void the warranty. For more information, see the warranty statement in the terms of sale.

For instructions on shutting down the TCC, see page 74.

7.2 Column Switching Valve

Depending on the instrument configuration, the TCC is shipped with one or two column switching valves (→ page 11).

To ensure optimum operation of the valve, observe the following guidelines:

- All parts of the valve that are exposed to solvents are made of Vespel and DuraLife™ (stainless steel valve), titanium (6-position, 7-port valve), or PEEK (biocompatible valve). The valve should not be used with concentrated formic acid.
- Operating, storing, or shipping the valve below 0 °C with water in the fluid passages may cause failure of the sealing surfaces.
- To connect the capillaries to the column switching valve, install only the ferrules and fitting nuts from the TCC accessories kit or original Dionex spare parts.

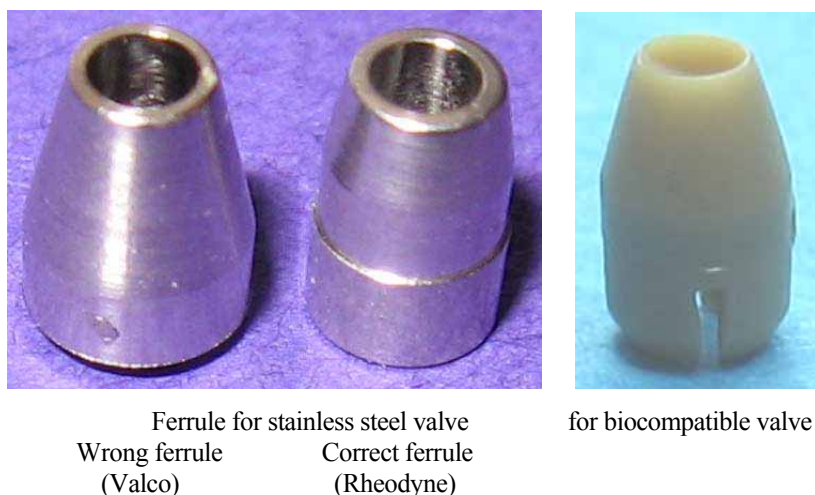


Fig. 45: Valve ferrules

Maintenance requirements are kept to a minimum. In most instances, it will be sufficient to clean the valve by flushing all lines with an appropriate solvent. The nature of the solvent to be used depends on the samples and the mobile phases that are used. The rotor seal and stator face seal are consumables that should be replaced as necessary.

7.2.1 Inspecting the Column Switching Valve for Leakage

Several drain holes are provided on the stator ring. If liquid droplets appear on one or more drain holes, this may indicate valve leakage.

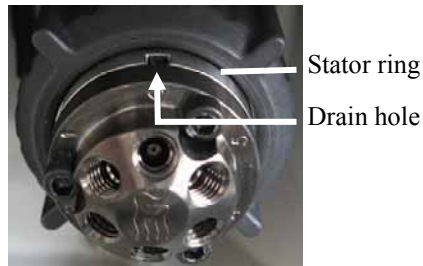


Fig. 46: Drain hole on the column switching valve

Possible remedial actions:

- Replace the rotor seal or rotor seal and stator face seal (→ page 92).
- Replace the stator (→ page 91).
- Replace the valve pod (→ page 88).

7.2.2 Replacing the Valve Pod

Description	Part No.
<p><i>Stainless steel column switching valves</i></p> <p>Pod for</p> <p>2-position, 6-port valve</p> <p>2-position, 10-port valve</p> <p>6-position, 7-port valve</p> <p>The rotor seal in the valve pod is the appropriate choice for pH values < 10. For pH values > 10, replace this rotor seal with the PEEK rotor seal and stator face seal (→ page 92).</p>	<p>6722.9013</p> <p>6722.9023</p> <p>6722.9035</p>
<p><i>Biocompatible column switching valve</i></p> <p>Pod for 2-position, 10-port valve (PEEK)</p> <p>The rotor seal in the valve pod is suitable for pH values 0-14.</p>	<p>6723.9023</p>

- Switch the valve into the appropriate position for the change (see below).
In Chromeleon, select **ValveLeft** or **ValveRight**, and then select the position—or—on the front panel display, select the **Control** menu and **Valve Control**, and then select **Left Valve** or **Right valve** and the desired position.
2-position, 6-port and 2-position, 10-port column switching valves
Switch the valve into position 1-2.
6-position, 7-port column switching valves
Switch the valve into position 1.
- Disconnect all liquid lines connected to the column switching valve.
- Unscrew and remove the locking ring ("spanner") using only your hand (do not use a wrench). Grasp the pod and pull out firmly to remove the pod from the valve driver body. The orientation of the valve coupling on the old pod is important for the new pod. Therefore, be careful not to twist the coupling when removing the pod.

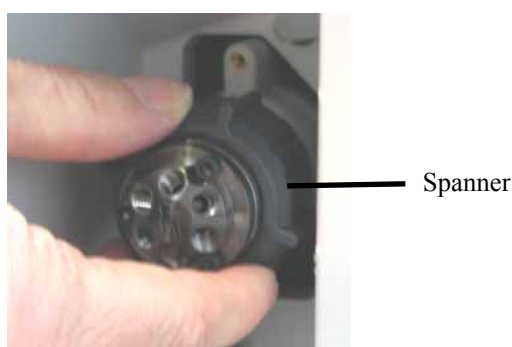
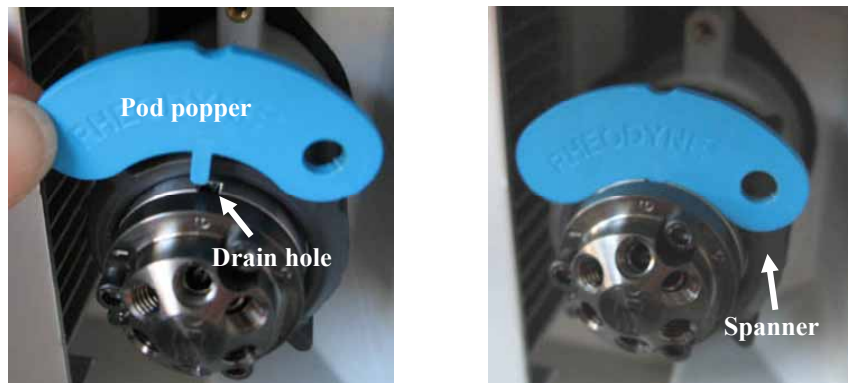


Fig. 47: Removing the spanner

As an alternative

You can use the so-called "Pod Popper" to facilitate the removal of the valve pod. Place the tab of the popper into one of the drain holes on the stator ring (→ Fig. 48). Unscrew the spanner (using only your hand) while holding the popper in place with pressure. This will force the pod out. Unscrew the spanner until the pod is completely removed from the valve driver body.



Place the tab of pod popper into one of the drain holes on the stator ring.

Fig. 48: Pod popper

4. If necessary, adjust the valve coupling on the new pod so that the orientation is the same as on the old pod.
5. Install the new valve pod in the reverse order. Be sure to install the pod in the correct orientation: Align the large slot in the pod with the matching runner in the valve driver body (→ Fig. 49).

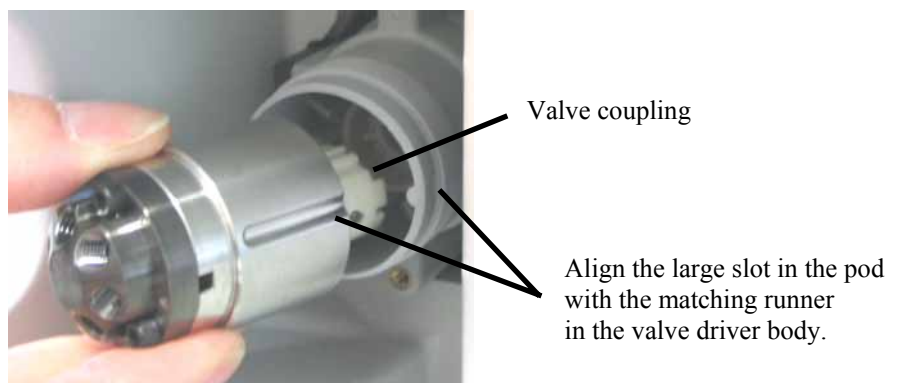


Fig. 49: Installing the pod

To ensure that the valve is installed correctly, avoid turning the valve coupling or shaft manually. Turning the coupling or shaft while the stator is removed will change the contact pressure so that readjustment will be required. The separation distance between the valve coupling and body must be 0.7 mm (→ Fig. 50).

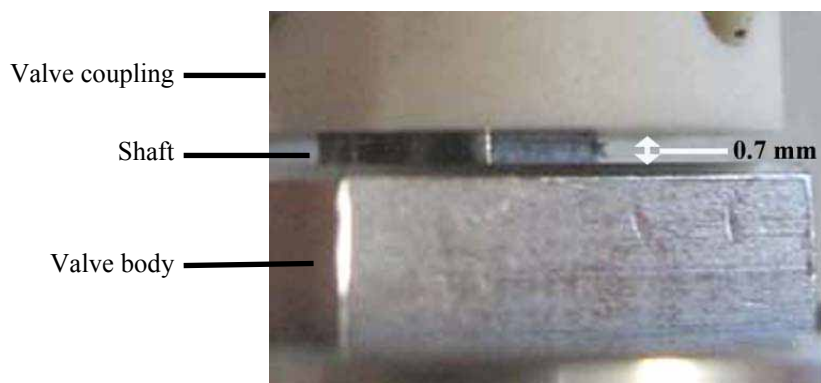


Fig. 50: Separation distance between valve coupling and body

6. Tighten the spanner firmly with your hand only (use no tool). If the spanner is too tight, the valve cannot be switched. If you attempt to switch the valve, a message will appear, for example, Left (or Right) MSV error! Retrying... or Left (or Right) MSV position error.

i Tip: When the valve pod is replaced, the rotor seal is also replaced. Therefore, after you have replaced the valve pod, update the service information for the rotor seal in Chromeleon. To do so, perform the **LeftRotorSealChanged** or **RightRotorSealChanged** command.

7.2.3 Replacing the Valve Stator

Description	Part No.
<i>Stainless steel column switching valves</i> Stator for 2 position, 6 port valve 2 position, 10 port valve 6 position, 7 port valve	6722.9011 6722.9021 6722.9031
<i>Biocompatible column switching valve</i> Stator for 2 position, 10 port valve (PEEK)	6723.9021

1. Remove the three stator screws located in the stator.
Remove the screws simultaneously to avoid that the stator gets jammed.



Fig. 51: Removing the stator

2. Remove the stator from the valve body.
3. Mount the new stator on the valve so that the stator locating pins in the valve body enter the matching holes in the stator.
4. Tighten all stator screws hand-tight in turns, and then tighten the screws firmly (no more than 0.7 Nm).

7.2.4 Rotor Seal and Stator Face Seal

The valve type (standard or biocompatible) *and* the pH value of the application determine the type of seals:


Description	Part No.
<i>Stainless steel column switching valve and pH value of the application < 10</i>	
Rotor Seal (RheBuild) kit ¹ for	
2-position, 6-port valve	6722.9012
2-position, 10-port valve	6722.9022
6-position, 7-port valve	6722.9032
<i>Stainless steel column switching valve and pH value of the application > 10</i>	
Rotor Seal and Stator Face Seal (RheBuild) kit ² for	
2-position, 6-port valve	6722.9014
2-position, 10-port valve	6722.9024
<i>Note: There will be an increase in dead volume when using this two-piece seal.</i>	
<i>Biocompatible column switching valve (pH value 0-14)</i>	
Rotor Seal (RheBuild) kit ¹ for	
2-position, 10-port valve (PEEK)	6723.9022

¹ The kit includes a rotor seal, hexagon wrench, and installation instructions. For replacement instructions, see section 7.2.4.1.

² The kit includes a rotor seal and stator face seal, hexagon wrench, and installation instructions. For replacement instructions, see section 7.2.4.2 (→ page 93).


7.2.4.1 Replacing the Rotor Seal

1. Remove the stator screws located in the stator (→ Fig. 51, page 91), and then remove the stator from the valve body.
2. Slip a flathead screwdriver underneath the rotor seal and remove the seal.
3. Mount the new rotor seal on the valve body with the grooves facing the stator. The three pins on the shaft assembly fit into the matching holes in the rotor seal only one way (see the installation instructions shipped with the kit).
4. Reinstall the stator (→ page 91).

 **Tip:** After you have replaced the rotor seal, update the related service information in Chromeleon. To do so, perform the **LeftRotorSealChanged** or **RightRotorSealChanged** command.

7.2.4.2 Replacing the Rotor Seal and Stator Face Seal

1. Remove the stator screws located in the stator (→ Fig. 51, page 91), and then remove the stator with stator face seal from the valve body.
2. Slip a flathead screwdriver underneath the rotor seal and remove the seal.
3. Mount the new rotor seal on the valve body with the grooves facing the stator. The three pins on the shaft assembly fit into the matching holes in the rotor seal only one way (see the installation instructions shipped with the kit).
4. Remove the old stator face seal from the stator.
5. Mount the new stator face seal on the stator. The three pins on the seal fit into the matching holes in the stator only one way.
6. Reinstall the stator (→ page 91).

 **Tip:** After you have replaced the rotor seal, update the related service information in Chromeleon. To do so, perform the **LeftRotorSealChanged** or **RightRotorSealChanged** command.

7.3 Replacing the Main Power Fuses



Warning:

Before replacing the fuses, turn off the TCC. Be sure to disconnect the power cord from its source.



Avertissement:

Avant de remplacer les fusibles, arrêtez l'instrument. Assurez-vous de bien débrancher le cordon d'alimentation de la source secteur.

1. Remove the fuse holder, using a small screwdriver.



Fig. 52: Fuse holder

2. Replace the fuses with fuses of the appropriate rating.



Important:

Always install two new fuses. Use only the fuses indicated in the table.



Important:

Installez toujours deux nouveaux fusibles. Ne faites pas fonctionner l'instrument avec seulement un fusible. Utilisez uniquement les fusibles indiqués ci-dessous.

Description	Part No.
2 A Fuse, slow-blow, 5 x 20 mm	Included in Fuses Kit, part no. 6710.9001 For information about which fuses are included in the kit, see section 9.3 (→ page 101).

3. Reinstall the fuse holder.
4. Reconnect the power cord to its source and turn on the TCC.

8 Technical Information

Temperature range:	5 °C to 85 °C (max. 18 °C below ambient)
Temperature accuracy:	±0.5 °C
Temperature stability:	±0.1 °C
Temperature precision:	±0.1 °C
Column capacity:	Up to 6 columns, max. 30 cm length
Heatup time:	Typically 15 minutes 20 °C to 50 °C
Cooldown time:	Typically 18 minutes 50 °C to 20 °C
Control:	All functions software controlled via USB
I/O interfaces:	2 digital inputs, 2 programmable relay outputs
Switching valves:	1 or 2 thermostatted valves (2-position, 6-port, 2-position, 10-port, or 6-position, 7-port)
Wetted parts:	Stainless steel (1.4571, 316L), PEEK; Waste line: PTFE Column switching valve (stainless steel): Vespel and DuraLife™ Column switching valve (biocompatible): PEEK Column switching valve (6-position, 7-port): Titanium
Safety features:	Humidity sensor and gas sensor Temperature control and temperature sensors
User input/display:	LCD-indicating system parameters Standby button 3 LEDs for status monitoring (Power, Connected, Status) 4 function keys for operation during initial installation and maintenance
GLP features:	Electronic identification system for 4 columns In Chromeleon: Full support of automatic equipment qualification (AutoQ) and System System Wellness monitoring All system parameters are recorded in the Chromeleon Audit Trail.
Power requirements:	100 - 120 V, 60 Hz; 200 - 240 V, 50 Hz, max. 150 VA
Environmental conditions:	Range of use: Indoor use Temperature: 10 to 35 °C Air humidity: 80% relative humidity, non-condensing Overvoltage category: II Pollution degree: 2
Dimensions (h × w × d)	17 x 42 x 51 cm (6.7 x 16.5x 20 in)
Weight	TCC-3000: 12.6 kg (27.7 lbs) TCC-3100: 12.9 kg (28.3 lbs) TCC-3200: 13.2 kg (29.0 lbs)

Technical information: February 2008.

All technical specifications are subject to change without notice.

9 Accessories, Spare Parts, and Consumables

Accessories, spare parts, and consumables for the TCC are always maintained at the latest technical standard. Therefore, part numbers are subject to alteration. However, updated parts will always be compatible with the parts they replace. The part numbers always refers to the packing unit.

9.1 Standard Accessories

The following accessories are shipped with the TCC. (The list is subject to change without notice.) Some parts listed below are included in one of the spare part kits. For information about these kits, see section 9.3 (→ page 101).

Description	Part No.*	Quantity in the accessories kit
Accessories for TCC-3000, including:	5722.8910	
2 A fuse, slow-blow, 5x20 mm	Included in 6710.9001	2
6.3 A fuse, slow-blow, 5x20 mm	Included in 6710.9001	1
Column ID	Included in 6710.1505	2
Column clips kit (set of 6 clips)	6722.0290	1
Double open-end wrench (1/4" x 5/16")	6000.0051	1
Wrench (size 2.5 mm)	6146.2625	1
Tubing (1.5 m), Tee piece, and elbow for waste fluidics	Included in 6000.5001	1 each
Dionex menu pen	6300.0100	1
USB cable (1 m, type A to type B, USB 2.0)	6035.9035	1
USB cable (0.5 m, type A to type B, USB 2.0)	6720.8910	1
6-pin Mini-DIN signal cable (5 m)	6000.1004	1
Assortment box for accessories	6000.0043	1

* The part number always refers to the packing unit. For more information, contact your Dionex sales representative.

Description	Part No.*	Quantity in the accessories kit
Accessories for TCC-3100, including:	5722.8915	
2 A fuse, slow-blow, 5x20 mm	Included in 6710.9001	2
6.3 A fuse, slow-blow, 5x20 mm	Included in 6710.9001	1
Column ID	Included in 6710.1505	2
Column clips kit (set of 6 clips)	6722.0290	1
Double open-end wrench (1/4" x 5/16")	6000.0051	1
Wrench (size 2.5 mm)	6146.2625	1
Tubing (1.5 m), Tee piece, and elbow for waste fluidics	Included in 6000.5001	1 each
Dionex menu pen	6300.0100	1
Ferrule (RH)	Included in 6822.0011	10
Fitting nut (long , RH)	Included in 6822.0011	10
USB cable (1 m, type A to type B, USB 2.0)	6035.9035	1
USB cable (0.5 m, type A to type B, USB 2.0)	6720.8910	1
6-pin Mini-DIN signal cable (5 m)	6000.1004	1
Assortment box for accessories	6000.0043	1

* The part number always refers to the packing unit. For more information, contact your Dionex sales representative.

Description	Part No.*	Quantity in the accessories kit
Accessories for TCC-3200, including:	5722.8920	
2 A fuse, slow-blow, 5x20 mm	Included in 6710.9001	2
6.3 A fuse, slow-blow, 5x20 mm	Included in 6710.9001	1
Column ID	Included in 6710.1505	2
Column clips kit (set of 6 clips)	6722.0290	1
Double open-end wrench (1/4" x 5/16")	6000.0051	1
Wrench (size 2.5 mm)	6146.2625	1
Tubing (1.5 m), Tee piece, and elbow for waste fluidics	Included in 6000.5001	1 each
Dionex menu pen	6300.0100	1
Ferrule (RH)	Included in 6822.0011	20
Fitting nut (long , RH)	Included in 6822.0011	20
USB cable (1 m, type A to type B, USB 2.0)	6035.9035	1
USB cable (0.5 m, type A to type B, USB 2.0)	6720.8910	1
6-pin Mini-DIN signal cable (5 m)	6000.1004	1
Assortment box for accessories	6000.0043	1

* The part number always refers to the packing unit. For more information, contact your Dionex sales representative.

Description	Part No.*	Quantity in the accessories kit
Accessories for TCC-3200B, including:	5723.8920	
2 A fuse, slow-blow, 5x20 mm	Included in 6710.9001	2
6.3 A fuse, slow-blow, 5x20 mm	Included in 6710.9001	1
Column ID	Included in 6710.1505	2
Column clips kit (set of 6 clips)	6722.0290	1
Double open-end wrench (1/4" x 5/16")	6000.0051	1
Wrench (size 2.5 mm)	6146.2625	1
Tubing (1.5 m), Tee piece, and elbow for waste fluidics	Included in 6000.5001	1 each
Dionex menu pen	6300.0100	1
RheFlex 1/16" PEEK Short Fittings Set (set of 10 fitting nuts and 10 ferrules)	6723.0010	2
RheFlex 1/16" PEEK ferrules (set of 10)	6723.0011	1
USB cable (1 m, type A to type B, USB 2.0)	6035.9035	1
USB cable (0.5 m, type A to type B, USB 2.0)	6720.8910	1
6-pin Mini-DIN signal cable (5 m)	6000.1004	1
Assortment box for accessories	6000.0043	1

* The part number always refers to the packing unit. For more information, contact your Dionex sales representative.

9.2 Optional Accessories

Description	Part No.
2 µL eluent preconditioner (stainless steel)	6722.0530
7 µL eluent preconditioner (stainless steel)	6722.0540
11 µL eluent preconditioner (stainless steel)	6722.0550

9.3 Consumables and Spare Parts

Description	Part No.*
Column brackets (set of 2 brackets)	6720.0601
Column clip kit (set of 6 clips)	6722.0290
Column ID (set of 5 IDs)	6710.1505
Eluent preconditioner (2 µL) (stainless steel)	6722.0530
Eluent preconditioner (7 µL) (stainless steel)	6722.0540
Eluent preconditioner (11 µL) (stainless steel)	6722.0550
Fuses kit TCC-3x00, including: 10 fuses (2 A, slow-blow, 5 x 20 mm) 5 fuses (6.3 A, slow-blow, 5 x 20 mm)	6710.9001
Ferrules and Fittings kit (RH) for stainless steel column switching valve The kit includes 6 ferrules and 6 fitting nuts (long).	6822.0011
Ferrules and Fittings kit, 1/16", PEEK (RheFlex) for biocompatible switching valve The kit includes 10 ferrules and 10 fitting nuts (short).	6723.0010
Ferrules, 1/16", PEEK (RheFlex), for biocompatible switching valve (pack of 10 ferrules)	6723.0011
Menu pen	6300.0100
(Double) Open-end wrench (1/4" x 5/16")	6000.0051
<p><i>Pods for the following stainless steel column switching valves:</i></p> <p>2-position, 6-port valve*</p> <p>2-position, 10-port valve*</p> <p>6-position, 7-port valve*</p> <p>* The rotor seal in the valve pod is the appropriate choice for pH values < 10. For pH values > 10, replace this rotor seal with the PEEK rotor seal and stator face seal (→ page 92).</p> <p><i>Pod for biocompatible column switching valve:</i></p> <p>2-position, 10-port valve (PEEK)</p> <p>The rotor seal in the valve pod is suitable for pH values 0-14.</p>	<p>6722.9013</p> <p>6722.9023</p> <p>6722.9035</p> <p>6723.9023</p>
<p><i>Rotor Seal (RheBuild) kits for the following stainless steel column switching valves and pH value of the application < 10:</i></p> <p>2-position, 6-port valve</p> <p>2-position, 10-port valve</p> <p>6-position, 7-port valve</p> <p>The kit includes a rotor seal, hexagon wrench, and installation instructions.</p>	<p>6722.9012</p> <p>6722.9022</p> <p>6722.9032</p>
<p><i>Rotor Seal and Stator Face Seal (RheBuild) kits for the following stainless steel column switching valves and pH value of the application > 10:</i></p> <p>2-position, 6-port valve</p> <p>2-position, 10-port valve</p> <p><i>Note:</i> There will be an increase in dead volume when using this two-piece seal. The kit includes a rotor seal, stator face seal, hexagon wrench, and installation instructions.</p>	<p>6722.9014</p> <p>6722.9024</p>

Description	Part No.*
<i>Rotor Seal (RheBuild) kit for biocompatible column switching valve (pH value 0-14)</i> 2-position, 10-port valve (PEEK) The kit includes a rotor seal, hexagon wrench, and installation instructions.	6723.9022
Signal cable (6-pin Mini-DIN; 5 m)	6000.1004
<i>Stator for the following stainless steel column switching valves:</i> 2-position, 6-port valve 2-position, 10-port valve 6-position, 7-port valve <i>Stator for biocompatible column switching valve:</i> 2-position, 10-port valve (PEEK)	6722.9011 6722.9021 6722.9031 6723.9021
USB cable (1 m, type A to type B, USB 2.0)	6035.9035
USB cable (0.5 m, type A to type B, USB 2.0)	6720.8910
Waste fluidics kit, including 2 m tubing (OD x ID: 8 mm x 4.8 mm ID) 5 Tee pieces 2 elbows	6000.5001
Wrench (size 2.5 mm)	6146.2625

* The part number always refers to the packing unit. For more information, contact your Dionex sales representative.

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