DIONEX

DX-800 PROCESS ANALYZER
USER'S GUIDE

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1 • Introduction

1.1 Overview

The DX-800 Process Analyzer is designed for reliability, accuracy, low maintenance, and regulatory compliance. Its IC and HPLC capabilities allow the determination of species that are not possible with other process analytical techniques. Multicomponent characterization of a sample can be performed in a single analysis and multiple samples can be scheduled for automatic analysis.

The DX-800 is typically plumbed for one of four sample preparation configurations: concentration or direct injection, dilution or direct injection, dilution with reagent addition, or concentration with reagent addition. Operation is controlled by one of these Dionex software products:

- Chromeleon®-PA software running under Microsoft® Windows® XP or Windows® 2000
- PeakNet®-PA software running under Microsoft Windows 2000 or NT® 4.0 (or above)

Both Chromeleon-PA and PeakNet-PA incorporate a user interface that provides an industry-standard approach to process monitoring, industrial I/O, and process control. Chromeleon-PA and PeakNet-PA instrument control capabilities include:

- Scheduled sampling
- Synchronized operation of multiple systems/channels (see definitions below)
- Automatic alarm handling, using preprogrammed conditional responses

Each system or channel normally contains[1] an analytical pump, a detector, and a CC80 Component Controller, and is configured to perform a specific analysis. Chromeleon-PA uses the term *system*, while PeakNet-PA uses the term *channel*.

An *analyzer* is defined as a sampling system configured with from one to four analysis systems/channels. The DX-800 can be multiplexed to different sample sources, using the optional SS80 Sample Selector.

1. Chromeleon-PA can support a system *without* an analytical pump.

1.2 Analyzer Hardware Configuration Overview

Every DX-800 analyzer includes at least one analysis system/channel. Each system/channel is composed of several components configured inside an enclosure (see Figure 1-1).

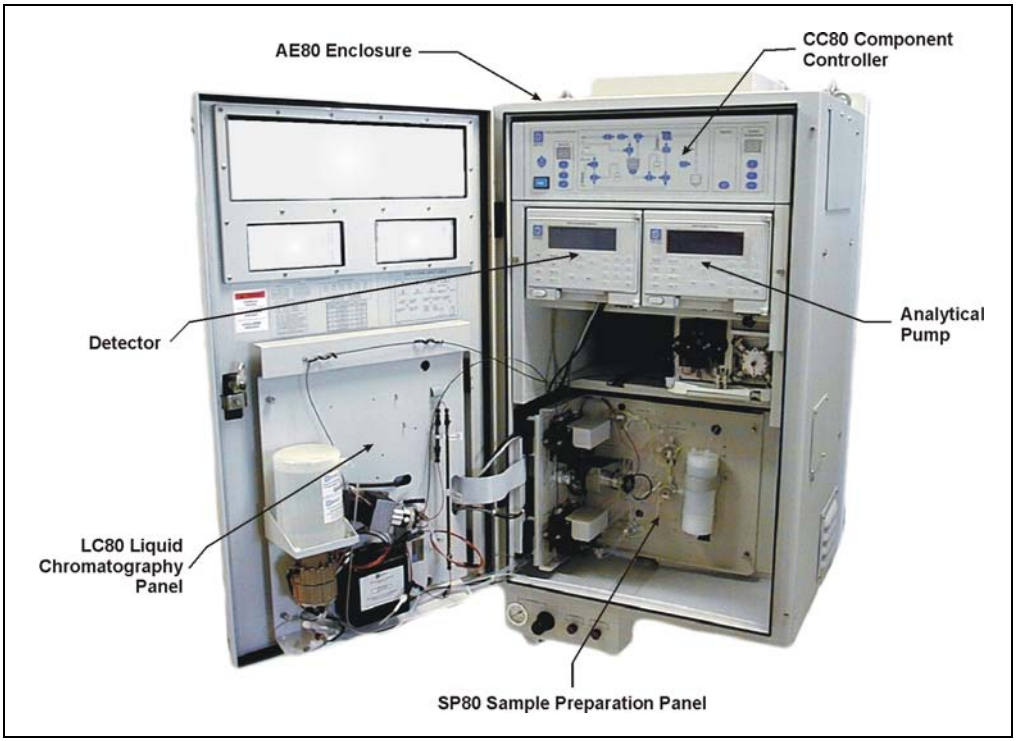


Figure 1-1. Typical DX-800 System/Channel

1.2.1 System/Channel Modules

This section provides an overview of the key components of a DX-800 system/channel.

AE80 Enclosure

The AE80 provides the liquids and gas connections, electrical connections, electrical emissions shielding, and environmental protection necessary in a process environment.

CC80 Component Controller

The CC80 controls the valves and pumps that perform sample selection, standard preparation, sample preparation, and chromatography. The CC80 also controls the optional SS80 Sample Selector, CH-4 Column Heater, and PC80 Post-Column Reagent Pump, if they are installed.

The CC80 front panel features an interactive plumbing schematic for status and local control of the SP80 and LC80 (described in the next two sections), controls for selecting the sample source and column heater temperature, and eight alarm indicators.

When the CC80 power is turned on, the Moduleware and BIOS version numbers are displayed briefly on the CC80 front panel.

The CC80 is installed at the top of the enclosure, above the analytical pump and the detector. For more information, see Chapter 3.

SP80 Sample Preparation Panel

The SP80 is purchased in one of four configurations. Each configuration performs a different type of sample preparation: concentration or direct injection, dilution or direct injection, dilution with reagent addition, or concentration with reagent addition. All four configurations automatically prepare and analyze calibration standards.

Components installed on the front of the SP80 panel include pumps, valves, and a dilution vessel. Electronics, air valve manifolds, and gas regulators are installed on the rear of the SP80. The panel swings open to permit access to these components.

The SP80 is located inside the enclosure, directly below the analytical pump and the detector. For more information, see Chapter 4.

LC80 Liquid Chromatography Panel

The LC80 panel provides mounting for the load/inject (LI) valve, columns, conductivity detector cell, and suppressor (for conductivity detection only). If the optional column heater, column switching valve, or eluent generator is required, it is mounted on the LC80, also.

The LC80 distribution board is located on the back of the swing-out panel. The LC80 is secured to the inside of the enclosure door. For more information, see Chapter 5.

NOTE If absorbance detection is used, the absorbance detector cell is installed inside the detector.

EG40-PA Eluent Generator (Optional)

An eluent generator can be added for generating high-purity acid or base eluents online from deionized water. The EluGen® cartridge is installed on the LC80 Liquid Chromatography panel. The EG40-PA controller, the Dionex DX-LAN™ interface, and other components are installed inside the enclosure. For more information, see Chapter 6.

LM80 Liquids Manager

The LM80 consists of a rack and a control panel, attached to the bottom of the system/channel enclosure (see Figure 1-2). A polypropylene holder in the rack accommodates two 1-liter and/or 2-liter plastic bottles for standards and reagents. The control panel includes a pressure regulator and gauge, as well as valves to control the gas supply that pressurizes the reservoirs and eluent containers.

Eluents and solvents can be delivered using one or more NOWPAK® II containers placed below the system/channel enclosure. From one to three NOWPAKs can be placed on the floor or in the polypropylene drip tray provided. For more information, see Chapter 7.

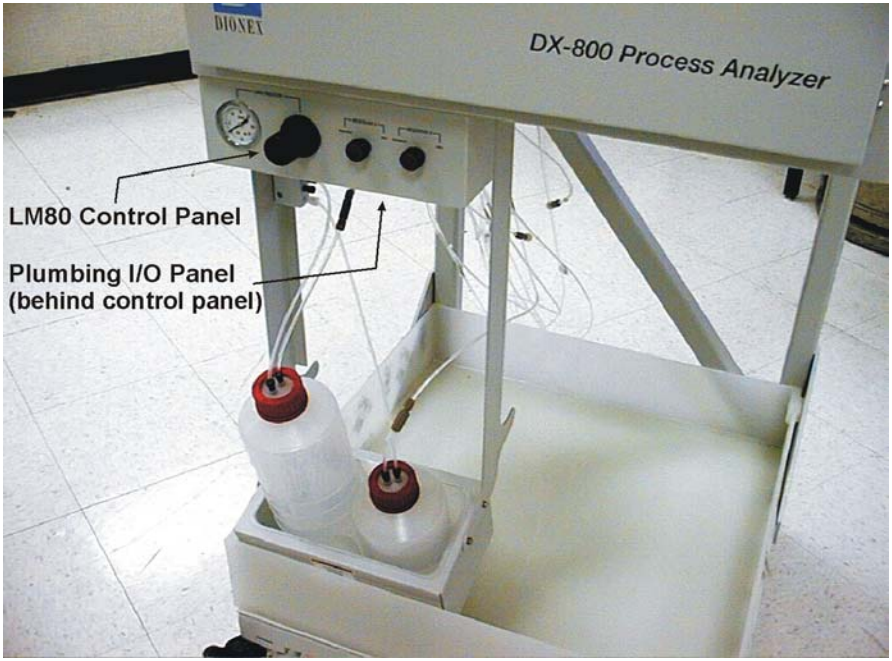


Figure 1-2. LM80 Liquids Manager

Analytical Pumps

The analytical pump (gradient or isocratic) is installed below the CC80 Component Controller.

The pump's front panel display is visible through a window in the door of the DX-800 enclosure. The display backlight automatically turns off after 2 hours if no front panel buttons have been pressed. To turn the backlight on again, press the blue **Display Refresh** button on the enclosure door or any button on the pump front panel.

NOTE If you are running PeakNet-PA, the Display Refresh button is functional only after a Method has been loaded into the pump.

Gradient Pump

The gradient pump is a dual processor-controlled gradient delivery system designed to blend and pump mixtures of up to four mobile phase (or eluent) components at precisely controlled flow rates. The selected mobile phase composition may be delivered isocratically, or as a linear or exponential gradient.

For operating, troubleshooting, and service information, see the pump operator's manual. Online operation of the pump is similar to the laboratory operation described in the manual.

Isocratic Pump

The isocratic pump is a dual processor-controlled isocratic delivery system designed to pump mobile phase (or eluent) at a precisely controlled flow rate.

For operating, troubleshooting, and service information, see the pump operator's manual. Online operation of the pump is similar to the laboratory operation described in the manual.

Detectors

Each system/channel includes a conductivity detector, absorbance detector, or electrochemical detector. The detector is installed below the CC80 Component Controller.

The detector's front panel display is visible through a window in the enclosure door. The display backlight automatically turns off after 2 hours if no front panel buttons have been pressed. To turn on the backlight again, press the blue **Display Refresh** button on the enclosure door or any button on the detector front panel.

NOTE If you are running PeakNet-PA, the Display Refresh button is functional only after a Method has been loaded into the pump.

Conductivity Detector

The conductivity detector is a microprocessor-driven precision conductivity detector. The detector incorporates digital autoranging, auto offset, and temperature compensation. Optional thermal control of the conductivity cell, combined with AutoSuppression™, provides unsurpassed signal-to-noise ratios, baseline stability, and dynamic range.

For operating, troubleshooting, and service information, see the detector operator's manual. Online operation of the detector is similar to the laboratory operation described in the manual.

Absorbance Detector

The absorbance detector is a dual-beam, variable-wavelength photometer. Advanced fiber-optics technology provides simple, reliable operation. Full spectral capability is provided by two light sources: a deuterium lamp for ultraviolet detection and a tungsten lamp for visible wavelength operation.

For operating, troubleshooting, and service information, see the detector operator's manual. Online operation of the detector is similar to the laboratory operation described in the manual.

Electrochemical Detector

The electrochemical detector provides the three major forms of electrochemical detection: conductivity, DC amperometry, and integrated amperometry. An additional mode is voltammetry, which can be used to determine the potentials used for amperometry operation. The electrochemical detector can also be used to monitor

pH during amperometric operation and temperature during conductivity operation.

For operating, troubleshooting, and service information, see the detector operator's manual. Online operation of the detector is similar to the laboratory operation described in the manual.

1.2.2 SS80 Sample Selector (Optional)

The SS80 Sample Selector can select one of 7, 14, or 21 sample sources, depending on the number of valves inside the module. For a single sample, no SS80 is required.

Sample lines can be continuously flushing or static, and can be returned to the process or to waste. The SS80 is in a separate enclosure in order to isolate the bulk of the liquid flow from the analytical instrumentation. For more information, see Chapter 8.

1.2.3 Hardware Options

- *CH-4 Column Heater.* Installing a column heater (P/N 051890) on the LC80 Liquid Chromatography panel ensures stable column temperatures for applications that are temperature-sensitive or require elevated temperatures. The CH-4 Column Heater holds one column with these dimensions: 6- or 8-mm OD x 100-, 150-, or 250-mm ID. The column heater temperature range is from ambient + 5 ºC to 80 ºC ± 1 ºC.
- *PC80 Post-Column Reagent Pump.* The PC80 delivers reagent for post-column detection PGM Files or Methods. The PC80 is installed at the base of the enclosure behind the SP80 Sample Preparation panel. The PC80 kit includes a single-piston pump, knitted reaction coil, and pulse damper. The kit is available in two versions: 115 V (P/N 050305) and 230 V (P/N 050307).
- *Column switching valve.* A 10-port, electrically-actuated PEEK valve (P/N 051824) can be added to the LC80 Liquid Chromatography panel for control of the liquid flow in dual-column Methods.

Contact Dionex for more information about DX-800 options.

1.3 Chromatography Software

Either Chromeleon-PA or PeakNet-PA software is required for automated control of DX-800 instrumentation, data acquisition and analysis, and results reporting. The software is typically installed on a personal computer before shipment from Dionex. Communication between the PC and the DX-800 is via the DX-LAN interface.

This section provides a brief overview of Chromeleon-PA and PeakNet-PA. For detailed information, refer to the software user's guide or online Help.

1.3.1 Chromeleon-PA Software

Chromeleon-PA is an extended version of Chromeleon, the Dionex client/server-based chromatography data system. The Analyzer program provides a user interface for accessing process analytical functions. Chromeleon-PA integrates the Analyzer program with Chromeleon to add process monitoring functions to the chromatography functions of Chromeleon.

Use the Analyzer program to:

- Specify the instrument server.
- Specify the datasource.
- Create Analyzers and associate systems (timebases) with Analyzers.
- Create analyzer Sequences.
- Specify default and alarm Sequences.
- Configure alarm conditions and responses.

Use Chromeleon to:

- Create systems (timebases).
- Create PGM Files, QNT Files, and reports for each system (timebase).

Chromeleon-PA can control a maximum of four analyzers; up to four systems of instrumentation can be configured to a single analyzer. Chromeleon allows four timebases per server.

Modes of Software Control

In the Analyzer program, you can either run a single sample manually or create a list of injections, called a Sequence, to be analyzed sequentially. The Sequence can include any combination of injection types (sample stream, calibration, check standard, blank, or matrix). Sequences are defined on the **Configuration** tab page.

In Chromeleon, two modes of software control are available:

- With *direct* control, you select operating parameters and commands from menus, toolbars, the CC80 control panel, etc. Direct control commands are executed as soon as they are entered.
- With *automated* control, you create a list of samples to be processed automatically. This list, called a Sequence, includes programs (PGM Files) with commands and parameters for control of the DX-800 instrumentation, data acquisition and analysis, and results reporting.

OPC Interface (Optional)

OPC (OLE for Process Control) is a series of standards specifications that enables open connectivity in industrial automation. The Chromeleon-PA OPC Server includes two interface specifications:

- The *OPC Data Access* (DA) interface moves real-time data.
- The *OPC Alarms and Events* (AE) interface provides notification of alarms and events on demand (in contrast to the continuous data flow of the Data Access interface).

Installation of the Chromeleon-PA OPC Server allows access to, and limited control of, one or more DX-800 Process Analyzers by an external OPC-compatible program (the *client*). The OPC client will use DX-800 data and/or alarm and event information for custom applications.

For more information about the OPC interfaces, including installation instructions, refer to *Setting Up Chromeleon-PA* (Document No. 031970).

1.3.2 PeakNet-PA Software

PeakNet-PA incorporates a user interface based on Wonderware® InTouch™. PeakNet-PA can control up to four analyzers, provided that there are no more than eight total channels. A maximum of four channels of instrumentation can be configured to a single analyzer.

Two modes of software control are available: *direct* control and *automated* control.

- With direct control, you select operating parameters and commands from PeakNet-PA menus, toolbars, etc. Direct control commands are executed as soon as they are entered.
- With automated control, you create a list of samples to be processed automatically. This list, called a Schedule, includes programs with commands and parameters for controlling the DX-800 instrumentation, data acquisition and analysis, and results reporting.

1.4 About This Manual

Chapter 1 Introduction	Introduces the DX-800 subsystems. Explains conventions used throughout the manual. Presents safety-related information.
Chapter 2 AE80	Describes the key features of the AE80 enclosure.
Chapter 3 CC80	Describes the function and key components of the CC80 Component Controller.
Chapter 4 SP80	Describes the function and key components of the SP80 Sample Preparation Panel, including the optional PC80 Post-Column Reagent Pump.
Chapter 5 LC80	Describes the function and key components of the LC80 Liquid Chromatography Panel.
Chapter 6 EG40-PA Eluent Generator	Describes the function and key components of the EG40-PA Eluent Generator.
Chapter 7 LM80	Describes the function and key components of the LM80 Liquids Manager.
Chapter 8 SS80	Describes the function and key components of the optional SS80 Sample Selector.
Chapter 9 Operation and Maintenance	Provides start-up, operation, and shutdown instructions. Includes routine preventive maintenance procedures.
Chapter 10 Troubleshooting	Lists problems, and presents step-by-step procedures for how to isolate and eliminate them.
Chapter 11 Service	Provides step-by-step instructions for routine service and parts replacement procedures.
Chapter 12 TTL/Relay Control	Describes TTL and relay control functions. Provides connection instructions.
Appendix A Specifications	Lists the DX-800 specifications and installation site requirements.

1.4.1 Safety Messages and Notes

This manual contains warnings and precautionary statements that can prevent personal injury and/or damage to the DX-800 when properly followed. Safety messages appear in bold type and are accompanied by icons, as shown below.

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

Indicates a potentially hazardous situation which, if not avoided, may result in death or serious injury.

Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. Also identifies a situation or practice that may seriously damage the instrument, but will not cause personal injury.

IMPORTANT

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

Messages d'avertissement en français

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

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

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

Warnhinweise in Deutsch

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

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

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

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

NOTE NOTES call attention to certain information. They alert the user to an unexpected result of an action, suggest how to optimize instrument performance, etc.

1.4.2 Safety Labels

The TUV GS, C, US Mark safety label and the CE Mark label on the DX-800 indicate compliance with these standards: EN 61010-1:1993 (safety), CAN/CSA-C22.2 No. 1010.1-92 (safety), UL 3101-1/10.93 (safety), EN 50082-1:1992 (susceptibility), and EN 55011:1991 (emissions). The symbols below appear on the DX-800 or on DX-800 labels.

~ Alternating current

 Protective conductor terminal

 Power supply is on

 Power supply is off

1.5 DX-800 Safety Practices

Do not operate the DX-800 Process Analyzer for any purpose other than that for which it is designed or for any purpose not described in the user documentation. If you have a question regarding appropriate usage, contact Dionex before proceeding.

1.5.1 General Precautions

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

1.5.2 Compressed Gas or Liquid Cylinder Precautions

- Periodically check all pressure regulators and verify that pressure settings are within the recommended limits.
- Compressed gas cylinders are initially pressurized at 14 to 15 MPa (2200 to 2500 psi). Use a regulator to reduce the delivered air pressure to 0.3 to 0.5 MPa (50 to 75 psi).
- Fasten all cylinders securely to an immovable structure.
- Do not store or move a cylinder unless the safety cap is in place.
- Store or move cylinders in a vertical position only. Do not move the cylinders with regulators attached.
- Store cylinders in a well-ventilated area, away from heat or ignition sources.
- Clearly label the cylinder with the contents.
- Use only approved regulators and tubing connections of the appropriate material and purity.

1.5.3 Mechanical Precautions

- The piston-drive mechanism of the analytical pump contains hazardous moving parts. Before servicing, turn off the main power switch and unplug the pump.
- The precision displacement pump(s) on the SP80 Sample Preparation panel contains a piston-drive mechanism with moving parts. Before servicing either of these pumps, turn off the air supply to the pump and unplug the pump from the SP80 distribution board.

1.5.4 Electrical Precautions

- Replace blown fuses with the size and rating stipulated for each component.
- Verify that the selected operating voltage for the analyzer(s) is the same as the actual power line voltage.

The power supply cord is used as the main disconnect device. Make sure the socket-outlet is located near the DX-800 and is easily accessible.

Le cordon d'alimentation principal est utilisé comme dispositif principal de débranchement. Veillez à ce que la prise de base soit située/installée près du DX-800 et facilement accessible.

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

2 • AE80 Enclosure

The standard AE80 enclosure is configured as an epoxy-painted NEMA 12 enclosure. (A stainless steel NEMA 4X enclosure is available as an option.) Enclosures are constructed of 14-gauge steel, with all seams continuously welded and ground smooth. The enclosures are designed for use in nonhazardous locations; see the table below for details.

NOTE The information in this table is not intended to be a complete representation of NEMA standards for enclosures nor those of the Electrical and Electronic Manufacturers Association of Canada (EEMAC).

Enclosure Type	Location
NEMA 12	Intended for use primarily to provide a degree of protection against dust, falling dirt, and dripping noncorrosive liquids.
NEMA 4X	Intended for use primarily to provide a degree of protection against corrosion, windblown dust and rain, splashing water, and hose-directed water.

The external dimensions of the enclosure (without an air conditioner) are 93 x 58 x 58 cm D (37 x 23 x 23 in). Allow at least 1 m (40 in) of clearance in front of the enclosure for opening the door and performing maintenance tasks. The 5-cm (2-in) flanges on the top and bottom are required to mount the enclosure on the wall.

IMPORTANT **The user is responsible for ensuring the structural integrity of the installation site and for supplying mounting hardware for the enclosure.**

2.1 Front Door

- The front panel displays on the analytical pump and the detector are visible through two small windows in the enclosure door. You can adjust the display brightness on the pump and detector modules on the **MODULE SETUP** screen (a **MAIN MENU** option).
- The red **Emergency Off** switch controls power to all components except the intrinsically-safe power circuit routed to the front door.

IMPORTANT **If an emergency occurs, turn off the power by pushing the Emergency Off switch completely in. After resolving the situation, push Power Reset to restore power.**

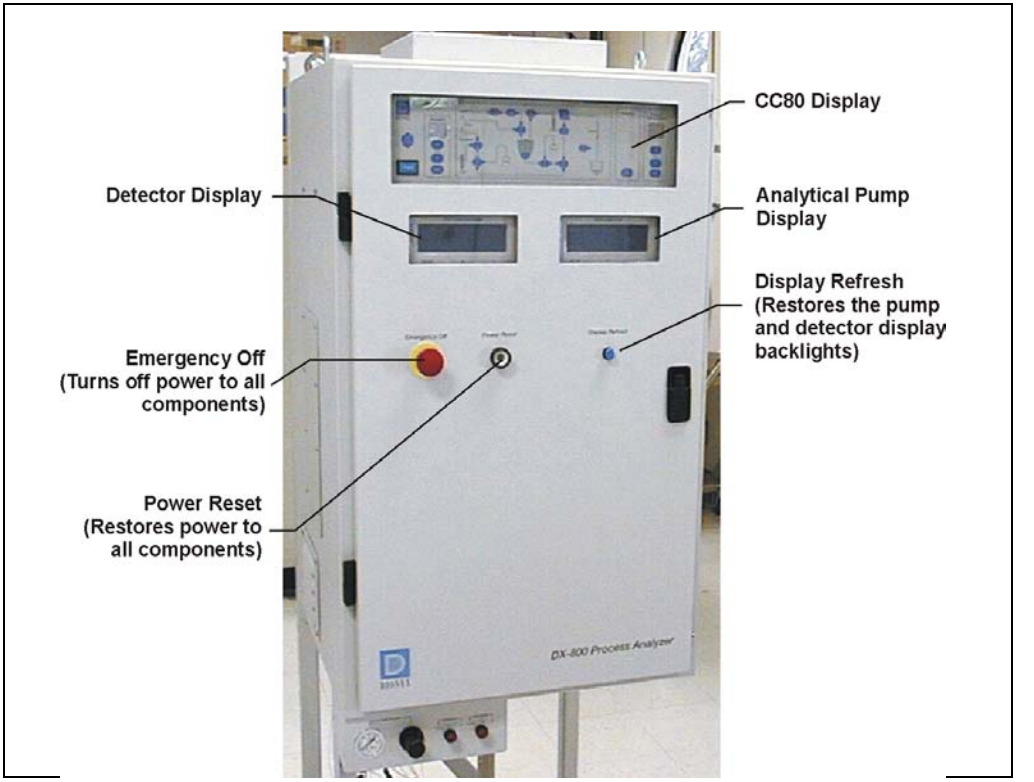


Figure 2-1. AE80 Enclosure Door

- Push the **Power Reset** button to start up the DX-800 system when the power is turned on initially, or to restore power after an emergency shutdown. As long as the power is on and the system is ready to operate, the **Power Reset** lamp remains illuminated continuously.
- The blue **Display Refresh** button controls the LCD backlights on the analytical pump and the detector. The backlight automatically turns off after 2 hours if no front panel buttons have been pushed. To turn on the backlight again, press **Display Refresh**.
- To open the enclosure door, lift up on the door handle and turn it one-quarter turn to the left. To close the door, turn the handle to the right and push in.

SHOCK HAZARD—A shock hazard exists inside the enclosure when the door is opened.

Various types of chemicals are used in the DX-800, depending on the application that is being performed. Follow all appropriate hazardous materials and safety guidelines for chemicals when operating the DX-800.

DANGER D'ÉLECTROCUTION—Un danger d'électrocution existe dans l'enceinte lorsque la porte est ouverte.

Différents types de produits chimiques sont utilisés dans le DX-800, selon l'application à effectuer. Respectez toutes les directives de sécurité sur les matières dangereuses pour les produits chimiques lors de l'utilisation du DX-800.

STROMSCHLAGGEFAHR—Bei geöffneter Tür besteht im Gehäuseinnern Gefahr durch elektrischen Schlag.

Je nach Anwendung, die gerade läuft, werden im DX-800 verschiedenartige Chemikalien verwendet. Beachten Sie beim Betrieb des DX-800 alle entsprechenden Sicherheitsrichtlinien bezüglich gefährlicher Stoffe für die verwendeten Chemikalien.

2.2 Electrical System

Electrical connections are made to an electrical I/O panel on top of the AE80 enclosure (see Figure 2-2).

- The **POWER IN** connector provides a connection to the main power. Connect the power cord (provided in the DX-800 installation kit) from this connector to a grounded, single-phase power source.

  The power cord is configured with a NEMA L5-20P plug (125 Vac/20 A twist-lock) for connection to facility power terminated as a NEMA L5-20R wall receptacle. Other wall plugs or hard-wired connections may be used, provided that arrangements are made with the Dionex representative prior to installation.

SHOCK HAZARD—If a grounded receptacle is not used, a shock hazard may result. Do not operate or connect to AC power mains without earthed ground connections.

The power cord is used as the main disconnect device. Make sure the outlet is located near the enclosure and is easily accessible.

DANGER D'ÉLECTROCUTION—Pour éviter toute électrocution, il faut utiliser une prise de courant avec prise de terre. Ne l'utilisez pas et ne le branchez pas au secteur C.A. sans utiliser de branchement mis à la terre.

Le cordon d'alimentation principal est utilisé comme dispositif principal de débranchement. Veillez à ce que la prise de base soit située/installée près du DX-800 et facilement accessible.

STROMSCHLAGGEFAHR—Zur Vermeidung von elektrischen Schlägen ist eine geerdete Steckdose zu verwenden. Das Gerät darf nicht ohne Erdung betrieben bzw. an Wechselstrom angeschlossen werden.

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

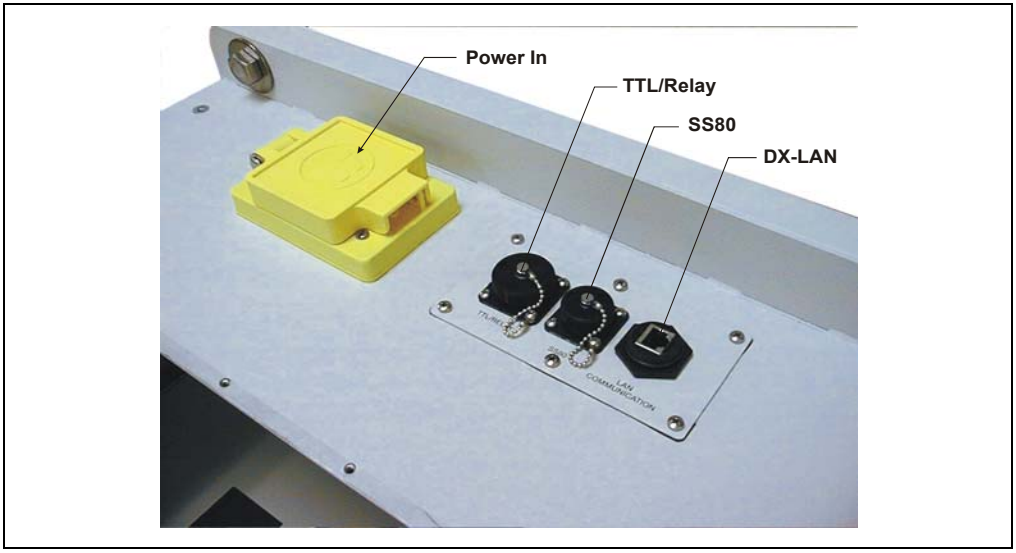


Figure 2-2. Top View of AE80 Enclosure Electrical I/O Panel

- The **TTL/RELAY** input and output connector provides a passage for TTL and relay cables connected to the CC80 rear panel.
- The **SS80** provides a connection from the analyzer to an SS80 Sample Selector. Connect a 9-pin shielded cable (P/N 050363) from here to the connector on the side of the SS80.
- The **DX-LAN** RJ-45 (10BASE-T) connector provides a connection to the computer running Chromeleon-PA or PeakNet-PA.

NOTE An electrical panel with BNC DX-LAN connectors is available, if necessary. Contact Dionex for more information about this option.

2.3 Fluid and Pneumatic Systems

2.3.1 External Features

All liquid and gas lines are connected to the plumbing interface panel on the bottom of the AE80 enclosure, behind the LM80 control panel (see Figure 1-2).

2.3.2 Internal Features

A drip tray in the bottom of the AE80 enclosure traps liquid spills and leaks. Trapped liquid normally exits the enclosure via a drain tube in the drip tray.

A sensor in the drip tray reports the presence of liquid to the CC80 electronics and to either Chromeleon or PeakNet-PA. When a leak is reported, the **Analyzer Leak** LED on the CC80 front panel begins flashing. To prevent overflows, always respond promptly to leak alarms.

2.4 Environmental Controls

Each channel is equipped with a ventilation blower, a conductive cooler, or an air conditioner, depending on the ambient temperature of the installation site.

- A blower is installed when the ambient temperature range is 4 to 40 ºC (40 to 105 ºF).
- An optional air conditioner will allow operation, as a sealed enclosure, in ambient temperatures up to 55 ºC (130 ºF).

Ventilation Blower

The blower dissipates heat by drawing in air through a grill and filter, routing it to the top of the AE80 enclosure, and expelling it through a vent in the top of the enclosure. The blower operates continuously while the enclosure power is on.

Two air filters (one on each side, near the bottom of the enclosure) prevent the blower from pulling dirt and dust into the enclosure. Clean the filters with warm water whenever a fine layer of dust or lint is visible on the surface. Establish a cleaning schedule to meet this requirement, taking local air quality into account.

Air Conditioner (Optional)

The air conditioner is installed on the side of the enclosure. The air conditioner cools to below ambient and keeps the enclosure isolated in order to prevent internal components from coming in contact with damaging airborne materials. Periodically remove the filter from the bottom of the air conditioner and clean it.

IMPORTANT **The air conditioner cannot be installed if the purge-and-pressurization unit is installed. The air conditioner is not corrosion-resistant.**

Purge-and-Pressurization Unit (Optional)

When the installation site is a Class 1, Division 2 location requiring intrinsically safe equipment, a purge-and-pressurization unit is installed on top of the AE80 enclosure.

The purge-and-pressurization unit maintains a positive pressure inside the enclosure. The over-pressure relief valve and orifice are located on the side of the unit. A visual fault indicator is supplied with the unit.

IMPORTANT **This configuration does not include electrical interlocks. The user is responsible for ensuring that all supplemental safety requirements are met.**

3 • CC80 Component Controller

3.1 Overview

The CC80 Component Controller (CC80) is installed at the top of the AE80 enclosure. The CC80 provides control and status for the following components:

- Valves and pumps on the SP80 Sample Preparation panel and LC80 Liquid Chromatography panel
- SS80 Sample Selector valves (optional)
- CH-4 Column Heater (optional)
- PC80 Post-Column Reagent Pump (optional)

The center of the CC80 front panel is an interactive flow chart that represents the system components. Besides providing a convenient overview of the plumbing configuration, the flow chart buttons and indicator lights serve these purposes:

- Display the real-time state, or operating position, of valves and pumps. An indicator light beside each button indicates the status.
- Enable direct control of any component on the SP80 and LC80 panels, or the SS80 valves.
- Initiate a drain sequence for the dilution vessel if a method is ended or aborted before the dilution vessel is emptied.

Finally, certain alarm conditions are reported to the CC80. Four hardware alarm conditions are preassigned; you can define four additional alarms in the Analyzer program or in PeakNet-PA (see Section 12.1). When an alarm condition occurs, the corresponding annunciator on the CC80 front panel begins flashing.

The CC80 Moduleware version number is displayed for 4 seconds at power-up. To check the Moduleware version at another time:

- Right-click the device name in the Chromeleon Server Configuration program and select **Properties** on the context menu.
- Open the Configuration Editor in PeakNet-PA and click the Moduleware button on the toolbar.

3.2 Operating Features

3.2.1 Front Panels

There are four versions of the CC80 front panel—one for each of the four SP80 Sample Preparation configurations:

- CC81/SP81 for concentration or direct injection
- CC82/SP82 for dilution or direct injection
- CC83/SP83 for dilution with reagent addition
- CC84/SP84 for concentration with reagent addition

Figure 3-1 illustrates the CC81/SP81 front panel for concentration or direct injection. For illustrations of the other front panels, see Chapter 4.

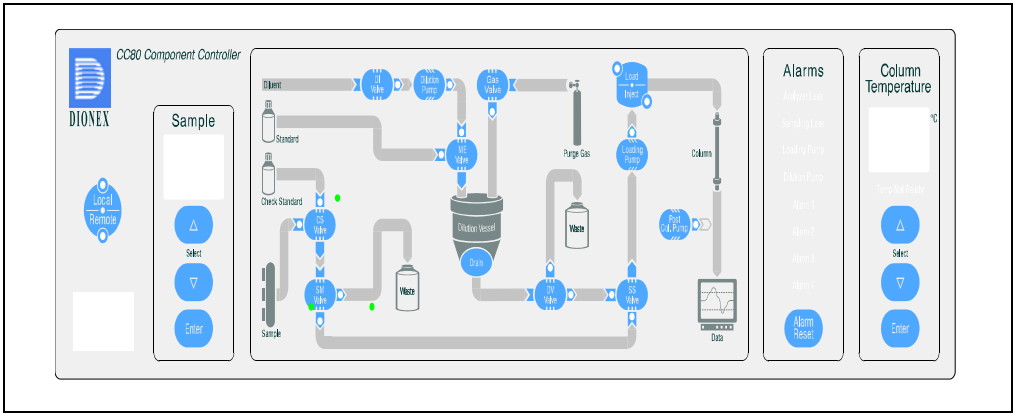


Figure 3-1. CC80/SP81 Front Panel (for Concentration or Direct Injection)

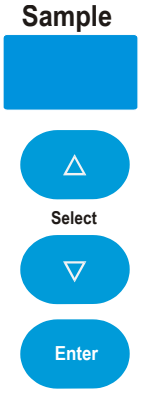
Button	Function
	Toggles between Local and Remote control modes; the light indicates the selected mode. • In Local mode, components displayed in the flow chart are controlled from the CC80 front panel. The CC80 is in Local mode when the power is turned on. • In Remote mode, components displayed in the flow chart are controlled from Chromeleon-PA or PeakNet-PA.
	On/off control of the CC80 and components controlled by the CC80.
	*These buttons are functional only when the optional SS80 Sample Selector is installed.* Selects SS80 valve positions that correspond to specific samples. If no SS80 is installed, only one sample is being supplied to the analyzer. Press a **Select** button to increase (or decrease) the sample number. (Numbers blink while an entry is in progress.) The selected sample number is displayed above the **Select** buttons; to confirm the selected number, press **Enter**. When a sample select valve is switching positions, two of the LED segments rotate in a clockwise direction. If no button in this section is pressed, the display reverts to the currently selected sample number.
FLOW CHART	The buttons in the flow chart vary, depending on the SP80 configuration. For descriptions of all four versions of the flow chart, see Chapter 4.

Table 3-1. CC80 Front Panel Button Functions

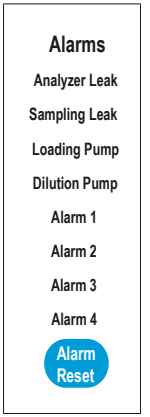
Button	Function
	*If no alarm condition exists, annunciator lights in this section are not illuminated.* When a problem is detected, an annunciator that identifies the source of the problem begins flashing. Press **Alarm Reset** to turn off the annunciator. If the problem has not been fixed, the annunciator will start flashing again. The preassigned **Analyzer Leak** and **Sampling Leak** annunciators indicate leaks in the AE80 enclosure and the optional SS80 Sample Selector, respectively. The preassigned **Loading Pump** and **Dilution Pump** annunciators indicate pump failure due to cavitation or starvation of the pump. To assign activation of Alarms 1-4 in the software, see Section 12.1. For instructions on how to have a warning tone sound when an alarm condition is detected, see Section 3.2.3.
	Sets the temperature of the column heater (optional) from ambient + 5 ºC to 80 ºC ± 1 ºC. Press a **Select** button to increase or decrease the temperature by one degree. (Numbers blink while an entry is in progress.) The selected temperature is displayed in ºC above the **Select** buttons. To confirm the selected temperature, press **Enter**. If the column heater has not reached the selected temperature, **Temp Not Ready** flashes.

Table 3-1. CC80 Front Panel Button Functions (Continued)

3.2.2 Rear and Side Panels

- Five AC outlets provide connections to the analytical pump, detector, and column heater, plus either the fan, cooler, or air conditioner.
- The main power receptacle provides a connection to **POWER IN**, the main power inlet on top of the AE80 enclosure (see Figure 2-2).
- Electrical cables (including the DX-LAN and TTL/Relay cables) exit the CC80 via openings in the rear panel. The cables are connected to the top of the AE80 enclosure (see Figure 2-2).
- A 2-pole, 20 amp circuit breaker is installed on the left side panel of the CC80. If the breaker is tripped, reset it by flipping up the switch.

3.2.3 DIP Switches

The CC80 contains two sets of DIP switches. The CC80 reads the state of the DIP switches each time the power is turned on. The switches are typically set at the factory. However, if an option is installed in the field, the appropriate DIP switch must be reset.

DIP switch #1 records the following information:

- The number of valves in the SS80
- The configuration of the SP80
- The options that are installed in the DX-800

DIP switch #2 controls the following functions:

- Enabling or disabling an audible tone when an alarm condition is reported to the CC80
- Enabling or disabling the metering (ME) valve functions
- Setting the TTL input signal mode and relay output mode (see Section 12.4)

Follow this procedure to reset the DIP switches:

1. Press **Emergency Off** on the front door of the AE80 enclosure to turn off the main power. Disconnect the power cord.

SHOCK HAZARD—Disconnect the power cord before raising the top cover of the CC80.

DANGER D'ÉLECTROCUTION—Débranchez le cordon d'alimentation électrique avant de soulever le couvercle du CC80.

STROMSCHLAGGEFAHR—Ziehen Sie den Netzstecker, bevor Sie den Deckel des CC80 öffnen.

2. Open the front door of the AE80 enclosure. Loosen the two retaining screws in the module chassis. Pull out the chassis just until the first stop on the sliders is engaged.

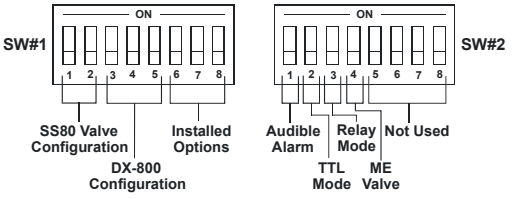
Do not pull the module chassis beyond the slider stops. The chassis may become disengaged from the enclosure.

Ne tirez pas le châssis au-delà des butées du mécanisme coulissant. Le châssis peu se détacher de l'enceinte.

Ziehen Sie die Montageplatte nicht über die Arretierungen hinaus. Sie könnte sich sonst vom Gehäuse lösen.

3. Loosen, but do not remove, the four screws securing the CC80 top cover in place.
4. Raise the top cover and slide it back to expose the DIP switches on the back of the front panel display board.
5. Check Figure 3-2, and then set the switches as required. The switches are numbered 1 through 8. The ***off*** position (logic-false) is down; the ***on*** position (logic-true) is up.

6. Replace the CC80 top cover. Push the module chassis back into the enclosure and tighten the retaining screws.
7. Close the enclosure door.
8. Plug in the power cord. Press **Power Reset** on the front door of the AE80 to turn on the power.



SWITCH 1 (SW #1)			
1	2		
OFF	OFF		NO SS80
ON	OFF		7 SAMPLES
OFF	ON		14 SAMPLES
ON	ON		21 SAMPLES
3	4	5	
OFF	OFF	ON	81/CONCENTRATION
ON	OFF	OFF	82/DILUTION
ON	ON	OFF	83/DILUTION W/REAGENT
ON	ON	ON	84/CONC W/REAGENT
6 ON=ENABLE			COLUMN HEATER
7 ON=ENABLE			POST-COLUMN PUMP
8 ON=ENABLE			COLUMN SWITCHING VALVE
SWITCH 2 (SW#2)			
1 ON=ENABLE			AUDIBLE ALARMS
2	ON		TTL 1-8 POSITIVE EDGE (DEFAULT)
	OFF		TTL 1-4 NEGATIVE EDGE TTL 5-8 NEGATIVE PULSE
3 ON=ENABLE			INVERT RELAY CNTL
4 ON=ENABLE			DISABLE ME VALVE

Figure 3-2. CC80 DIP Switch Settings

3.3 Operating Modes

The CC80 has two operating modes:

- In Local mode, operation is controlled from the CC80 front panel.
- In Remote mode, operation is controlled from the software.

The LED on the CC80 **Local/Remote** button indicates the selected mode.

3.3.1 Local Mode

When the CC80 power is turned on, it is in Local mode. In Local mode, the CC80 accepts operating commands from the front panel buttons. This allows direct control of individual valves and pumps, which is useful when performing troubleshooting and service procedures.

When the CC80 is in Remote mode, press **Local/Remote** on the CC80 front panel to return to Local mode. If a PGM File (Chromeleon-PA) or Method (PeakNet-PA) is running at the time, the CC80 will automatically abort it.

3.3.2 Remote Mode with Chromeleon-PA

If the CC80 is configured in a timebase, the module is automatically switched to Remote mode when the Chromeleon Server starts. In Remote mode, Chromeleon is responsible for downloading PGM File commands and controlling the start of their execution. Chromeleon sends operating commands from the computer to the CC80 via the DX-LAN interface.

In Remote mode, all operating changes from the CC80 front panel are disabled. This prevents users from inadvertently altering operation of the system. To place the CC80 in Local mode, clear the **Connect** check box on the CC80 control panel in Chromeleon. To return to Remote mode, select the **Connect** check box.

NOTE Do not attempt to return the CC80 to Remote mode by pressing the Local/Remote button on the front panel; this will cause a communication failure and Chromeleon will abort operation.

3.3.3 Remote Mode with PeakNet-PA

In Remote mode, PeakNet-PA sends operating commands from the computer to the CC80 via the DX-LAN interface. The CC80 is automatically switched to Remote mode when a Schedule is downloaded from PeakNet-PA or when a Method is downloaded as a result of running a manual sample.

In Remote mode, sample preparation and chromatography Methods are executed. The CC80 performs the sample preparation Method, and sends a run command to the analytical pump and the detector. PeakNet-PA is responsible for downloading Methods and controlling the start of Method execution. To run a single Method, run a manual sample from the Analyze program.

3.3.4 TTL Inputs

The eight TTL input connectors on the CC80 rear panel allow input signals from external devices. For example, a signal from a liquid sensor on a sample pipe can be used to communicate to the analyzer that the source should not be sampled because the pipe is dry. If you would like to have a visible indication that an alarm state exists on an external device, assign one of the user-definable alarms on the CC80 front panel to the TTL input.

TTL labels and functions are configured in the Analyzer program (Chromeleon-PA) or the Analyze program (PeakNet-PA). Four inputs are active low edge and four inputs are active low level. For proper switching, the active low edge or level should be less than 0.8 V. (High is greater than 3.0 V; low is less than 0.8 V.)

Cable connections can be made to the **TTL** connector on top of the AE80 enclosure.

3.3.5 Relay Outputs

There are two Relay outputs on the CC80 rear panel. The outputs are rated 120 V at 100 mA.

When running Chromeleon-PA, configure the Relay labels in the Server Configuration program (in the CC80 Properties dialog box). The Relay outputs can be controlled from the CC80 control panel or a PGM File.

When running PeakNet-PA, configure the Relay labels and functions in the Analyze program; they can be controlled from the Method.

3.4 Power-Up Diagnostics

Each time the CC80 power is turned on or is reset (for example, when a new Moduleware version is downloaded), this sequence of events occurs:

- All CC80 front panel LEDs are illuminated for 2 seconds.
- The BIOS version number is displayed for 4 seconds, with the integer in the **Sample** section and the decimal fraction in the **Column Temperature** section.
- The Moduleware version number is displayed for 4 seconds, with the integer in the **Sample** section and the decimal fraction in the **Column Temperature** section.
- The CC80 automatically begins running a series of diagnostic tests (see the table below).

If the CC80 fails a diagnostic test, contact Dionex. In the U.S., call Dionex Technical Support at 1-800-346-6390. Outside the U.S., call the nearest Dionex office.

Diagnostic Test	Purpose
CPU Test	Tests the CPU's internal configuration and checksum.
Load/Inject Valve Test	Verifies that the valve can be set to the load and inject positions.
Metering Valve Test	Verifies that the valve can be set to both operating positions. (If the ME valve functions are disabled (see Section 3.2.3), this test will not run.)
LED Test	Turns on all LEDs and 7-segment display segments for 2 seconds.

4 • SP80 Sample Preparation Panel

4.1 Overview

The SP80 Sample Preparation panel is equipped with the pump(s), valves, dilution vessel, and interconnecting tubing required for one of these four configurations:

- Concentration or direct injection (SP81)
- Dilution or direct injection (SP82)
- Dilution with reagent addition (SP83)
- Concentration with reagent addition (SP84)

While the DX-800 can automatically prepare and analyze calibration standards in all four configurations, the distinguishing feature of each configuration is the type of sample preparation performed. For a summary of the components required for each configuration, see Section 4.2 through Section 4.5.

The SP80 panel is located in the AE80 enclosure, below the analytical pump and the detector (see Figure 1-1). Components are located on both the front and rear of the swing-out panel. To access the rear, loosen the thumbscrew on the right side of the panel and swing it open.

4.2 Configuration: SP81 for Concentration or Direct Injection

This configuration is used for trace ion analysis or direct injection, in which the sample is either pre-concentrated on a concentrator column or pumped to the sample loop before the chromatographic analysis.

All materials in the flow paths are of the highest purity and permit trace ion analysis even at the low part-per-trillion (ppt) level.

Figure 4-1 shows the CC80 front panel flow chart for the concentration or direct injection configuration.

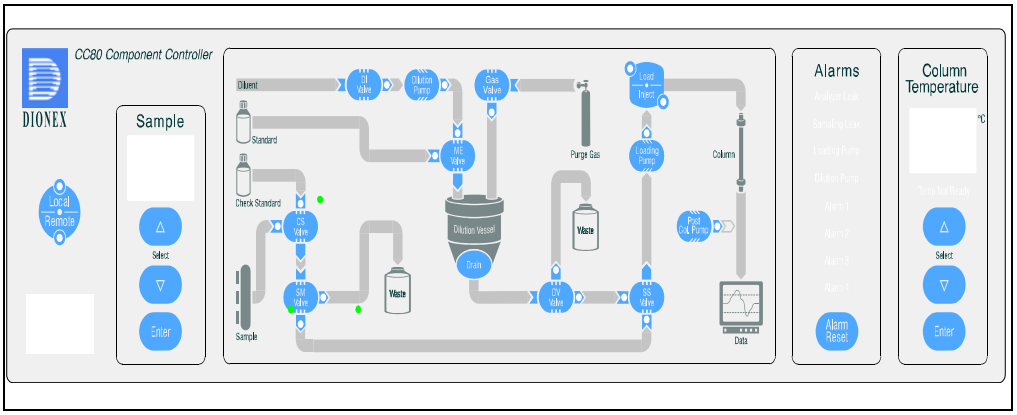


Figure 4-1. CC81 Front Panel: SP81 for Concentration or Direct Injection

Components for Concentration or Direct Injection		
Component	**Description**	**Valve Position and/or Function***
Check Standard (CS) Valve	3-way solenoid valve	Selects sample (0) or check standard (1).
Sample (SM) Valve	3-way solenoid valve	Directs sample or check standard to waste (0) or to SS valve and loading pump for analysis (1).
Sample/Standard (SS) Valve	3-way solenoid valve	Selects sample (0) or calibration standard (1).
Dilution Vessel (DV) Valve	3-way solenoid valve	Purges dilution vessel to waste (0) or directs calibration standard to SS valve (1).
Diluent (DI) Valve	2-way solenoid valve	Provides on/off control of diluent (typically DI water) to dilution pump.
Metering (ME) Valve	Rheodyne 10-port valve	Measures stock standard for delivery to dilution vessel (for preparation of calibration standard).
Gas Valve	3-way solenoid valve	Vents (0) or pressurizes (1) dilution vessel.
Dilution Pump	Precision displacement pump	Delivers diluent to dilution vessel.
Loading Pump	Precision displacement pump	Loads samples or standards on concentrator column.
Regulator/Valve Manifold (on rear of SP80)	4-way air valve manifold	Regulates air flow to dilution and loading pumps.
Regulator/Valve Manifold (on rear of SP80)	3-way gas valve manifold	Regulates flow of high purity gas (typically helium) to dilution vessel.

* When the valve is not energized (i.e., it is off), port 0 (the default) is normally open and port 1 is normally closed. Conversely, port 1 opens when the valve is turned on.

4.3 Configuration: SP82 for Dilution or Direct Injection

This configuration is used for applications in which the samples are injected directly into the chromatographic system or for applications in which the samples must be diluted prior to chromatographic analysis. Dilution factors up to 1/25,000 can be achieved. A system/channel configured for dilution is often used when assaying process samples for major constituents.

Figure 4-2 shows the CC80 front panel flow chart for the dilution or direct injection configuration.

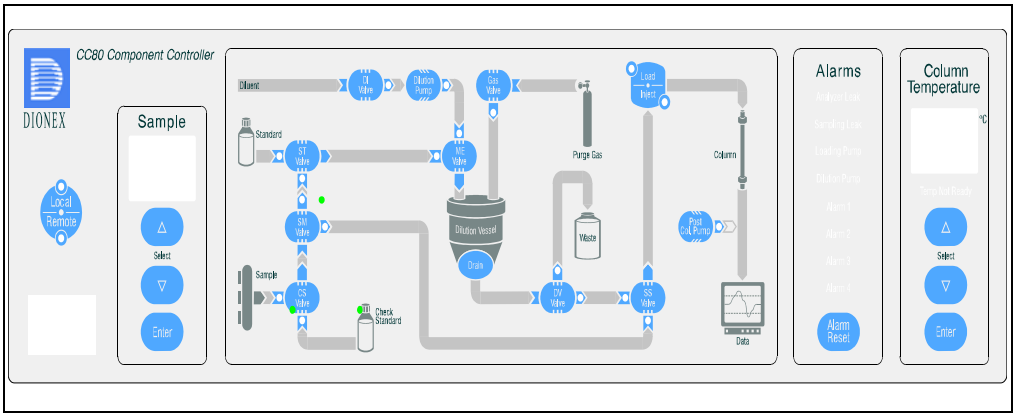


Figure 4-2. CC82 Front Panel: SP82 for Dilution or Direct Injection

Components for Dilution or Direct Injection		
Component	**Description**	**Valve Position and/or Function***
Check Standard (CS) Valve	3-way solenoid valve	Selects sample (0) or check standard (1).
Sample (SM) Valve	3-way solenoid valve	Directs sample to SS valve (0) or to ST valve (1).
Standard (ST) Valve	3-way solenoid valve	Selects stock standard for calibration standard preparation (0) or sample for dilution (1).
Sample/Standard (SS) Valve	3-way solenoid valve	Selects undiluted sample (0) or diluted sample (1).
Dilution Vessel (DV) Valve	3-way solenoid valve	Purges dilution vessel to waste (0) or directs diluted sample/standard to SS valve (1).
Diluent (DI) Valve	2-way solenoid valve	Provides on/off control of diluent (typically DI water) to dilution pump.
Metering (ME) Valve	Rheodyne 10-port valve	Measures sample or standard for delivery to dilution vessel.
Gas Valve	3-way solenoid valve	Vents (0) or pressurizes (1) dilution vessel.
Dilution Pump	Precision displacement pump	Delivers diluent to dilution vessel.
Regulator/Valve Manifold (on rear of SP80)	4-way air valve manifold	Regulates air flow to dilution and loading pumps.
Regulator/Valve Manifold (on rear of SP80)	3-way gas valve manifold	Regulates flow of high purity gas (typically helium) to dilution vessel.

* When the valve is not energized (i.e., it is off), port 0 (the default) is normally open and port 1 is normally closed. Conversely, port 1 opens when the valve is turned on.

4.4 Configuration: SP83 for Dilution with Reagent Addition

This configuration is used when the samples require dilution and reagent addition prior to chromatographic analysis.

Figure 4-3 shows the CC80 front panel flow chart for the dilution with reagent addition configuration.

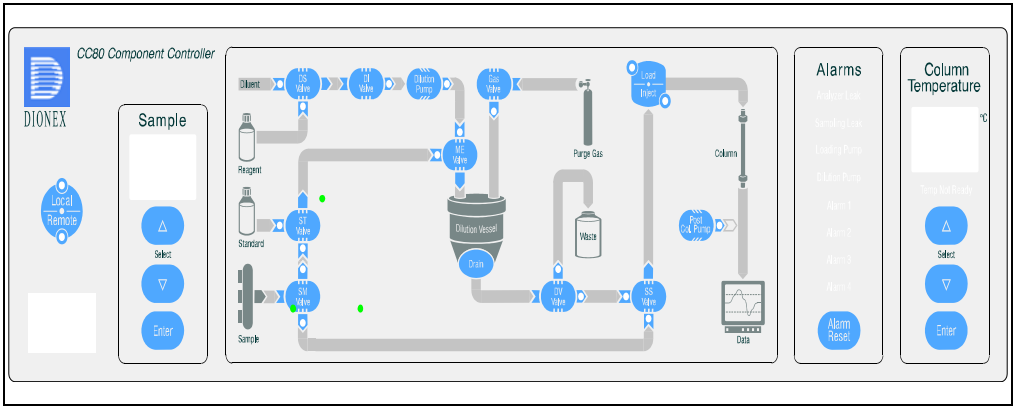


Figure 4-3. CC83 Front Panel: SP83 for Dilution with Reagent Addition

Components for Dilution with Reagent Addition		
Component	**Description**	**Valve Position and/or Function***
Sample (SM) Valve	3-way solenoid valve	Directs sample to ST valve (0) or to SS valve (1).
Standard (ST) Valve	3-way solenoid valve	Selects sample (0) or stock standard (1) for dilution.
Sample/Standard (SS) Valve	3-way solenoid valve	Selects undiluted sample (0) or diluted sample (1).
Dilution Vessel (DV) Valve	3-way solenoid valve	Purges dilution vessel to waste (0) or directs diluted sample/standard to SS valve (1).
Diluent Select (DS) Valve	3-way solenoid valve	Selects diluent (0) or reagent (1).
Diluent (DI) Valve	2-way solenoid valve	Provides on/off control of diluent (typically DI water) to dilution pump.
Metering (ME) Valve	Rheodyne 10-port valve	Measures sample or standard for delivery to dilution vessel.
Gas Valve	3-way gas/liquid solenoid valve	Vents (0) or pressurizes (1) dilution vessel.
Dilution Pump	Precision displacement pump	Delivers diluent to dilution vessel.
Regulator/Valve Manifold (on rear of SP80)	4-way air valve manifold	Regulates air flow to dilution and loading pumps.
Regulator/Valve Manifold (on rear of SP80)	3-way gas valve manifold	Regulates flow of high purity gas (typically helium) to dilution vessel.

* When the valve is not energized (i.e., it is off), port 0 (the default) is normally open and port 1 is normally closed. Conversely, port 1 opens when the valve is turned on.

4.5 Configuration: SP84 for Concentration with Reagent Addition

In addition to performing concentration (see Section 4.2), this configuration is used to add reagent to samples prior to analysis. A typical application is the acidification of samples prior to chromatographic analysis for trace transition metals.

Figure 4-4 shows the CC80 front panel flow chart for the concentration with reagent addition configuration.

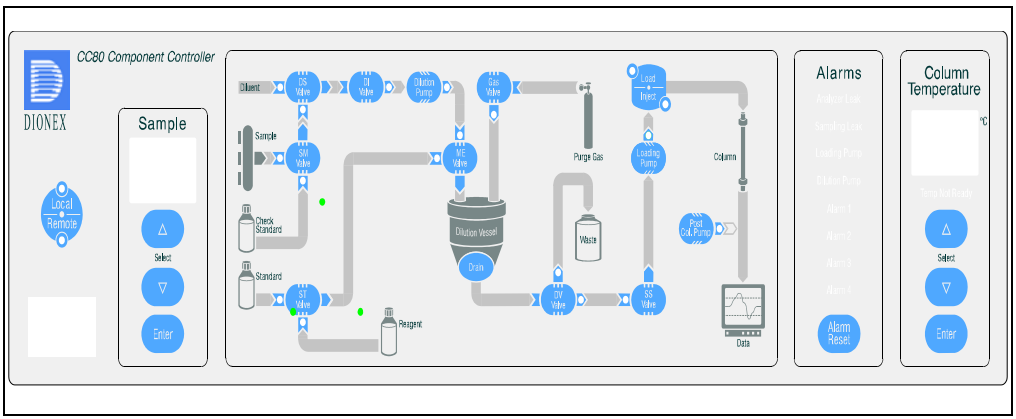


Figure 4-4. CC84 Front Panel: SP84 for Concentration with Reagent Addition

Components for Concentration with Reagent Addition		
Component	**Description**	**Valve Position and/or Function***
Sample (SM) Valve	3-way solenoid valve	Directs sample (0) or check standard (1) to DS valve.
Diluent Select (DS) Valve	3-way solenoid valve	Selects diluent (0) or sample/check standard (1).
Diluent (DI) Valve	2-way solenoid valve	Provides on/off control of diluent (typically DI water) to dilution pump.
Standard (ST) Valve (on rear of SP80)	3-way solenoid valve	Selects reagent (0) or stock standard (1).
Metering (ME) Valve	Rheodyne 10-port valve	Measures stock standard or reagent for delivery to dilution vessel.
Gas Valve (on rear of SP80)	3-way solenoid valve	Vents (0) or pressurizes (1) dilution vessel.
Sample/Standard (SS) Valve	3-way solenoid valve	Selects no flow (0) or selects sample or standard from dilution vessel (1).
Dilution Vessel (DV) Valve	3-way solenoid valve	Purges dilution vessel to waste (0) or directs prepared sample or standard to SS valve (1).
Dilution Pump	Precision displacement pump	Delivers diluent to dilution vessel.
Loading Pump	Precision displacement pump	Loads samples or calibration standards on concentrator column.
Regulator/Valve Manifold (on rear of SP80)	4-way air valve manifold	Regulates air flow to dilution and loading pumps.
Regulator/Valve Manifold (on rear of SP80)	3-way gas valve manifold	Regulates flow of high purity gas (typically helium) to dilution vessel

* When the valve is not energized (i.e., it is off), port 0 (the default) is normally open and port 1 is normally closed. Conversely, port 1 opens when the valve is turned on.

4.6 Precision Displacement Pumps

Depending on the configuration, the SP80 may contain either one or two precision displacement pumps:

- The loading pump is required for loading sample onto a concentrator column. The loading pump is present in two SP80 configurations: concentration or direct injection (SP81) and concentration with reagent addition (SP84). The loading pump is not configured with the panels when only a sample loop is connected to the load/inject (LI) valve.
- The dilution pump is required for pumping diluent (typically deionized water) through the metering (ME) valve to the dilution vessel.

A precision displacement pump is an air-driven, volume displacement pump. Each pump is controlled by two three-way air valves on the rear of the SP80 panel. Air pressure at 275 kPa (40 psi) is applied to two chambers on either end of a cylindrical block. When the air pressure is sufficient to overcome the liquid pressure on the other side of the piston, the piston pulls or pushes liquid through the pump head.

Two check valves control the direction of liquid flow. With each pump stroke, the piston draws liquid into the pump. When the piston reaches maximum travel, the valve states are reversed, so that the piston moves back and pushes out the liquid. When the piston reaches maximum travel in the other direction, the pump is ready to perform the next stroke. A small rod on the piston trips optical sensors on the pump controller board when the piston has reached maximum travel in either direction.

With a fixed driving air pressure, the liquid flow rate will decrease with increasing backpressure. This is advantageous, given that the desired flow rate is 10 to 15 mL/min for the sample dilution pump and less than 3 mL/min for the sample loading pump.

The loading pump and the dilution pump can be calibrated in the software.

- In Chromeleon, open the DX-800 Wellness Panel and follow the step-by-step calibration instructions.
- In PeakNet-PA, the Configuration Editor includes calibration Methods for the pumps. To begin, select **Calibration Wizard** on the **Configure** menu and follow the step-by-step calibration instructions.

4.7 Dilution Vessel

The 250 mL dilution vessel is used to prepare calibration standards and to dilute samples (in the dilution configuration). A PFA (perfluoroalkoxy) Teflon™ dilution vessel is configured with the SP84 panel (concentration with reagent addition). The other three configurations use a dilution vessel made of high purity polyethylene.

Pressurize the dilution vessel with high purity nitrogen or helium (filtered, dry, and oil-free) regulated to 170 to 240 kPa (25 to 35 psi). A pressure relief valve on the rear of the SP80 is designed to open if this reaches 340 kPa (50 psi).

4.8 PC80 Post-Column Reagent Pump (Optional)

The PC80 Post-Column Reagent Pump Kit is available in two versions: 115 V (P/N 050305) and 230 V (P/N 050307). Each kit includes the following items:

- Dionex Reagent Pump (RP-1)
- Pulse damper
- Knitted reaction coil

Post-column components are installed in the area behind the SP80 Sample Preparation panel. In Local mode, the PC80 pump is turned on from the CC80 front panel. In Remote mode, the pump is turned on from a control panel or a command in the CC80 PGM File (Chromeleon-PA) or Method (PeakNet-PA).

If the analytical pump encounters a pressure limit alarm and shuts off, the pump power is automatically turned off, also.

Post-Column Reagents

The LM80 Liquids Manager holds two plastic bottles for standards or reagents. Two-liter plastic bottles (P/N 044129) are shipped with the LM80; 1-liter bottles (P/N 044128) are available.

When preparing post-column reagents, use only ASTM Type II (18.0 megohm/cm resistance or 1 μS) deionized water and reagents of adequate purity. Improperly prepared reagent is a common cause of baseline drift, high background, and column contamination.

5 • LC80 Liquid Chromatography Panel

5.1 Overview

The LC80 Liquid Chromatography panel is equipped with the chromatography components: the load/inject (LI) valve, the columns, and (for conductivity detection) the suppressor and conductivity cell. For systems/channels using UV/Vis absorbance detection, the absorbance detector cell is inside the detector. Optional chromatography components, such as the CH-4 column heater or EluGen cartridge, are also mounted on the LC80.

The LC80 panel is located on the inside of the enclosure door. The panel is hinged to permit easy access to the distribution board on the rear of the panel for servicing. Electrical connections for the LC80 components are made to the distribution board.

5.2 Chromatography Components

Chromatography hardware components, such as the load/inject (LI) valve and the conductivity cell, are installed on the LC80 panel at the factory. Chromatography consumables, including columns and suppressors, are installed at the customer site during the analyzer installation and setup.

The numerous mounting holes and slots on the LC80 panel maximize the installation options. Figure 5-1 illustrates one example component layout; many other component configurations are possible.

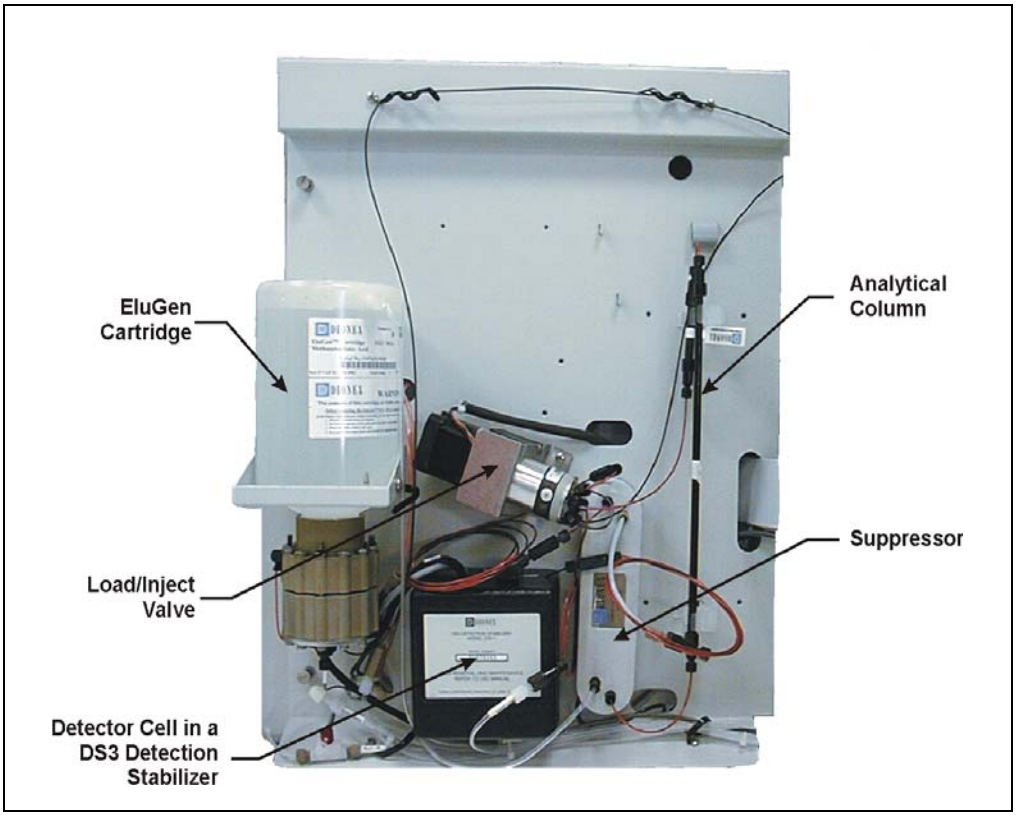


Figure 5-1. Example LC80 Component Layout

5.2.1 Load/Inject (LI) Valve

The load/inject valve is a six-port, two-position, electrically-actuated Rheodyne valve. The valve can be configured with either a sample loop (10 to 1000 µL) or a concentrator column.

5.2.2 Detector Cell

For applications requiring conductivity detection, the conductivity cell for the conductivity detector or electrochemical detector is housed in a DS3 Detection Stabilizer. The DS3 is mounted on the LC80 panel.

The DS3 improves baseline stability by heating the cell to a selectable set point above ambient and preventing temperature fluctuations.

5.2.3 Consumables

Guard and Analytical Columns

The LC80 has several sets of column clips for mounting the guard and analytical columns. Install the columns in the location that will minimize the total extra-column volume.

Concentrator Columns

Concentrator columns are used for trace analysis for enriching analyte concentration.

Suppressor

The suppressor is used with conductivity detection to neutralize the eluent and enhance analyte conductivity.

Use the manual regenerant shutoff valve at the bottom of the panel to turn off the flow of regenerant (typically deionized water) to the suppressor whenever the suppressor is being changed or whenever eluent flow from the analytical pump has been turned off. When the regenerant flow is stopped, the power to the suppressor must be turned off, also. For detailed operating instructions, refer to the suppressor manual.

EluGen Cartridge

If the DX-800 is configured with the optional EG40-PA Eluent Generator, an EluGen cartridge is mounted on the LC80 panel. The mounting bracket is supplied with the EG40-PA.

5.2.4 CH-4 Column Heater (Optional)

The CH-4 column heater (P/N 051890) accommodates one 6- or 8-mm OD x 100-, 150-, or 250-mm ID column. The heater operates between ambient + 5 ºC to 80 ºC and is used for temperature-sensitive chromatographic methods. Select the heater temperature from the CC80 front panel or from the software.

5.2.5 Column Switching Valve (Optional)

A 10-port, two-position, electrically-actuated rotary valve (P/N 051824) is available for use with column switching chromatography methods. The high pressure valve is controlled by an output from the analytical pump.

6 • EG40-PA Eluent Generator

6.1 Overview

The optional EG40-PA eluent generator generates high-purity acid or base eluents online, using only deionized water as the carrier. The device consists of the EG40-PA electronics components, a degas tubing assembly, and either an EGC-KOH EluGen Cartridge or an EGC-MSA EluGen Cartridge.

The DX-800 analytical pump delivers deionized water to the EluGen cartridge, which generates the eluent. The eluent exits the cartridge and flows through a degas tubing assembly that removes electrolysis gases created during eluent generation. After degassing, the eluent flows to the inject valve.

For detailed system flow information for different applications, refer to the eluent generator manual.

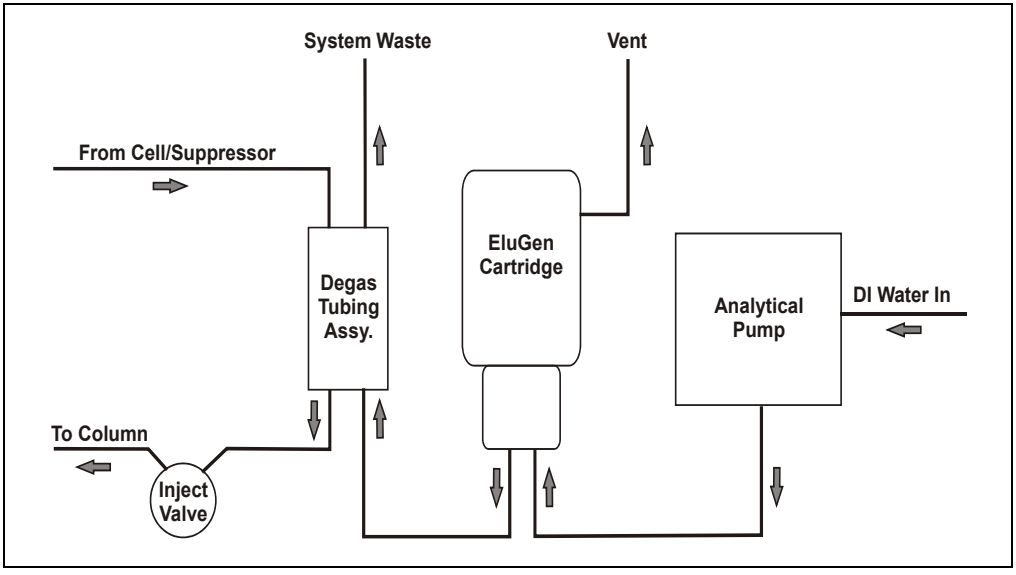


Figure 6-1. EG40-PA System Flow Diagram

6.2 Main Components

This section describes the main components of the eluent generator.

- The disposable EluGen cartridge is mounted on the LC80 Liquid Chromatography Panel (see Figure 6-2).
- A vent tube exits the side of the EluGen cartridge and is routed out the AE80 through the plumbing I/O panel. *See the caution for venting instructions on the next page.*
- A high-pressure degas tubing assembly is plumbed between the EluGen cartridge and the inject valve. The degas assembly is on the rear of the LC80 panel. A system waste line from the assembly is routed out the AE80 through the plumbing I/O panel. *See the caution for venting instructions on the next page.*

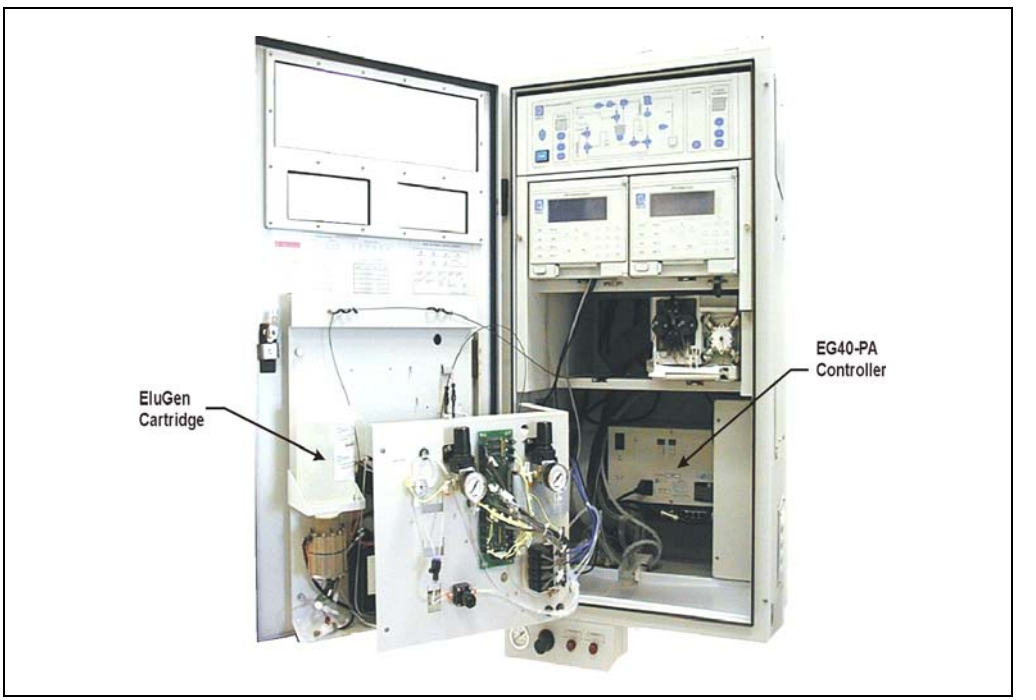


Figure 6-2. DX-800 with EG40-PA Installed

The EG40-PA generates eluent by means of electrolysis, which results in the production of small amounts of oxygen or hydrogen gas. To ensure that the gas is not trapped in a closed container and allowed to concentrate, connect a 1.3-cm (0.52-in) ID black gas separator waste tube (P/N 045460) to an uncapped waste reservoir. See the suppressor manual for installation instructions. Direct the waste line from the EG40-PA degas assembly to the waste tube. In addition, direct the clear vent tubing from the gas vent port on the EluGen cartridge to the gas separator waste tube or to any open, well-ventilated location.

Le EG40-PA produit des éluants par électrolyse, résultant en la production de petites quantités de gaz d'oxygène et d'hydrogène. Pour veiller à ce que les gaz ne soient pas emprisonnés dans un contenant fermé où ils pourraient se concentrer, installez un tube d'évacuation du séparateur de gaz noir ID (réf. 045460) de 1,3 cm (0,52 po) dans un réservoir d'évacuation ouvert (non bouché). Consultez le manuel du dispositif de suppression pour obtenir des instructions d'installation. Orientez la conduite d'évacuation de l'ensemble de dégazage de l'EG40-PA vers le tube d'évacuation. De plus, dirigez le tuyau d'aération clair de l'évent des gaz sur la cartouche EluGen vers le tube d'évacuation du séparateur de gaz ou vers n'importe quel lieu découvert et bien aéré.

Der EG40-PA erzeugt Eluenten durch Elektrolyse. Dabei entstehen kleine Mengen von Sauerstoff- und Wasserstoffgas. Verbinden Sie einen Gasabscheiderschlauch (ID = 1,3 cm) Bestell-Nr. 045460) mit einem offenen (unverschlossenen) Abgasbehälter, damit sich kein Gas in einem geschlossenen Behälter sammelt und aufkonzentriert. Hinweise zur Installation finden Sie im Suppressor-Handbuch. Führen Sie die Abgasleitung von der Entgasungseinheit des EG40-PA zum Abgasschlauch. Führen Sie außerdem den Entlüftungsschlauch vom Entlüftungsport der EluGen-Cartridge zum Abgasschlauch des Gasabscheiders oder zu einer beliebigen anderen, gut belüfteten Stelle.

- An EG40-PA controller is installed inside the AE80, at the lower rear of the enclosure (see Figure 6-2). The main power switch for the eluent generator is on the controller. The power LED is illuminated when the power is on. Refer to the eluent generator manual for details about other LEDs on the controller.
- TTL input and output connectors are present, but are not typically used with the DX-800.
- DX-LAN interface network connections are located below the controller. The DX-LAN allows communication between the eluent generator and the computer running Chromeleon-PA or PeakNet-PA.

6.2.1 Eluent Generator Control

The eluent concentration is controlled from the software:

- If you are running Chromeleon-PA, add the eluent generator to the timebase configuration. Then, add commands for controlling the eluent concentration to the PGM File.
- If you are running PeakNet-PA, add the eluent generator to the channel configuration. Then, add commands for controlling the eluent concentration to the Method.

The software monitors the EluGen cartridge use and remaining lifetime and displays a warning when it is time to replace the cartridge.

Refer to the eluent generator manual, software user's guide, or online Help for details.

7 • LM80 Liquids Manager

The LM80 Liquids Manager is located below the AE80 enclosure. The external location allows you to service eluents, standards, and reagents without opening the enclosure door and subjecting the analytical instrumentation to the environment.

Key features of the LM80 include:

- A control panel (see Section 7.1 for a description).
- One removable polypropylene holder, which accommodates two plastic bottles for standards or reagents. Two-liter bottles (P/N 044129) are shipped with the system/channel; 1-liter bottles (P/N 044128) can be ordered.

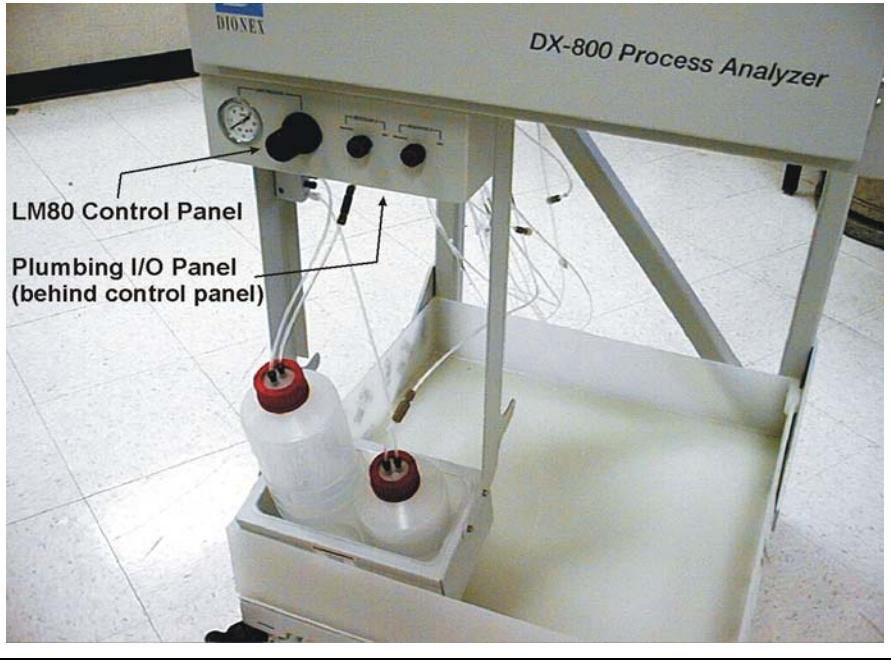


Figure 7-1. LM80 Liquids Manager

- One 20-liter aluminum NOWPAK II container (P/N 052882) with a Teflon liner for eluent, mobile phase, or solvent. A spring-loaded check valve prevents overpressurization of the NOWPAK container.

  NOTE The Teflon liner (P/N 052885) for the NOWPAK can be reused if it is refilled with the same solution. However, if contamination is suspected or if the NOWPAK cannot be pressurized, replace the liner.

  The NOWPAK sits directly below the AE80 enclosure. To contain spills, place the container in the provided drip tray. The tray material varies, depending on the liquids being used (for example, a polypropylene tray is used for ion chromatography eluents). Additional NOWPAKs may be purchased, if necessary.

- All liquid connections are made with 3-mm (1/8-in) OD PFA Teflon tubing and 10-32 ferrule fittings.
- The gas connection uses a 1/4-in pressfit fitting.

7.1 LM80 Control Panel

- The pressure gauge indicates the pressure applied to the reservoirs and the NOWPAK eluent container(s). The recommended operating pressure is 70 to 80 kPa (10 to 12 psi).
- Pressurizing gas is directed to the pressure regulator. A pressure relief valve behind the control panel is designed to open at 100 kPa (15 psi). If the valve opens during operation, turn off the pressure momentarily to allow the valve to reset itself.

The pressure relief valve prevents overpressurization of the LM80 containers, which might damage the containers and injure the user. Never operate the LM80 without the relief valve.

La soupape de détente empêche la surpression des conteneurs du LM80, surpression qui pourrait endommager les conteneurs et blesser l'utilisateur. N'utilisez jamais le LM80 sans la soupape de détente.

Das Überdruckventil verhindert einen Überdruck in den Behältern des LM80. Überdruck kann die Behälter beschädigen und zu Verletzungen des Anwenders führen. Betreiben Sie den LM80 daher niemals ohne Überdruckventil.

- The **A** and **B** controls provide on/off control of gas to the reservoirs and the NOWPAK(s). To apply pressure, turn the knob to the **GAS** position. To turn off the gas, turn the knob to the **VENT** position.

NOTE A second, identical control panel is installed for applications (such as transition metals) that require two gas supplies (one for reagents and one for standards and eluents). This prevents cross-contamination between reagents such as nitric acid and ammonium acetate buffered PAR.

7.2 Pneumatic Requirements

The reagent and standard reservoirs and NOWPAK eluent containers require a pressurized supply of nitrogen or helium regulated to between 70 and 80 kPa (10 to 12 psi). The gas purity should be appropriate for the application.

After pressurizing the reservoirs and eluent containers, wait 15 to 30 minutes and then check the LM80 pressure gauge and the supply tanks (if used); if the pressure is not between 70 and 80 kPa (10 to 12 psi), reset it. It may take several hours for the pressure to stabilize, depending on how much eluent the NOWPAK contains.

To maintain the desired pressure, install the reservoirs within 3 meters (10 feet) of the AE80 enclosure and no more than 0.5 to 1 meter (2 to 3 feet) below the bottom of the enclosure.

8 • SS80 Sample Selector

8.1 Overview

The optional SS80 Sample Selector (P/N 050332) is designed for multiple sample selection. The SS80 is a stand-alone module; this isolates the bulk of the sample flow from the analytical instrumentation. The basic SS80 contains a multiport sample valve for selection of one of seven sample sources. When a second and third valve are added, the SS80 can select one of 14 and 21 samples, respectively. Contact Dionex for information about installing additional valves in the SS80.

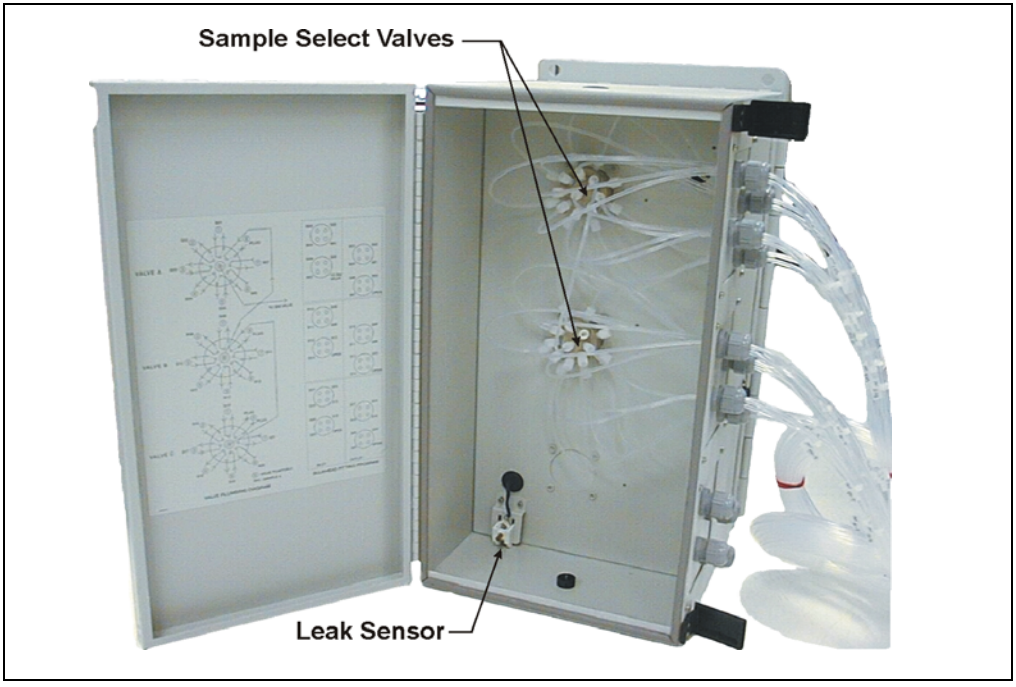


Figure 8-1. SS80 with Two Sample Valves

Sample lines enter the SS80 through the seal bushing. One sample at a time is selected for analysis. One port is selected for diversion to the analysis system(s)/channel(s). If more than one sampling valve is configured, sample streams are cascaded to the first valve before sample exits the SS80 through the common line to the system(s)/channel(s).

Samples that are not selected flow continuously out of the valve and exit the SS80. Continuously flowing samples can be directed to waste or returned to the process. The continuous flow ensures that all samples are fresh when selected and that a representative sample is delivered to the analyzer.

NOTE If continuous flow is not required, the exit ports on the sample select valve(s) can be plugged with 1/4-28 fittings, provided that the incoming sample pressure does not exceed 0.34 MPa (50 psi).

8.2 Main Components

The SS80 is mounted on the wall. To accommodate the control cable length and to minimize flush times between samples, the SS80 must be located within 8 meters (25 feet) of the DX-800. These are the main components in the SS80 enclosure:

- A mechanical compartment contains the sample select valves and the tubing connections. A leak sensor in the bottom of the mechanical compartment reports liquid leaks to the CC80. When a leak is detected, the **Sampling Leak** annunciator on the CC80 front panel begins flashing. Corrective action can be programmed in the software.
- An electronics compartment at the rear of the SS80 contains the valve motors and the distribution board.
- The SS80 main power receptacle is on the rear panel.
- A 9-pin shielded wire (P/N 050363) from the SS80 is connected to the **SS80** connector on top of the AE80 enclosure.

9 • Operation and Maintenance

NOTE The DX-800 Process Analyzer is designed for use with predominantly aqueous applications. If you have a question regarding appropriate usage, contact Dionex before proceeding.

9.1 Installation Checklist

Complete the following installation steps before initial operation of the DX-800.

9.1.1 Prepare the Site and Facilities

1. Select the location for the analyzer system(s)/channel(s), the Chromeleon-PA or PeakNet-PA computer, and the SS80 Sample Selector (optional) at the installation site. Refer to *Installation Requirements and Customer Responsibilities* (Document No. 031176) for appropriate locations and distances.
2. Provide the facilities specified in the installation requirements document. Refer to the document for appropriate voltages, currents, pressures, and flow rates.

9.1.2 Connect the Facilities

1. Connect electrical power to each system/channel, the computer, and the printer. A power cord is provided with each system/channel. If the wall receptacle is not a NEMA L5-20R receptacle, arrangements must be made with the Dionex representative prior to installation.
2. Confirm that LC80 regulators are turned down and valves are turned to the vent position. Connect gas sources to each system/channel. (Tubing and fittings are supplied in the DX-800 installation kit.) Shutoff valves for each of the gas inlets should be closed.
3. Connect water sources to each channel. (Tubing and fittings are supplied in the DX-800 installation kit.) Shutoff valves for each of the sample inlets should be closed.

4. Direct the waste lines into the drain. Refer to the installation requirements document for location and flow rates.

9.1.3 Connect the Communications Cables

1. Attach and dress the DX-LAN cable to the computer and to each analyzer system/channel.
2. Connect the SS80 control and power cable from the SS80 to the system/channel configured with the second power supply in the CC80.
3. Connect the TTL in and/or Relay out cable(s) to each system/channel (if applicable).

9.1.4 Connect the Sample Inlet to the Analyzer Systems/Channels

1. Locate the Sample Inlet line for each system/channel. If multiple systems/channels are configured with the analyzer, route a 3-mm (1/8-in) OD line from the system/channel farthest from the sample source and install a 3-way manifold from this line at each remaining system/channel.
2. Connect the sample line from the analyzer system(s)/channel(s) to the SS80 Sample Selector or sample source. Refer to the installation requirements document for correct pressures and flow rates.
3. If an SS80 is installed, connect it to the sample panel. Refer to the installation requirements document for correct pressures and flow rates.

9.2 Initial Startup

9.2.1 Turn On the Power

1. Confirm that the circuit breaker on the left side of the CC80 is in the closed/on (up) position.
2. Press **Power Reset** on the front door of each system/channel enclosure.

3. Confirm that the power switches for the CC80, analytical pump, detector, and (if applicable) post-column reagent pump are on.

9.2.2 Configure Systems/Channels

Start Chromeleon

1. Turn on the computer and start the Chromeleon Server Monitor.
2. Start the Server Configuration program. Configure the timebases and save the configuration.

Start PeakNet-PA

1. Turn on the computer and start PeakNet-PA.
2. Run the Configuration Editor to confirm that all modules are recognized. Define the channels and save the configuration. This will be required for the pump calibration (see Section 9.2.5).

9.2.3 Flush the Flow Path

1. Open the gas inlet valves. Adjust the pressures of the regulators on the rear of the SP80 panel(s) to the following:
   - 275 kPa (40 psi) for precision displacement pump control
   - 175 kPa (25 psi) for dilution vessel evacuation
2. Set the LM80 controls to vent. Adjust the pressure of the LM80 to 70 kPa (10 psi).
3. Prepare eluents, reagents (if used), and standards. Fill containers and pressurize to the appropriate pressures. Refer to the NOWPAK documentation provided with the installation kit for details about filling the eluent containers. Open water supplies to each system/channel.
4. Manually actuate the SP80 valves to flush the lines with water, diluent, sample, and standards.
5. Fill the dilution vessel with water or diluent and then drain the liquid. Depending on the application, it may be necessary to repeat this process several times or to soak the vessel overnight in order to remove trace contaminants.

6. Before installing consumable components (see Section 9.2.4), set the analytical pump flow rate to 0.25 mL/min (for a microbore pump) or 1 mL/min (for a standard bore pump). Prime and start the pump to flush the chromatography flow path. If a suppressor is being used with external water for regenerant, flush these lines, also.
7. Set the analytical pump to flow in "flow mode." While pumping through the chromatography flow path (without consumables), confirm that the total backpressure remains below 690 kPa (100 psi).

9.2.4 Install Consumable Components

Install the column(s), suppressor (if used), and any other consumable components according to the product manuals.

9.2.5 System/Channel Calibration

Precision Displacement Pump Calibration

Calibrate the dilution pump and the loading pump (if present) on the SP80 panel after replacing any component in the pump flow path (concentrator columns, sample loops, or tubing) that changes the backpressure in the system. The purpose of calibrating the pump(s) is to accurately determine the pump stroke volume, using the same hardware components (tubing, fittings, columns, etc.) used for routine analysis.

Calibrate the pumps via the software:

- In Chromeleon, open the System Wellness Control Panel for the DX-800 and follow the step-by-step calibration instructions.
- In PeakNet-PA, select **Calibration Wizard** on the **Configure** menu in the Configuration Editor and follow the step-by-step calibration instructions.

Standard Loop Calibration

Before running the initial analysis, calibrate the fixed-volume standard loop on the metering (ME) valve. Calibration of the standard loop (and the dilution pump) will determine the correct calibration standard concentration and ensure accurate analytical results.

1. Standard loops are usually made from 0.5-mm (0.020-in) ID PEEK tubing with Dionex 10-32 ferrule fittings. For analyses in the ppm to

ppb concentration range, use a loop with a volume of 20 to 100 µL. For analyses of 10 to 100 ppb, use a loop with a volume of 100 to 250 µL.

The table below indicates the tubing length for several standard loop sizes. *These values are approximations* because tubing IDs vary. After checking the table, cut a piece of tubing to the suggested length. Be very careful to cut the end square to the axis of the tubing, with no angle. Tubing that is poorly cut will cause fittings to leak.

Loop Size	Tubing Length (cm)
10	4.93
25	12.33
50	24.67
100	49.34
150	74.01
200	98.68
250	123.35
500	246.70
1000	493.40

2. Install a 10-32 PEEK bolt (P/N 043275) and a PEEK ferrule fitting (P/N 043276) on both ends of the tubing cut in Step 1.
3. Install a plug (P/N 042772) in one end of a black coupler (P/N 042627), and then install the coupler on one end of the standard loop. Repeat on the other end of the loop.
4. Weigh the loop, on an analytical balance, to the nearest 0.001gram. Record the weight. Remove the loop from the balance and remove the plugs from the couplers.
5. Using a syringe (P/N 016640) and a luer adapter (P/N 24305), fill the standard loop with deionized water. *Do not introduce any air into the loop.*

6. Reinstall the plug on the end of the coupler from which the water exited. Remove the syringe and luer adapter from the other end of the loop and install the plug in it.
7. Examine the outside of the loop for water droplets. **Carefully** dry any water and then weigh the loop to the nearest 0.0001gram, if possible.
8. Subtract the weight of the empty loop (Step 4) from the weight of the filled loop (Step 7); the difference is the weight of the water in the standard loop.
9. Repeat Step 7 and Step 8 until four to five consecutive weighings ± 0.009 are achieved.
10. Multiply the weight of the water by 1000 to obtain the standard loop volume in microliters (µL). The table below lists examples of dilution factors and final concentrations of the diluted standard.

Standard Loop Size (µL)	Dilution Volume (mL)	Dilution Factor	Calibration Standard Concentration (mg/L)	Diluted Standard Concentra-tion (µg/L)
10	50	5000	10	2
20	50	2500	10	4
25	50	2000	10	5
50	50	1000	10	10
100	50	500	10	20
150	50	33	10	30
200	50	250	10	40
250	50	250	10	40
250	25	100	10	100

Calculate the diluted standard concentration as follows:

$$V_1C_1 = V_2C_2$$

$$C_2 = \frac{V_1C_1}{V_2}$$

$$D_f = \frac{V_1}{V_2}\,\frac{25\,\mu L}{50\,mL} = 2000$$

where:

Standard loop = V_1
Dilution volume = V_2
Dilution factor = D_f
Calibration standard concentration = C_1
Diluted standard concentration = C_2

11. Install the loop between ports 1 and 4 of the metering (ME) valve.

Analytical Pump Calibration

Calibrate the analytical pump as instructed in the pump manual.

Detector Calibration

Calibrate the detector as instructed in the detector manual.

9.2.6 Initial Software Setup for the DX-800 Analyzer(s)

Initial Chromeleon-PA Setup

In Chromeleon:

- Write and save PGM Files, QNT Files, and reports.
- Run a standard and edit component information for the QNT File.
- Calibrate the QNT File for the first time (the file can subsequently be calibrated in the Analyzer program).

In the Analyzer program:

- Configure the DX-800 analyzer, systems (timebases), and samples.

Initial PeakNet-PA Setup

- Load PeakNet-PA.
- Run the Analyze program and configure the DX-800 analyzer and channels.
- Write and save Methods.
- Download and check Methods.
- Run a standard and define components.
- Calibrate the Method.
- Define and run a Schedule.

9.3 Routine Startup and Operation

Routine operation consists of first confirming that all hardware is operating properly and then running either PGM Files and Sequences (Chromeleon-PA) or Methods and Schedules (PeakNet-PA) to control sample analysis. Refer to the software user's guide or online Help for complete operating instructions.

9.3.1 Routine Startup

1. Confirm that the power is on for all modules and accessories. Press **Power Reset** on the front door, if necessary.
2. Confirm that the computer is on.
3. In Chromeleon-PA: Check that the Chromeleon Server is running.

   In PeakNet-PA: Check that the MainMenu is displayed.
4. Confirm that all water and gas utilities are on and adjusted to their proper pressures.
5. Confirm that all eluents, standards, and reagents are supplied.
6. In Chromeleon-PA: Start the Analyzer program and load an appropriate Sequence.

   In PeakNet-PA: Start the Analyze program and load an appropriate Schedule or Method.

   Verify the following:

   - The eluent flow rates are correct.
   - The detector cells are on and the suppressor is powered (if used).

Always turn on the flow to the suppressor (from the analytical pump) before turning on the detector. Operating the suppressor with no flow going to it will damage the suppressor.

   - The post-column flow rate is correct. Adjust the flow rate, if required.
   - Check the dilution vessel for liquid. If the vessel contains liquid, press the CC80 **Drain** button.

- Let each system/channel stabilize for 20 to 30 minutes. Verify that the detector background has stabilized before beginning the analysis.

9.3.2 Routine Operation

After each system/channel has stabilized and the Sequence (Chromeleon-PA) or Schedule (PeakNet-PA) has been started, use the following checklist to monitor operation.

1. Check the software and the CC80 front panel(s) for alarms. If an alarm LED is lighted, eliminate the cause of the problem.
2. Check for any liquid or gas leaks. Isolate and eliminate any leaks.
3. Check levels and flows for all eluents, standards, and reagents. Replenish them as needed.
4. Use a Check Standard in the Sequence or Schedule to monitor and trend system performance.

9.4 Short-Term Shutdown

Follow these procedures to prepare the DX-800 for a shutdown of a few days to less than two weeks. For long-term shutdowns, see Section 9.5.

1. In Chromeleon-PA: In the Analyzer program, click the **Run** tab. In the tree control in the left pane, select the analyzer to be shut down. Click the **Standby** button for this analyzer.

   In PeakNet-PA: On the Analyzer Status screen, press the **Standby** button for the analyzer to be shut down.
2. Push the **Emergency Off** button on the front door of each system/channel.
3. Turn the LM80 gas controls to Vent and turn off the LM80.
4. Shut off the water and gas facilities to each system/channel.
5. Leave the columns installed and filled with eluent.
6. Empty standards bottles if stability is questionable.
7. Exit the software and shut down the computer (optional).

9.5 Long-Term Shutdown

Follow these procedures to prepare the DX-800 for a shutdown of two weeks or more. For short-term shutdowns, see Section 9.4.

1. In Chromeleon-PA: In the Analyzer program, click the **Run** tab. In the tree control in the left pane, select the analyzer to be shut down. Click the **Standby** button for this analyzer.

   In PeakNet-PA: On the Analyzer Status screen, press the **Standby** button for the analyzer to be shut down.

2. Empty and rinse the eluent, standard, and reagent bottles.
3. Prepare the columns, suppressors, and EluGen cartridges for long-term storage as instructed in the product manuals.
4. Flush the pumps, valves, post-column system, and interconnecting tubing with deionized water. Blow out the lines with high-purity nitrogen or helium.
5. Turn the LM80 gas controls to Vent and turn off the LM80.
6. Shut off the water and gas facilities to each system/channel.
7. Push the **Emergency Off** button on the front door of each system/channel.
8. Exit the software and shut down the computer.

9.6 Maintenance

This section describes routine maintenance procedures that the user can perform. All other maintenance procedures must be performed by qualified Dionex personnel.

Establish a routine maintenance program based on the guidelines here, as well as information in the user manuals for other elements of the system (the analytical pump, detector, columns, etc.). Following a strict maintenance schedule ensures proper operation of the DX-800.

NOTE Dionex recommends recording the date on which each routine maintenance procedure is performed. Besides ensuring that these procedures are accomplished, a maintenance log is very helpful when troubleshooting the system.

9.6.1 Daily Maintenance

Completion Time: 10-15 min for a dual-system/channel analyzer

Component or Feature	Action
Gas pressure	Check house pressure; the cylinder must have enough pressure to supply gas for the day. Air/N_2 regulator for SP80 pumps=275 kPa (40 psi) LM80 regulator=70 kPa (10 psi) Helium pressure for dilution vessel=175 kPa (25 psi)
Reagent supplies	Check all liquid levels; replenish if necessary. Eluent for the day=1 L minimum (2 L recommended) Stock standard solution for the day=1 L minimum Regenerant water pressure=100 kPa (15 psi) Deionized water pressure to enclosure=100 to 140 kPa (15 to 20 psi) Sample line pressures=70 to 140 kPa (10 to 20 psi) minimum; 100 kPa (15 psi) recommended)
Sample lines	Make sure all waste lines flow freely.
Air and liquid lines	Check for leaks or spills. Isolate and repair leaks; clean up spills. Rinse dried chemicals from components with deionized water. Check for crimping; replace damaged lines.
All pumps	Check for piston seal leaks; replace defective seals.
Conductivity detector	Record the total conductivity readings at the beginning of a run.
SRS, DS3, EGC	Check for leaks. If Autosuppression is being used, check that bubbles are flowing from the SRS regenerant outlet line.
Chromatography	Check trend plots and chromatograms for trending problems (missed peaks, etc.).

Component or Feature	Action
Printer	Make sure there is paper. Check the ink or toner cartridge.

9.6.2 Weekly Maintenance

Completion Time: 30-40 min for a dual-system/channel analyzer

Component or Feature	Action
Standard solutions	Prepare new solution for the check standard and calibration standard.
Analytical pump	Rinse pistons. Record pump pressure when load/inject valve (LI) is in the load position.
SS80 valve	Check for leaks.
Gas and drain connections	Check all connections, including the drain manifold and the fluid connection panels. Check for accumulated liquid on the inside bottom cover of the enclosure and underneath the enclosure. Fix leaks promptly.
Power and signal connections	Visually inspect all connections and cables. Secure loose connections; move pinched or strained cables.

9.6.3 Biweekly Maintenance

Completion Time: 1-2 hrs for a dual-system/channel analyzer

Component or Feature	Action
Reagent reservoirs	Thoroughly rinse all reagent reservoirs with deionized water to remove precipitates.
Eluents, reagent	Prepare new eluents and reagents.
Eluent trap columns (if used)	Replace trap columns (may be required weekly).

9.6.4 Monthly Maintenance

Completion Time: 1-2 hrs for a dual-system/channel analyzer

Component or Feature	Action
In-line filters	Replace all in-line filters.
Guard columns	If the eluent pressure increases by 1.4 MPa (200 psi), replace the bed support in the guard column inlet. If the pressure does not return to near the original for this column, replace the guard column.
Air filter	Clean with warm water whenever a fine layer of dust or lint is visible. Establish a cleaning schedule, taking local air quality into account.
Enclosure	Clean with a mild soap solution and then rinse with water. Chips and scratches are invitations to corrosion.

9.6.5 Quarterly Maintenance

Completion Time: 1-2 hrs for a dual-system/channel analyzer

Component or Feature	Action
Pump seals	Replace pump seals.
Rotary valves	Replace rotors and stators in the load/inject (LI) valve and metering (ME) valve.
Analytical pump	Calibrate flow and pressure.
EluGen cartridge	Replace if necessary. Check the software for the lifetime remaining value.

10 • Troubleshooting

This chapter is a guide to troubleshooting minor problems that may occur during operation of the DX-800 Process Analyzer. First, turn to the section of this chapter that best describes the operating problem. There, possible causes of the problem are listed in order of probability.

You may be referred to other product manuals for additional information. Most of these manuals are located on the Dionex Reference Library CD-ROM (P/N 053891). A printed copy of the NOWPAK II documentation is shipped with the DX-800.

If you are unable to resolve a problem, contact Dionex Technical Support. In the U.S., call 1-800-346-6390. Outside the U.S., call the nearest Dionex office.

NOTE **For troubleshooting help specific to other aspects of the system (the analytical pump, detector, columns, etc.), refer to the relevant user manual.**

10.1 Troubleshooting Strategies

For any system, the initial troubleshooting objective is to isolate the source of the problem to a specific module or component or to an aspect of the analysis. Once this has been done, corrective action can be taken. This manual cannot address every possible symptom and failure; however, the techniques discussed here can be applied to problem solving throughout the DX-800 system.

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

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

In summary, an effective troubleshooting strategy requires that users:

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

10.2 Liquid Leaks

If leaking liquid creates a hazard, stop the leak immediately by turning off the flow at the source.

Si une fuite de liquide crée un danger, arrêtez immédiatement la fuite en fermant l'écoulement à la source.

Wenn eine Gefährdung durch austretende Flüssigkeit besteht, stoppen Sie die Leckage unmittelbar, indem Sie den Fluß an der Quelle abstellen.

NOTE When cutting tubing and preparing fittings, avoid crimping the tubing. Crimped tubing is a common cause of high backpressure.

- **Leaking fitting**

  Make sure that all liquid line connections are tight. If a fitting continues to leak, replace it. If the connection is made with 10-32 ferrule fittings, see *Installation of Dionex Liquid Line Fittings* (Document No. 031432) for instructions.

- **Broken liquid line**

  Cut the tubing at the break and install a new fitting. (If the connection is made with 10-32 ferrule fittings, see *Installation of Dionex Liquid Line Fittings* for instructions.) Or, if cutting the tubing would make it too short, replace it. The new tubing must be the same type, and have the same internal diameter, as the tubing it replaces.

- **Blocked or improperly installed waste line**

  Make sure the waste lines from the valves, detector cell, and SRS (if installed) are not crimped or otherwise blocked.

  Make sure the waste lines from the channel are not elevated at any point after they exit the AE80 enclosure. Waste lines should be clear and open to the atmosphere.

  If 10-32 ferrule fittings are installed on Teflon (PTFE or PFA) tubing, make sure the fittings are not overtightened (this will pinch off the tubing). If in doubt, cut off the end of the tubing and reconnect the fitting. See *Installation of Dionex Liquid Line Fittings* (Document No. 031432) for instructions.

10.2.1 Precision Displacement Pump Leaks

The loading pump and dilution pump are precision displacement pumps. Depending on the DX-800 configuration, one or both of these pumps is installed on the SP80 Sample Preparation panel.

- **Loose check valve fittings**

  With the pump flowing, use a wrench to tighten the inlet and outlet check valve fittings just until the leak stops.

- **Defective piston seal**

  A defective piston seal allows leaks between the pump head and end plate and/or from the piston rinse ports on the pump head. Check the pump head for leaks and replace the seal if necessary.

10.2.2 Dilution Vessel Leaks

- **Loose connections**

  Make sure all fittings are tightened securely.

- **Dilution vessel contains excess liquid**

1. The dilution vessel may contain partially diluted sample or standard from a previous analysis. Purge the vessel as follows: Press **Local/Remote** on the CC80 front panel to select Local mode, and then press **Drain**. The drain operation is programmed to take 3 minutes.

   If the vessel empties in less than 3 minutes, you may manually terminate the drain operation. Before doing so, check the dilution vessel waste line: If there is no liquid in the line, the vessel is empty. To terminate the drain operation, either press **Drain** again or press **Gas Valve** (this vents the dilution vessel).

2. The pressure applied to the dilution vessel may be insufficient to empty it. Make sure the high-purity gas supply is regulated to 170 to 240 kPa (25 to 35 psi).

3. Make sure that no more than 250 mL of liquid is pumped into the dilution vessel. In the normally open (default) position, the dilution vessel (DV) valve purges the dilution vessel to waste. Check the CC80 PGM File or Method to verify that the valve remains on (open) while the dilution pump is running.

10.2.3 SS80 Leaks

When a sample line leaks, the **Sampling Leak** LED on the CC80 front panel begins flashing.

If leaking liquid creates a hazard, turn off the SS80 power switch immediately, and then stop the leak by turning off the flow at the source.

Si une fuite de liquide crée un danger, arrêtez immédiatement la fuite en fermant l'écoulement à la source.

Schalten Sie den SS80 sofort am Netzschalter aus, wenn eine Gefährdung durch austretende Flüssigkeit besteht. Stoppen Sie die Leckage unmittelbar, indem Sie den Fluß an der Quelle abstellen.

- **Leaking fitting(s)**

  Tighten any leaking fittings. If a fitting continues to leak, replace it. If the connection is made with 10-32 ferrule fittings, see *Installation of Dionex Liquid Line Fittings* (Document No. 031432) for instructions.

- **Damaged tubing**

  If a piece of tubing is crimped or otherwise damaged, replace it. If this is inconvenient, patch the tubing by cutting out the bad section and inserting a new piece of tubing with a coupler (P/N 040240) on each end.

  NOTE Routinely patching tubing increases the possibility of leaks.

10.2.4 EluGen Cartridge Leaks

The cartridge must be replaced. Refer to the eluent generator manual for instructions.

10.2.5 Degas Assembly Leaks

The degas assembly must be replaced. Refer to the eluent generator manual for instructions.

10.3 Air and Gas Leaks

Air leaks, which can cause excessive air consumption, are usually audible. Gas leaks cause sluggish liquid delivery, unreliable pump operation, and excessive gas consumption.

Minor gas leaks can sometimes be felt, while major gas leaks are usually audible. To detect a minor gas leak, shut off the gas at the source and then check the pressure gauge for a drop in pressure. Repeat as often as necessary until the leak is found.

NOTE The use of Snoop or other dilute soap solutions for leak detection will contaminate the tubing. Water may be used, if desired.

- **Leaking fitting**

  If the fitting is stripped, cross-threaded, or otherwise damaged, replace it. If the fitting is not damaged, securely tighten it. If the connection is made with 10-32 ferrule fittings, see *Installation of Dionex Liquid Line Fittings* (Document No. 031432) for instructions.

  If the leak continues, cut the tube off the fitting and replace the fitting.

- **Leaking standard or reagent reservoir**

  Sluggish liquid delivery is usually due to a helium or nitrogen leak from a reservoir. Follow the strategy above to eliminate leaks at fittings and caps.

- **Damaged tubing**

  Over time, gas tubing can become compromised by chemical fumes (for example, eluent vapor in the air lines to the NOWPAK containers). If this happens, replace the tubing.

- **Defective air piston O-ring/seal on precision displacement pump**

  Although only one O-ring/seal set may be defective, both sets must be replaced at the same time. Contact Dionex Technical Support for assistance.

10.4 Excessive System Backpressure

Refer to the column manual for the recommended operating pressure. Then, check the analytical pump **MAIN** screen for the current system backpressure. A system backpressure of 3.4 MPa (500 psi) above the recommended value for the column is excessive. Excessive backpressure can cause leaks, or even irreparable damage, to system components. Crimped tubing is a common cause of high backpressure.

- **Excessive flow rate through columns**

  Make sure the pump is set to the flow rate specified by the analytical protocol. If the pump needs to be recalibrated, follow the instructions on the **FLOW CALIBRATION** screen (go to the **DIAGNOSTIC MENU**, select **CALIBRATION MENU**, and select the **FLOW CALIBRATION** option).

- **Restriction in chromatography flow path**

  Follow these steps to isolate the source of the high backpressure:

  a. Disconnect the analytical pump eluent line from the load/inject (LI) valve. Turn on the pump and monitor the operating pressure; it should not exceed 0.3 MPa (50 psi) for a standard bore system or 1.4 MPa (200 psi) for a microbore system.

  b. Begin reinstalling system components, starting with the load/inject (LI) valve, while monitoring the system pressure. When the analytical column is connected, the pressure should increase to the recommended value. Components other than the analytical column should add less than 2.1 MPa (300 psi) to the system backpressure.

     - If the load/inject (LI) valve is the cause of the high backpressure, contact Dionex Technical Support for assistance.
     - If the concentrator or guard column is the cause, replace the column.
     - If the analytical column is the cause, refer to the column manual for corrective action.
     - If the SRS is the cause, refer to the SRS manual for corrective action.
     - If the EluGen cartridge is the cause, refer to the eluent generator manual for corrective action.

10.5 Channel Stops Running

- **Dilution vessel contains residual liquid**

  After termination of a PGM File or Method that involves dilution, some partially diluted sample or standard may remain in the dilution vessel. Purge the vessel as follows: Press **Local/Remote** on the CC80 front panel to select Local mode, and then press **Drain**. The drain operation is programmed to take 3 minutes.

  If the vessel empties in less than 3 minutes, you may manually terminate the drain operation. Before doing so, check the dilution vessel waste line: If there is no liquid in the line, the vessel is empty. To terminate the drain operation, either press **Drain** again or press **Gas Valve** (this vents the dilution vessel).

10.6 Module(s) Does Not Power Up

Electrical system circuits carry dangerous voltages. Disconnect all power before working on them.

Les circuits du système électriques ont des tensions dangereuses. Débranchez toute l'alimentation électrique avant de travailler sur les circuits.

Elektrische Schaltkreise führen gefährliche Spannungen. Entfernen Sie alle Stromversorgungen, ehe Sie daran arbeiten.

- **Internal power cord(s) not connected**

  Make sure the power cords are connected from the analytical pump, detector, and eluent generator (if installed) to the appropriate AC outlets on the CC80 rear panel.

- **PC80 Post-Column Reagent Pump power cord not connected**

  Make sure the PC80 power cord is connected to the appropriate AC outlet on the CC80 rear panel.

- **System power cord not connected**

  1. Make sure the **Power Reset** lamp on the front door of the AE80 enclosure is illuminated.
  2. Make sure the modular power cord is connected from the **POWER IN** connector on top of the AE80 enclosure to the main power.

- **Eluent generator power turned off**

  Verify that the power switch on the EG40-PA controller is on. When the power switch is on, the power LED is illuminated. To access the EG40-PA controller, loosen the thumbscrew on the right side of the SP80 Sample Preparation panel and swing the panel out. The controller is at the lower rear of the AE80 enclosure (see Figure 6-2). For additional troubleshooting information, refer to the eluent generator manual.

- **Main power turned off**

  After pressing **Emergency Off** on the front door of the AE80 enclosure, remember to press **Power Reset** to restore power.

- **CC80 circuit breaker tripped**

  1. Open the front door of the AE80 enclosure. Loosen the two retaining screws in the module chassis. Pull out the chassis just until the first stop on the sliders is engaged.
  2. To reset the circuit breaker, flip up the switch on the left side of the CC80.
  3. Push the module chassis back into the enclosure and tighten the retaining screws.
  4. Close the enclosure door.

If the breaker continues to trip, the circuit may be shorted or overloaded. Disconnect all power and contact Dionex Technical Support for assistance.

Si le disjoncteur continue de sauter, le circuit peut être court-circuité ou surchargé. Débranchez toute l'alimentation électrique et contactez Dionex pour obtenir de l'aide.

Wenn der Unterbrecherschalter kontinuierlich auslöst, kann es sein, daß die Schaltung kurzgeschlossen oder überlastet ist. Entfernen Sie alle Stromversorgungen und wenden Sie sich an Dionex.

- **Blown fuse**

  Five IEC 127 3.15 amp fast-blow fuses (P/N 954745) are installed inside the CC80. Replace the open fuse (see Section 11.3).

If the fuse continues to blow, the circuit may be shorted or overloaded. Disconnect all power and contact Dionex Technical Support for assistance.

Si le fusible continue de sauter, le circuit peut être court-circuité ou surchargé. Débranchez toute l'alimentation électrique et contactez Dionex pour obtenir de l'aide.

Wenn die Sicherung weiterhin durchbrennt, kann es sein, daß die Schaltung kurzgeschlossen oder überlastet ist. Ziehen Sie den Netzstecker und wenden Sie sich an Dionex.

10.7 CC80 Sample LED Displays Spinning Segments

- **Sample select valve is between positions**

  This does not indicate a problem; the LED display segments rotate while the selected valve is switching positions.

10.8 CC80 Sample LED Displays *EE*

- **Malfunctioning sample select valve**

  The sample select valve is frozen in position or the valve sensor is not working properly. Press the **Select** button to select a different valve, and then select the first valve again. If *EE* is displayed again, the valve is broken and must be replaced. Contact Dionex Technical Support for assistance.

10.9 CC80 Analyzer Leak LED Is Flashing

The **Analyzer Leak** LED flashes when a leak is detected on the LC80 Liquid Chromatography panel or SP80 Sample Preparation panel.

- **Leaking fitting**

  Find and eliminate the source of the leak (see Section 9.2).

- **Loose electrical connection**

  1. Verify that the leak sensor cable is plugged into the leak detector connector (J7) on the LC80 distribution board. The board is located behind the LC80 panel. To access this area, loosen the two screws securing the LC80 to the module chassis and swing the panel open.
  2. If the **Analyzer Leak** LED immediately begins flashing again, the leak sensor is out of calibration.

  To recalibrate the sensor:

1. Open the door of the AE80 enclosure. Press the CC80 **Power** switch to turn off the power. After a few seconds, turn on the power again.
2. Wait until all CC80 front panel LEDs are illuminated, and then press **Display Refresh** on the enclosure door to calibrate the leak sensor.
3. Close the enclosure door.

10.10 Precision Displacement Pump Does Not Prime

The loading pump and the dilution pump are precision displacement pumps. Depending on the DX-800 configuration, one or both of these pumps is installed on the SP80 Sample Preparation panel.

- **Pump not plugged in**

  One at a time, check the cable connections from the pump to the distribution board on the rear of the SP80 panel. The 5-pin connector plugged into the pump controller board (under the white splash cover) should be connected to the following location on the distribution board: LP Sensor (for the loading pump) or DP Sensor (for the dilution pump).

- **Pump contains trapped air**

  When air becomes trapped in the pistons, the stroke speed increases significantly as the pump attempts to push out the trapped air.

  Before priming the pump, make sure the valve immediately before it is open by pressing the appropriate button on the CC80 front panel: **SS Valve** (for the loading pump) or **DI Valve** (for the dilution pump). In the open position, the gentle flow of water through the valve to the pump is effective at removing trapped air.

  If the stroke speed remains unusually fast even when the valve is open, turn off the pump for 2 to 3 minutes (leaving the valve open). Turn on the pump again. The pump speed should return to normal within a few seconds, confirming that the pump is primed.

10.11 No Sample Delivered to Loading Pump

The CC80 monitors the number of pump strokes per second. If the rate exceeds one stroke/second after 10 seconds of operation, it indicates that no liquid is being pumped. If this occurs, the **Loading Pump** LED on the CC80 front panel will begin flashing continuously.

Press **Alarm Reset** to turn off the LED and fix the problem. If the LED starts flashing again, the problem was not eliminated. Contact Dionex Technical Support for assistance.

- **No sample supplied to channel**

  Make sure the dilution vessel contains sample or standard.

  Make sure the air supply for the dilution vessel is regulated to between 34 and 69 kPa (5 to 10 psi).

- **No liquid passing through SS80 valve**

  Positions 1 and 2 of DIP switch #1 record the number of sample select valves installed in the SS80. This information is reported to both the software and the CC80 Moduleware. Verify that the switch settings are correct (see Section 3.2.3).

- **Liquid leaks**

  Check for leaks in the liquid lines or fittings in the sample flow path. Tighten or replace leaking fittings.

- **Malfunctioning valve**

  Press **Local/Remote** on the CC80 front panel to select Local mode. One at a time, press the flow chart button that represents each valve in the flow path and listen for the click that occurs when the valve is actuated. Any valve that is not actuated should be replaced. Contact Dionex Technical Support for assistance.

- **Damaged pump controller board**

  The loading pump must be replaced. Contact Dionex Technical Support for assistance.

10.12 Loading Pump Delivers Inconsistent Volume

- **Excessive fluctuation in sample inlet pressure**

  Regulate the sample inlet pressure to between 70 and 280 kPa (10 to 40 psi).

- **Defective pump seal**

  A defective seal allows liquid leaks between the pump head and the end plate to which it is attached. Check the pump head for leaks and replace the seal, if necessary.

- **Gas leaks from dilution vessel**

  Make sure all fittings are tightened securely.

- **Load/inject (LI) valve leaks**

  Tighten all fittings. If a fitting continues to leak, replace it.

10.13 Irregularity in Loading Pump

- **Dilution vessel gas leak**

  An irregularity in the pump stroke speed or rhythm when pumping from the dilution vessel may indicate a gas leak.

  Follow this procedure to check for a gas leak from the dilution vessel:

  1. Press **Local/Remote** on the CC80 front panel to select Local mode.
  2. Press **DV Valve** to seal off the bottom of the dilution vessel.
  3. Press **SS Valve**.

4. Press **Gas Valve** to pressurize the dilution vessel.
5. Press **ME Valve**.
6. Turn on the gas supply for the dilution vessel.
7. Using deionized water, verify that there are no gas leaks from the fitting on top of the dilution vessel.

NOTE Do not use Snoop or other dilute soap solutions for leak detection, as they will contaminate the tubing. Water may be used for leak detection, if desired.

10.14 Dilution Pump Does Not Pump

The CC80 monitors the number of pump strokes per second. If the rate exceeds one stroke per second after 10 seconds of operation, it indicates that no liquid is being pumped. If this occurs, the **Dilution Pump** LED on the CC80 front panel will begin flashing.

Press **Alarm Reset** to turn off the LED and fix the problem. If the LED starts flashing again, the problem was not eliminated. Contact Dionex Technical Support for assistance.

- **No diluent supply**
  1. Make sure there is a supply of diluent (usually deionized water) to the channel.
  2. Check for leaking fittings on the diluent lines. Tighten or replace fittings as necessary.
- **Inadequate air supply (stroke speed slower than normal)**

  The dilution pump is air-driven. For optimal pump performance, the facility gas supply (air or nitrogen) must be regulated to a minimum of 280 kPa (40 psi).

- **Diluent (DI) valve is off (or closed)**

    1. Check the CC80 PGM File or Method to verify that the diluent (DI) valve is on (open) while the dilution pump is running.
    2. Verify correct valve operation as follows:
        a. Press **Local/Remote** on the CC80 front panel to select Local mode.
        b. Press **DI Valve** on the CC80 flow chart to open the diluent valve.
        c. Press **Dilution Pump** to turn on the pump. Check the waste line to verify that diluent is being directed to waste.

- **Blockage in air or liquid connections**

    Make sure the lines to and from the dilution pump are not crimped or otherwise blocked.

    If 10-32 ferrule fittings are installed on Teflon (PTFE or PFA) tubing, make sure the fittings are not overtightened, thus pinching off the tubing. If in doubt, cut off the end of the tubing and reconnect the fitting. See *Installation of Dionex Liquid Line Fittings* (Document No. 031432) for instructions.

- **Leaking pump seal**

    A defective seal allows liquid leaks between the pump head and the end plate to which it is attached. Check the pump head for leaks and replace the seal if necessary.

- **Damaged pump controller board**

    The dilution pump must be replaced. Contact Dionex Technical Support for assistance.

10.15 Dilution Pump Delivers Inconsistent Volume

- **Variation in diluent supply pressure**

  Make sure the diluent supply is regulated to between 170 and 240 kPa (25 to 35 psi).

- **Metering (ME) valve leaks**

  Refer to the manual included with the Rheodyne rebuild kit for corrective action.

- **Blockage in air or liquid connections**

  Make sure the lines to and from the dilution pump are not crimped or otherwise blocked.

  If 10-32 ferrule fittings are installed on Teflon (PTFE or PFA) tubing, make sure the fittings are not overtightened, thus pinching off the tubing. If in doubt, cut off the end of the tubing and reconnect the fitting. See *Installation of Dionex Liquid Line Fittings* (Document No. 031432) for instructions.

- **Dirty or worn pump check valve**

  Clean the check valves (see Section 10.2).

- **Defective pump seal**

  A defective seal allows liquid leaks between the pump head and the end plate to which it is attached. Check the pump head for leaks and replace the seal if necessary.

10.16 Dilution Vessel Does Not Empty

- **Fitting allows gas (helium) leaks**

  If the fitting is stripped, cross-threaded, or otherwise damaged, replace it. If the fitting is not damaged, tighten it securely. If the connection is made with 10-32 ferrule fittings, see *Installation of Dionex Liquid Line Fittings* (Document No. 031432) for instructions.

  If the leak continues, cut the tube off the fitting and replace the fitting.

- **Dilution vessel inadequately pressurized**

    1. Disconnect the fitting on the helium inlet line to the dilution vessel lid and check for flow from the line. If there is no flow, check the pressure for the helium supply.

    To check the helium supply pressure:

    a. Loosen the thumbscrew on the right side of the SP80 Sample Preparation panel and swing the panel open.

    b. The pressure gauge is located on the rear of the SP80 panel, directly behind the dilution vessel. The gauge should read between 170 and 240 kPa (25 and 35 psi); if it does not, contact Dionex Technical Support for assistance.

    2. Check the CC80 PGM File or Method to verify that the gas valve is in the pressurize (1, or normally open) position. If it is not, edit the PGM File or Method.

    3. Make sure the waste line is clear and open to the atmosphere.

- **Pressure relief valve compromised**

    The pressure relief valve is on the rear of the SP80 panel, behind the dilution vessel lid. If the vessel is insufficiently pressurized, the relief valve may be activated prematurely.

    To check the pressure relief valve operation:

    1. Loosen the thumbscrew on the right side of the SP80 and swing the panel open. The regulator is in the upper left corner of the panel, below the dilution vessel.

    2. Set the pressure regulator to 345 kPa (50 psi).

    3. Using a screwdriver, turn the valve adjustment screw to the right just until a hissing sound is audible. When the hissing starts, reset the pressure to 276 kPa (40 psi). If the hissing starts again, the pressure relief valve is broken and must be replaced. Contact Dionex Technical Support for assistance.

- **Dilution vessel not drained after PGM File or Method is aborted**

    When a PGM File or Method that involves dilution is terminated while the dilution vessel is being filled or emptied, some diluted sample or standard may remain in the vessel.

To ensure complete drainage:

a. Press **Local/Remote** on the CC80 front panel to select Local mode.

b. Press **Drain** on the CC80 flow chart to pressurize the dilution vessel and direct residual liquid to waste. The drain operation is programmed to take 3 minutes.

If the vessel empties in less than 3 minutes, you may manually terminate the drain operation. Before doing so, check the dilution vessel waste lie. If there is no liquid in the line, the vessel is empty. To terminate the drain operation, either press **Drain** again or press **Gas Valve** (this vents the dilution vessel).

- **Dilution vessel (DV) valve not operating correctly**

  In the normally open (default) position, the dilution vessel valve purges the dilution vessel to waste. Check the CC80 PGM File or Method to verify that the valve remains on (open) while the dilution pump is running.

10.17 Column Heater Does Not Heat

Verify that the column heater cable is plugged into the column heater connector on the LC80 distribution board. The board is located behind the LC80 panel. To access this area, loosen the two screws securing the LC80 to the module chassis and swing the panel open.

10.18 Inoperative Sample Select Valve

- **Incorrect CC80 DIP switch setting**

  Positions 1 and 2 of DIP switch #1 record the number of sample select valves installed in the SS80. This information is reported to both the software and the CC80 Moduleware. Verify that the switch settings are correct (see Section 3.2.3).

10.19 Lack of Flow at Selected Sample Outlet

- **Inadequate sample pressure and/or flow to SS80**

  The minimum sample flow to the SS80 is 15 mL/min; the minimum sample inlet pressure is 69 kPa (10 psi).

Various types of chemicals are used in the DX-800, depending on the application that is being performed. Follow all appropriate hazardous materials and safety guidelines for chemicals when operating the DX-800.

Différents types de produits chimiques sont utilisés dans le DX-800, selon l'application à effectuer. Respectez toutes les directives de sécurité sur les matières dangereuses pour les produits chimiques lors de l'utilisation du DX-800.

Je nach Anwendung, die gerade läuft, werden im DX-800 verschiedenartige Chemikalien verwendet. Beachten Sie beim Betrieb des DX-800 alle entsprechenden Sicherheitsrichtlinien bezüglich gefährlicher Stoffe für die verwendeten Chemikalien.

- **Leaking fitting and/or sample select valve**

  Make sure all liquid line connections are tight. If this does not stop the leak, replace the fitting. If the connection is made with 10-32 ferrule fittings, see *Installation of Dionex Liquid Line Fittings* (Document No. 031432) for instructions.

- **Blocked tubing**

  1. Replace all kinked or pinched tubing.
  2. If particulates are blocking the sample lines, replace the affected tubing and filter the incoming sample (5 μm particulate size).

- **Sample select valve does not respond when energized**

  Using the CC80 front panel **Select** buttons, select each valve position in turn and check for flow at the SS80 sample outlet. If a valve is unresponsive, it should be replaced. Contact Dionex Technical Support for assistance.

10.20 No Peaks Detected

- **Detector not ready**

  Verify that the cell (or lamp) is on and that there is flow through the cell.

- **Eluent generator not working**

  Verify that the power switch on the EG40-PA controller is on. When the power switch is on, the power LED is illuminated. To access the EG40-PA controller, loosen the thumbscrew on the right side of the SP80 Sample Preparation panel and swing the panel out. The controller is at the lower rear of the AE80 enclosure (see Figure 6-2). For additional troubleshooting information, refer to the eluent generator manual.

- **No sample injected**

  1. Make sure the CC80 PGM File or Method includes an inject command at the appropriate step.
  2. Verify correct operation of the load/inject (LI) valve as follows:
     a. Press **Local/Remote** on the CC80 front panel to select Local mode. Press **Load/Inject** on the flow chart a few times to verify that the valve switches between the load and inject positions.
     b. If the valve does not switch positions, make sure the valve cable is connected to the LIV connector on the LC80 distribution board. The distribution board is located on the rear of the LC80 panel. To access this area, loosen the two screws securing the LC80 to the module chassis and swing the panel open.
     c. If the valve is correctly connected to the distribution board but fails to switch positions, contact Dionex Technical Support for assistance.
  3. If no peaks are detected when analyzing a sample, verify that there is sample flow between the SS80 and the channel.
  4. If no peaks are detected when preparing and analyzing a calibration standard, check the following:
     a. Verify that the reservoir contains stock standard. The gas supply for the reservoir should be regulated to between 70 and 80 kPa (10 to 12 psi).

b. Verify that the metering (ME) valve is programmed correctly in the CC80 PGM File or Method and that it is operating correctly.

c. Verify that the prepared calibration standard is flowing from the dilution vessel to the load/inject (LI) valve. Make sure the vessel is pressurized to between 170 and 240 kPa (25 to 35 psi).

10.21 Spurious Peaks

Spurious peaks in a chromatogram may be late-eluting peaks from a previous injection or may result from a contaminated valve or poor sample loading technique. Spurious peaks sometimes co-elute with peaks of interest, resulting in nonreproducible peak area or height.

To verify the cause, first select a run time that ensures that the peak elutes with the injection. If this is a late-eluting peak, there are two ways to accomplish this:

Adjust the run time to permit the peak to elute with the injection, *or*

Increase the eluent (or mobile phase) concentration, causing the peak to elute earlier. (Be sure to equilibrate the system with the composition required for the isocratic run or used to start the gradient separation.)

- **Insufficient time between sample injections**

  Wait until the previous sample has been completely eluted before making another injection.

- **Insufficient rinse between samples**

  Edit the CC80 PGM File or Method to increase the time allowed for rinsing the sample line from the analyzer to the SS80 (or the sample source for a single-sample analyzer). In general, rinse the lines with at least five tubing volumes. For ultra-trace analyses or certain samples, larger rinse volumes may be required. The sample tubing ID is 1.5 mm (0.060 in); the volume is about 0.55 mL/ft.

  To test for sample carryover, run the highest calibration standard or most concentrated sample, followed by a blank. (For ultra-low samples, use the highest calibration standard **only**.) The carryover should be less than 1%.

- **Analytical column degraded**

  Clean the column as instructed in the column manual. When the column is used with a weak eluent system and samples contain an appreciable level of polyvalent anions or cations, the polyvalent anions or cations may contaminate the column. If this occurs, retention times for analytes will decrease and spurious, normally inefficient peaks may appear at unexpected times.

- **Baseline upset**

  1. First, run a gradient without making an injection. Study the baseline; if there are spurious peaks, the analytical column may be contaminated (see above).
  2. Run a second gradient. This time, switch the load/inject (LI) valve, but not the injection sample or standard (the sample loop should contain deionized water or eluent).

     A baseline upset, especially at the beginning of a chromatogram, is probably caused by actuation of the load/inject valve (LI) or column switching valve. Clean the valve.

     NOTE A minor baseline disturbance at the start or end of a chromatogram may be disregarded unless it interferes with the quantitation of peaks of interest.

10.22 Poor Peak Resolution

- **Retention times too short**

  1. Verify that the selected flow rate is the one specified by the analytical protocol. When analytes elute too fast, their resolution is compromised.
  2. If an eluent generator is installed, verify that the correct concentration and flow rate combination is programmed in the PGM File or Method. Refer to the eluent generator manual for details.

- **Incorrect eluent composition or concentration**

    1. Prepare fresh eluent. An excessively strong eluent causes peaks to elute more quickly (and vice versa).
    2. The gradient pump proportioning valve may be malfunctioning (applicable when the gradient pump is proportioning the eluent by combining eluents from more than one container).

        To check the proportioning valve operation:

        Run an isocratic PGM File or Method, using a container with the correct eluent composition. If retention times and resolution are recovered, the proportioning valve is defective. Replace the valve as instructed in the gradient pump manual.
    3. Pump validation is included in the software qualification programs. Follow the instructions in the software user's guide or online Help to validate the pump performance. If this does not isolate the cause of the problem, contact Dionex Technical Support for assistance.

- **Column contamination**

    Clean the column as instructed in the column manual. Column contamination sometimes results in a loss of column capacity because some exchange sites are no longer available for the sample ions. Polyvalent anions or cations may be concentrating on the column.

    Impurities in the chemicals or deionized water used to prepare eluent can contaminate the column. When preparing eluent, be sure to use reagent-grade chemicals or chemicals of the purity recommended in the column manual. Use only ASTM Type II (18.0 megohm/cm resistance or 1 μS) deionized water.

The symptoms below apply to loss of resolution for early-eluting peaks only.

- **Incorrect eluent concentration**

    Remake the eluent. If gradient elution is being used, verify that the PGM File or Method for the pump is correct.

    If an eluent generator is installed, verify that the correct concentration and flow rate combination is programmed in the PGM File or Method. Refer to the eluent generator manual for details.

- **Column overloading**

  Strongly-retained ions may be rinsing more weakly-retained ions off the concentrator column. Concentrate 5 mL less of sample; if linearity improves, continue decreasing the sample amount until linearity fails to improve. Increase the sample amount in increments of 5 mL, if desired, as long as linearity remains acceptable.

10.23 Small Peaks Detected

- **Air leak from loading pump**

  Listen for air leaks from the air cylinder of the loading pump. If there is a leak, the two O-ring/seal sets (P/N 049317) on the air piston must be replaced. Contact Dionex Technical Support for assistance.

10.24 Peak Height Greater Than Expected

- **Air leak from dilution pump**

  Listen for air leaks from the air cylinder of the loading pump. If there is a leak, the two O-ring/seal sets (P/N 049317) on the air piston must be replaced. Contact Dionex Technical Support for assistance.

10.25 Poor Peak Area (or Height) Precision

Poor peak area or height precision is indicated by the inability to reproduce results from injection to injection.

- **Leaks in sample or standard flow path**

  Tighten any leaking fittings. If a fitting continues to leak, replace it. If the connection is made with 10-32 ferrule fittings, see *Installation of Dionex Liquid Line Fittings* (Document No. 031432) for instructions.

- **Leaking load/inject (LI) valve**

  Make sure all liquid line connections are tight. If this does not stop the leak, replace the fitting. If the connection is made with 10-32 ferrule fittings, see *Installation of Dionex Liquid Line Fittings* (Document No. 031432) for instructions. If the leak persists, contact Dionex Technical Support for a replacement valve.

- **Insufficient or inconsistent sample or standard flow to loading pump**

  For calibration standards prepared in the dilution vessel, maintain a pressure of at least 170 kPa (25 psi) on the dilution vessel when delivering standard to the loading pump.

  For sample, maintain a pressure of at least 100 kPa (15 psi) on the sample inlet line to the analyzer.

- **Leaking loading pump**

  A defective piston seal allows leaks between the pump head and end plate and/or from the piston rinse ports on the pump head. Check the pump head for leaks and replace the seal if necessary.

- **Sample carryover**

  Edit the CC80 PGM File or Method to increase the time allowed for rinsing the sample line from the analyzer to the SS80 (or the sample source for a single-sample analyzer). In general, rinse the lines with at least five tubing volumes. For ultra-trace analyses or certain samples, larger rinse volumes may be required. The sample tubing ID is 1.5 mm (0.060 in); the volume is about 0.55 mL/ft.

  To test for sample carryover, run the highest calibration standard or most concentrated sample, followed by a blank. (For ultra-low samples, use the highest calibration standard **only**.) The carryover should be less than 1%.

The following items pertain to calibration standards.

- **Incorrect valve positions in flow path after dilution vessel**

  Verify that the state of the three-way valve(s) restricts flow out of the dilution vessel while it is being filled.

- **Dilution vessel does not empty between runs**

  Sample may be carrying over from injection to injection. Edit the CC80 PGM File or Method to increase the time allowed for purging the dilution vessel.

- **Preparing and analyzing a more concentrated standard prior to a dilute standard**

  Always prepare and analyze calibration standards in the order of increasing concentration. When a PGM File or Method that involves dilution is terminated while the dilution vessel is being filled or emptied, diluted sample or standard may remain in the vessel. Purge the vessel as follows: Press **Local/Remote** on the CC80 front panel to select Local mode, and then press **Drain**. The drain operation is programmed to take 3 minutes.

  If the vessel empties in less than 3 minutes, you may manually terminate the drain operation. Before doing so, check the dilution vessel waste line; if there is no liquid in the line, the vessel is empty. To terminate the drain operation, either press **Drain** again or press **Gas Valve** (this vents the dilution vessel).

- **Loading pump not operating properly**

  Refer to Section 10.10 through Section 10.13.

- **Poor chromatography**

  Check the column manual for troubleshooting advice.

10.26 Nonreproducible Peak Area and/or Retention Time

- **Insufficient time between sample injections**

  Wait until the previous sample has been completely eluted before making another injection.

- **Insufficient rinse between samples**

  Edit the CC80 PGM File or Method to increase the time allowed for rinsing the sample line from the analyzer to the SS80 (or the sample source for a single-sample analyzer). In general, rinse the lines with at least five tubing volumes. For ultra-trace analyses or certain samples, larger rinse volumes may be required. The sample tubing ID is 1.5 mm (0.060 in); the volume is about 0.55 mL/ft.

  To test for sample carryover, run the highest calibration standard or most concentrated sample, followed by a blank. (For ultra-low samples, use the highest calibration standard **only**.) The carryover should be less than 1%.

- **Sample concentration too high**

  Install a smaller volume sample loop. For available loop sizes, refer to the *Dionex Product Selection Guide* or contact Dionex Technical Support.

- **Liquid leaks**

  Refer to Section 10.2 for instructions on how to locate and eliminate leaks.

10.27 Poor Retention Time Precision

- **Leaking piston seal**

  Change the piston seal as instructed in the analytical pump manual.

- **Insufficient equilibration time**

  The system is equilibrated when the detector background returns to the value for the initial eluent composition. Although this usually takes 15 minutes, equilibration times vary widely, depending on the PGM File or Method in use.

  After a gradient elution, the system is typically equilibrated in 5 to 10 minutes. However, after a substantial eluent change (for example, after column cleaning), 30 to 45 minutes is normal.

  Begin increasing the equilibration time (in increments of several minutes) until consecutive injections of a standard give reproducible retention times.

- **Malfunctioning proportioning valve (gradient pump only)**

  Run an isocratic PGM File or Method, using a container with the correct eluent composition. If the retention time is recovered, the proportioning valve is defective. Replace the valve as instructed in the pump manual.

- **Analytical pump requires validation**

  Pump validation is included in the software qualification programs. Follow the instructions in the software user's guide or online Help to validate the pump performance. If this does not isolate the cause of the problem, contact Dionex Technical Support for assistance.

10.28 Abnormal Shift in Retention Time

- **Incorrect eluent composition or concentration**

    1. Prepare fresh eluent. An eluent that is excessively strong causes peaks to elute more quickly (and vice versa).

        When preparing eluents, use reagent-grade chemicals or chemicals of the purity recommended in the column manual. Use only ASTM Type II (18.0 megohm/cm resistance or 1 μS) deionized water.

    2. The gradient pump proportioning valve may be malfunctioning (applicable when the gradient pump is proportioning the eluent by combining eluents from more than one container).

        Check the proportioning valve operation as follows:

        Run an isocratic PGM File or Method, using a container with the correct eluent composition. If the retention time is recovered, the proportioning valve is defective. Replace the valve as instructed in the pump manual.

    3. If an eluent generator is installed, verify that the correct concentration and flow rate combination is programmed in the PGM File or Method. Refer to the eluent generator manual for details.

- **Incorrect flow rate through system**

    1. Verify that the selected flow rate is the one specified by the analytical protocol.

    2. Verify that the analytical pump is delivering the correct flow rate by measuring the eluent flow rate after the column, using a stopwatch and graduated cylinder. If the pump needs to be recalibrated, follow the instructions on the **FLOW CALIBRATION** screen (go to the **DIAGNOSTIC MENU**, select **CALIBRATION MENU**, and select the **FLOW CALIBRATION** option).

    3. Locate and eliminate any liquid leaks in the chromatography flow path.

    4. Pump validation is included in the software qualification programs. Follow the instructions in the software user's guide or online Help to validate the pump performance. If this does not isolate the cause of the problem, contact Dionex Technical Support for assistance.

- **System not equilibrated after eluent change**

  The system is equilibrated when the detector background returns to the value for the initial eluent composition. Although this usually takes 15 minutes, equilibration times vary widely, depending on the PGM File or Method in use.

  After a gradient elution, the system is typically equilibrated in 5 to 10 minutes. However, after a substantial eluent change (for example, after column cleaning), 30 to 45 minutes is normal.

- **Contaminated or expended trap column**

  A trap column removes trace impurities from eluents (mobile phases) and/or carbonate from hydroxide eluents. Over time, the column will become expended. Follow the instructions in the column manual to clean or regenerate the column.

- **Contaminated guard or analytical column**

  Column contamination can also lead to a loss of column capacity, which will result in poor resolution and shortened retention times.

  Clean the column as instructed in the column manual. If this does not eliminate the problem, replace the column.

- **System temperature differs from that normally used for analysis (applicable when using a column heater)**

  Verify that the system temperature is correct.

10.29 Poor Linear Curve

Poor linearity is indicated by a poor correlation coefficient from the linear regression data.

- **Dilution vessel does not empty between runs**

    1. Sample may be carrying over from injection to injection. Edit the PGM File or Method to allow more time for the dilution vessel to drain.
    2. When a PGM File or Method that involves dilution is terminated while the dilution vessel is being filled or emptied, diluted sample or standard may remain in the vessel. Purge the vessel as follows: Press **Local/Remote** on the CC80 front panel to select Local mode, and then press **Drain**. The drain operation is programmed to take 3 minutes.

        If the vessel empties in less than 3 minutes, you may manually terminate the drain operation. Before doing so, check the dilution vessel waste line: if there is no liquid in the line, the vessel is empty. To terminate the drain operation, either press **Drain** again or press **Gas Valve** (this vents the dilution vessel).

- **Loading pump not operating properly**

    Refer to Section 10.10 through Section 10.13.

- **Dilution pump not operating properly**

    Refer to Section 10.14 and Section 10.15.

- **Too much sample loaded onto concentrator**

    Strongly-retained ions may be rinsing more weakly-retained ions off the concentrator column. Concentrate 5 mL less of sample; if linearity improves, continue decreasing the sample amount until linearity fails to improve. Increase the sample amount in increments of 5 mL, if desired, as long as linearity remains acceptable.

- **Chromatographic system overloaded**

    1. Decrease the concentration of analytes in the standard.
    2. Check the column manual for troubleshooting advice.

10.30 Baseline Drift

- **Incorrect regenerant flow rate**

  If the baseline drifts steadily upward or downward, adjust the regenerant flow rate to level out the baseline. Decreasing the flow rate usually raises the baseline, while increasing the flow rate usually lowers the baseline.

- **Eluents or reagents improperly made**

  Remake the eluent and reagent. When preparing eluents, use reagent-grade chemicals or chemicals of the purity recommended in the column manual. Use only ASTM Type II (18.0 megohm/cm resistance or 1 μS) deionized water. Make sure the deionized water used to prepare reagents is 18.0 megohm/cm resistance.

- **Inappropriate SRS operating conditions**

  Refer to the SRS manual for the correct power setting and other operating conditions.

10.31 Baseline Noise—Conductivity Detection System

- **Trapped air in detector cell**

  Refer to the detector manual for corrective action.

- **Detector requires validation**

  Detector validation is included in the software qualification programs. Follow the instructions in the software user's guide or online Help to validate the detector performance. If this does not isolate the cause of the problem, contact Dionex Technical Support for assistance.

10.32 Baseline Noise—Absorbance Detection System

- **Trapped air in detector cell**

  Refer to the detector manual for corrective action.

- **Detector requires validation**

  Detector validation is included in the software qualification programs. Follow the instructions in the software user's guide or online Help to validate the

detector performance. If this does not isolate the cause of the problem, contact Dionex Technical Support for assistance.

10.33 High Background—Conductivity Detection System

A system with a high background generally has excessive noise, also, with a resulting decrease in sensitivity.

- **Incorrect eluent**

  Remake the eluent. Verify that the selected flow rate is the one specified by the analytical protocol.

  Check the column manual for typical background values.

  If an eluent generator is installed, verify that the correct concentration and flow rate combination is programmed in the PGM File or Method. Refer to the eluent generator manual for details.

- **Contaminated eluent**

  Remake the eluent and reagent. When preparing eluents, use reagent-grade chemicals or chemicals of the purity recommended in the column manual. Use only ASTM Type II (18.0 megohm/cm resistance or 1 μS) deionized water. Make sure the deionized water used to prepare reagents is 18.0 megohm/cm resistance.

- **SRS operating incorrectly**

  Refer to the suppressor manual for corrective action.

- **Contaminated or expended trap column**

  A trap column removes trace impurities from eluents (mobile phases) and/or carbonate from hydroxide eluents. Over time, the column will become expended. Follow the instructions in the column manual to clean or regenerate the column.

- **Contaminated analytical column or hardware**

  To determine whether the column is causing the high background, remove the column from the system.

  If the background then returns to normal, either replace the column or clean it as instructed in the column manual.

If the background remains high, the hardware may be contaminated. To check for this, use deionized water as eluent. The background should be less than 2 μS. Isolate the contaminated component by removing components from the system, one by one. Replace or clean the contaminated component.

10.34 High Background—Absorbance Detection System

A system with a high background generally has excessive noise, also, with a resulting decrease in sensitivity.

- **Detector requires validation**

  Detector validation is included in the software qualification programs. Follow the instructions in the software user's guide or online Help to validate the detector performance. If this does not isolate the cause of the problem, contact Dionex Technical Support for assistance.

10.35 Loss of Sensitivity

- **Liquid leaks**

  Tighten any leaking fittings. If a fitting continues to leak, replace it. If the connection is made with 10-32 ferrule fittings, see *Installation of Dionex Liquid Line Fittings* (Document No. 031432) for instructions.

- **Load/inject (LI) valve not operating correctly**

  Refer to the manual included with the Rheodyne rebuild kit for troubleshooting information.

- **Sample loop not filled**

  When using an injection loop, the sample flow should be sufficient to flush the loop with several loop volumes.

- **SRS needs cleaning**

  Clean the suppressor as instructed in the SRS manual.

- **Contaminated concentrator**

  The concentrator column may have been contaminated by impurities in the sample streams, causing a loss of capacity. When this occurs, sample ions are not concentrated as effectively. This results in less sample being injected and an apparent loss of sensitivity.

  To check the concentrator for contamination:

  a. Prepare a standard consisting of two components: a peak that elutes close to the void volume and a peak that is strongly retained. For anions, use 1 ppm F^- and 10 ppm SO_4^{2}. For cations, use 1 ppm Li^+ and 5 ppm K^+.

  b. Disconnect the concentrator from the load/inject (LI) valve and replace it with a 50 µL sample loop.

  c. Install the concentrator in place of the analytical column.

  d. Load the injection loop manually, using a syringe filled with the standard, and inject it. (Note: If preferred, create a PGM File or Method to automate the analysis and data reduction of this capacity test.)

  e. Calculate the column capacity (see Dionex Technical Note 2R). This provides a relative measure of how the current capacity of the concentrator compares to the capacity when the concentrator is new. If the capacity has decreased by more than 30%, clean or replace the concentrator.

  f. If the concentrator column is not the cause of poor sensitivity, clean the suppressor as instructed in the SRS manual. If the problem persists, contact Dionex Technical Support for assistance.

11 • Service

This chapter describes DX-800 service and repair procedures that the user can perform. You may be referred to other product manuals for additional information. These manuals are usually located on the Dionex Reference Library CD-ROM (P/N 053891).

All procedures not included here, including electronics-related repair procedures, must be performed by Dionex personnel. For assistance, contact Dionex Technical Support. In the U.S., call 1-800-346-6390. Outside the U.S., call the nearest Dionex office.

Before replacing any part, refer to the troubleshooting information in Chapter 9 to isolate the cause of the problem.

IMPORTANT **Substituting non-Dionex parts may impair DX-800 performance, thereby voiding the product warranty. Refer to the warranty statement in the Dionex Terms and Conditions for more information.**

11.1 Eliminating a Fluid System Restriction

A restriction in the fluid system (crimped tubing, etc.) can cause excessive system backpressure. This, in turn, may cause leaks or irreparable damage to system components.

1. Begin pumping eluent (mobile phase) through the system (including the columns) at the flow rate normally used.
2. Refer to the appropriate fluid schematic (P/N 051833 for the SP81, P/N 051860 for the SP82, P/N 051861 for the SP83, or P/N 051862 for the SP84). Work backward through the system, beginning at the cell exit. One at a time, loosen each fitting and check the pressure. The connection at which the pressure drops indicates the point of restriction.
3. Remove the restriction, either by flushing or by replacing the section of tubing.

11.2 Cleaning/Replacing Precision Displacement Pump Check Valves

The loading pump and dilution pump are precision displacement pumps. Depending on the DX-800 configuration, one or both of these pumps is installed on the SP80 Sample Preparation panel. A dirty or worn check valve will cause an erratic flow rate and prevent the pump from delivering the expected volume of liquid.

Removing the Inlet Check Valve

1. Open the front door of the AE80 enclosure. Press **POWER** on the CC80 front panel to turn off the power.
2. Disconnect the Teflon fitting from the inlet check valve (see Figure 11-1).
3. Use a 1/2-in wrench to loosen the check valve housing. Remove the housing and carefully remove the check valve cartridge from the housing.

Removing the Outlet Check Valve

1. Open the front door of the AE80 enclosure. Press **POWER** on the CC80 front panel to turn off the power.

To prevent the pump from inadvertently starting, unplug it from the distribution board and turn off the air supply to the pump.

Pour empêcher la pompe de démarrer par mégarde, débranchez-la du tableau de distribution et coupez-en l'alimentation en air.

Ziehen Sie den Stecker auf der Verteilerkarte und schalten Sie die Luftzufuhr zur Pumpe ab, um zu verhindern, daß die Pumpe versehentlich startet.

2. Disconnect the fitting from the outlet check valve.
3. Use a 1/2-in wrench to loosen the check valve housing. Remove the housing and carefully remove the check valve cartridge from the housing.

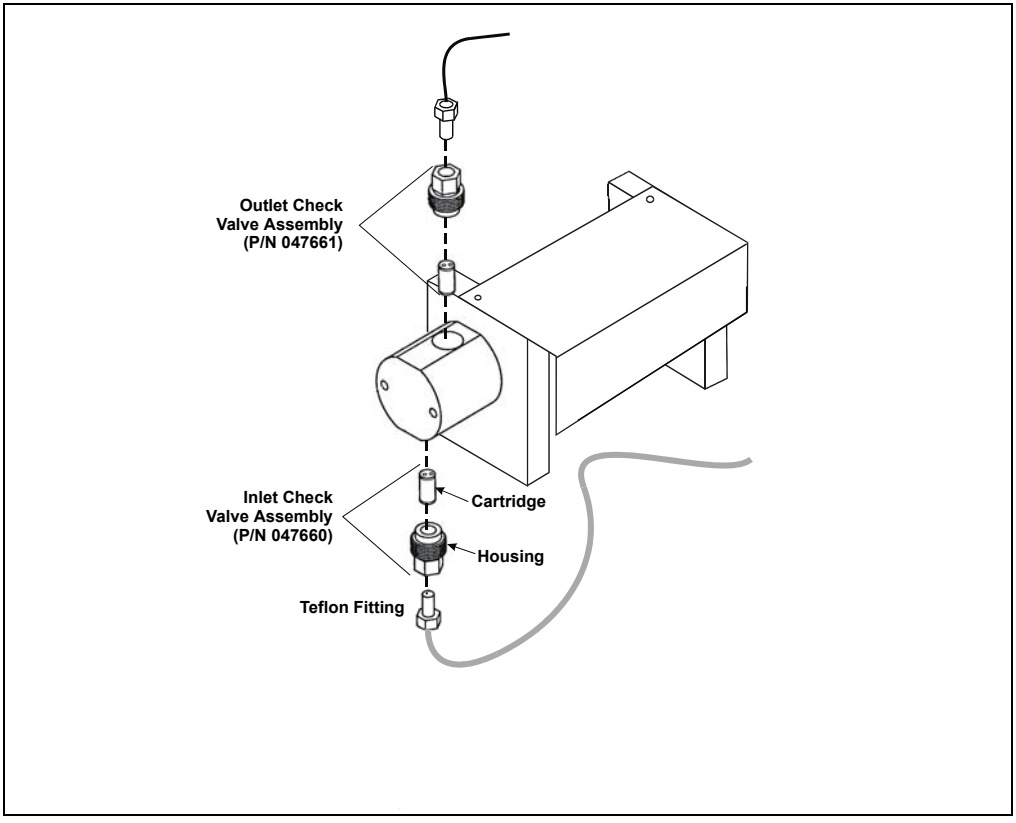


Figure 11-1. Precision Displacement Pump Check Valves

Cleaning the Check Valves

1. Place the check valve housings and cartridges in a beaker with methanol. Sonicate or agitate for several minutes.
2. Rinse each check valve housing and cartridge thoroughly with filtered, deionized water.

Replacing the Inlet Check Valves

1. The inlet check valve assembly housing has a 1/4-28 port. Replace the cartridge in the inlet check valve housing so that the double-hole end of the cartridge is visible. Liquid flows through the check valve in the large single hole and out the small double holes.
2. Reinstall the check valve. Tighten only enough to seat (25 in-lb torque). If the cartridge leaks again, it is cracked and should be replaced.

Overtightening may damage the pump head and the check valve housing and crush the check valve seats.

Replacing the Outlet Check Valves

1. The outlet check valve assembly housing has a 10-32 port. Replace the cartridge in the outlet check valve housing so that the single-hole end of the cartridge is visible. Liquid flows through the check valve in the large single hole and out the small double holes.
2. Reinstall the check valve. Tighten only enough to seat (25 in-lb torque). If the cartridge leaks again, it is cracked and should be replaced.

Overtightening may damage the pump head and the check valve housing and crush the check valve seats.

Completing the Procedure

1. Reconnect the liquid lines.
2. Press **POWER** on the CC80 to restore power. Close the front door of the AE80 enclosure.
3. Prime the system. If the system will not prime and all other possible causes of the problem have been eliminated, replace the check valve cartridge (P/N 047755).

11.3 Changing a CC80 Fuse

1. Press **Emergency Off** on the front door of the DX-800 enclosure to turn off the main power.

HIGH VOLTAGE—Disconnect the main power cord from its source and also from the POWER IN connector on top of the DX-800 enclosure.

HAUTE TENSION—Débranchez le cordon d'alimentation électrique principale de sa source et aussi du connecteur POWER IN (Entrée du courant) sur le dessus de l'enceinte du DX-800.

HOCHSPANNUNG—Ziehen Sie das Netzkabel aus der Steckdose und der POWER IN-Buchse oben auf dem Gehäuse des DX-800.

2. Open the enclosure door. Loosen the two retaining screws in the module chassis. Grasp the chassis by the sides and pull it forward just until the first stop on the sliders is engaged.

Do not pull the chassis beyond the slider stops. The chassis can become disengaged from the enclosure.

Ne tirez pas le châssis au-delà des butées du mécanisme coulissant. Le châssis peu se détacher de l'enceinte.

Ziehen Sie die Montageplatte nicht über die Arretierungen hinaus. Sie könnte sich sonst vom Gehäuse lösen.

3. Use a Phillips screwdriver to loosen, but not remove, the screw in each corner of the top cover of the CC80.
4. The fuse holders are near the front left corner of the CC80 (see Figure 11-2). One at a time, remove each of the five fuse holders from the DIN rail and check the fuse with an ohmmeter. If the fuse is not open, reinstall the fuse holder. If the fuse is open, replace it with a new fuse.

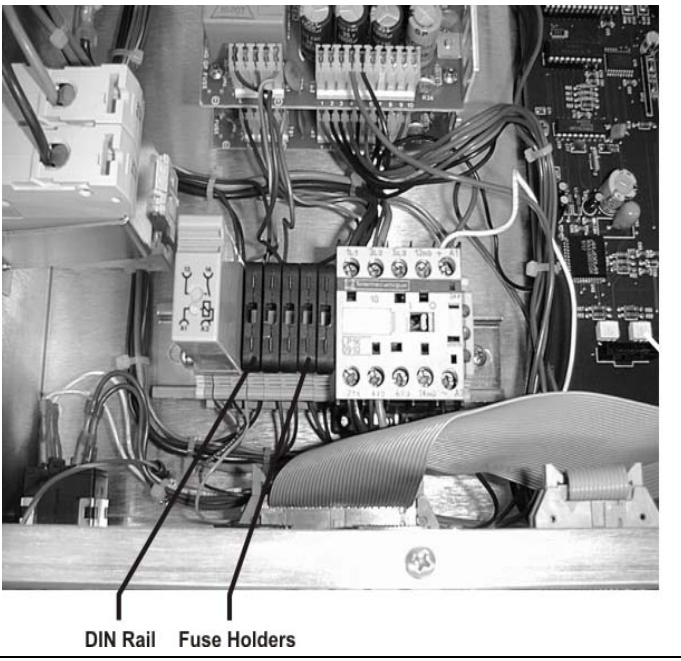


Figure 11-2. Changing a CC80 Fuse
CC80 Top Cover Removed—Top View

To replace a fuse:

a. Hold the fuse holder with the cover (which reads "Open Here") facing upward. Insert the end of a small screwdriver into the recessed lock of the cover and pop it open.

b. Remove the old fuse (see Figure 11-3) and insert a new 3.15 amp fast-blow IEC 127 fuse (P/N 954745). Close the cover.

c. Hold the fuse holder with the cover facing to the right, and push it into the DIN rail. The fuse holder is keyed to fit only in its proper orientation.

5. Replace the top cover of the CC80. Push the module chassis back into the enclosure and tighten the retaining screws.

6. Close the enclosure door. Reconnect the main power cord and push **Power Reset** to restore power.

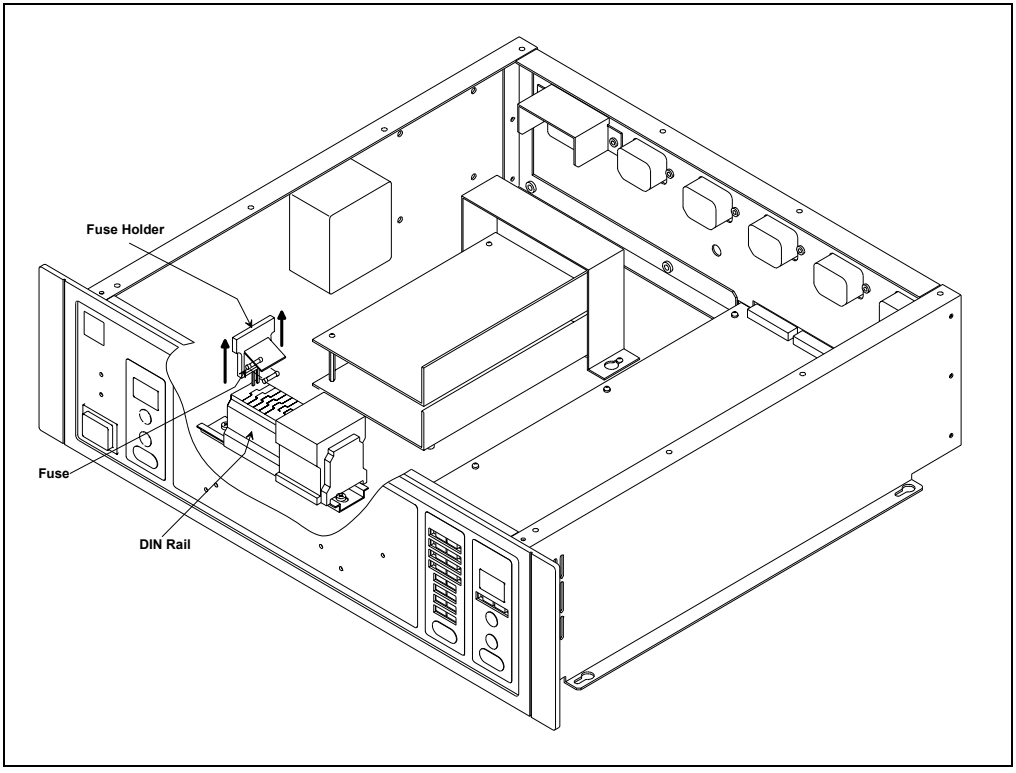


Figure 11-3. Changing a CC80 Fuse
CC80 Top Cover Removed—Cutout View

12 • TTL and Relay Control

Eight TTL inputs and two relay outputs are located on the CC80 rear panel:

- The TTL inputs allow external devices to activate various analyzer functions (see Section 12.1).
- The relay outputs allow the CC80 to control functions in external devices (see Section 12.2.2).

An internal cable connects the CC80 connectors to the **TTL/Relay** connector on top of the AE80 enclosure. See Section 12.3 for connection instructions.

12.1 TTL Input Control

The eight TTL inputs on the CC80 rear panel allow an external device to trigger one or more of the following analyzer actions:

- Display an alarm on the CC80 front panel
- Turn on a relay
- Shut down the channel
- Put the channel in standby
- Bypass an injection from a specified sample

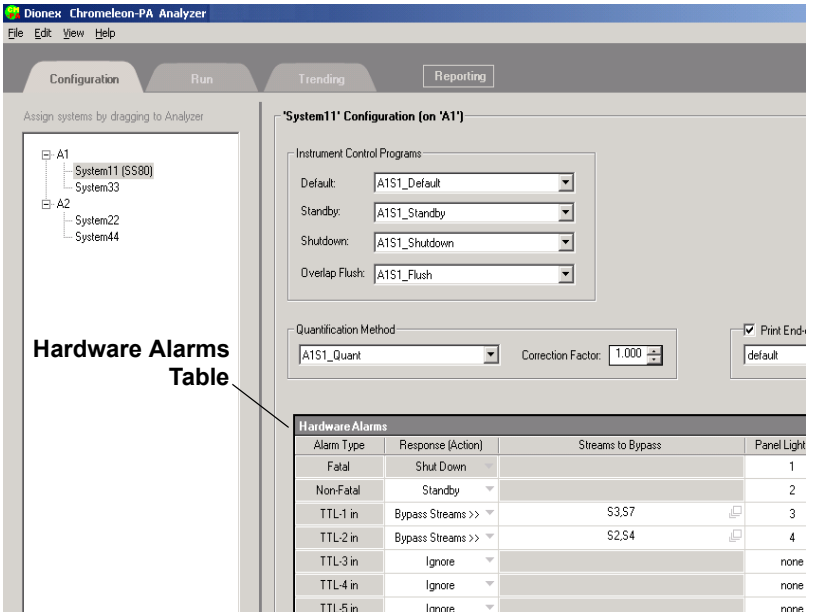
For example, you can connect a flow sensor on a sample pipe to one of the TTL inputs. If the sample stops flowing, the sensor signals the TTL and the analyzer bypasses that sample source.

12.1.1 Configuring TTL Input Actions in Chromeleon-PA

NOTE Refer to the Analyzer user's guide or online Help for details about how to configure analyzers.

1. Open the Analyzer program.
2. Select the **Configuration** tab.

   The **Configuration** page is displayed.
3. In the tree control in the left pane, select the system whose TTL inputs you are configuring.



4. In the **Hardware Alarms** table in the right pane, select the desired action(s) for each connected TTL input in the drop-down list.
   - **Relay Out (1-2)**: Select **1** or **2** to open the corresponding relay output. Select **None** to close the relay outputs.
   - **Panel Light (1-4)**: Select **1**, **2**, **3**, or **4** to turn on the corresponding CC80 front panel alarm light. Select **None** if you do not want the front panel alarm lights to turn on.

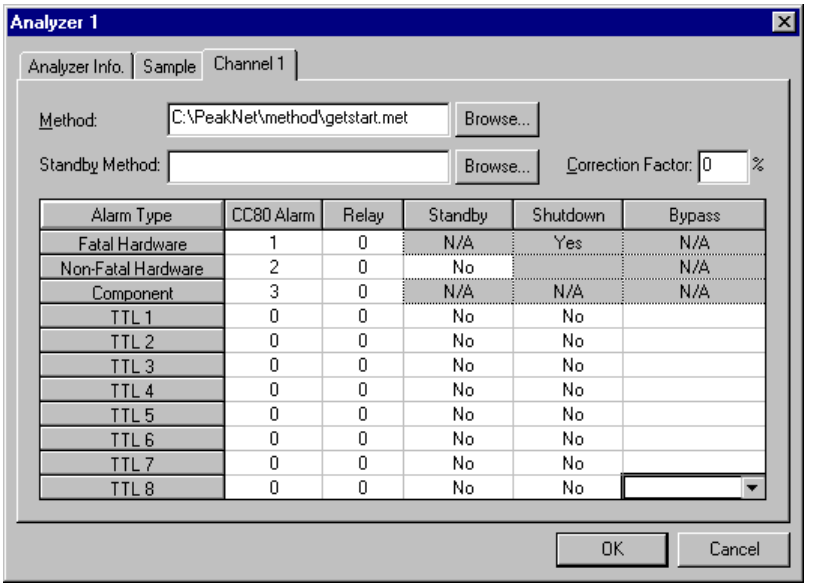
- **Action**: Select one of the following actions for each alarm type: **Shutdown** (to shut down the system), **Ignore** (to ignore the alarm), **Standby** (to place the system in standby), or **Bypass** (to skip an injection from a specified sample valve).
- **Streams to Bypass**: This cell is enabled when you select **Bypass** (see above). Click the cell to open a dialog box where you specify the valve position for which injections will be skipped.

NOTE **If the relay outputs are configured to change states with alarm events, do not configure them in CC80 PGM Files to control devices. If they are configured with alarms, always include a sample preparation step that closes the relays at the beginning of the CC80 PGM File (see Section 12.2.1). Include the step in all CC80 PGM Files used with the system.**

12.1.2 Configuring TTL Input Actions in PeakNet-PA

NOTE Refer to the PeakNet-PA user's guide or online Help for details about how to configure analyzers.

1. Open the Analyze program and select **Analyzer Configuration** on the **Edit** menu.
2. Select the analyzer and then click the **Edit** button.
3. Select the tab for the channel whose TTL inputs you are configuring.



4. On the channel tab page, enter the desired action(s) for each connected TTL input. **Note:** Cells that are gray cannot be edited.
   - **CC80 Alarm**: Enter **1**, **2**, **3**, or **4** to turn on the corresponding CC80 front panel alarm light.
   - **Relay Out**: Enter **1** or **2** to open the corresponding relay output.
   - **Standby**: Select **Yes** to place the channel in standby.
   - **Shutdown**: Select **Yes** to shut down the channel.

- **Bypass**: Select a sample valve position from the drop-down list to skip injections for that sample.

NOTE **If the relay outputs are configured to change states with alarm events, do not configure them in CC80 Methods to control devices. If they are configured with alarms, always include a sample preparation step at the beginning of the CC80 Method that closes the relays (see Section 12.2.2). Include the step in all CC80 Method files (*.met) or sample preparation files (*.spr) used with the channel.**

12.1.3 TTL Input Signal Mode

This description of the TTL input signal mode is applicable if you are running:

- Chromeleon-PA and a CC80 with Moduleware Version 5.29 and later installed *or*
- PeakNet-PA and a CC80 with Moduleware Version 5.26, 5.27, or 5.28 installed

The TTL inputs are, by default, active on a positive edge signal (see Figure 12-1). If the input goes from low (0 V, closed) to high (+5 V, open), the configured action occurs. This follows the logic that a closed circuit with continuity is normal and an open circuit is an exception (alarm).

For the CC80 alarm, relay control, and sample bypass actions, the action remains on as long as the TTL input is high. If the input returns to low, the action is turned off. For example, if an external device triggers a CC80 front panel alarm, the alarm remains on as long as the input is at +5 V (open). When the input returns to 0 V (closed), the alarm turns off. For the channel standby and shutdown actions, returning the TTL to low has no effect.

In Chromeleon, you can check the TTL state as follows:

- Press the F8 key to display the Commands dialog box, select the input whose status you want to check, and click the + character preceding the name to display details about the selected input.

- If the TTL input function is linked to a switch on the CC80 control panel, the TTL state is displayed on the control panel.

In the PeakNet-PA Run program (on the channel's system window), the arrow icon for each CC80 TTL input indicates the TTL state:

 indicates the TTL input is closed

 indicates the TTL input is open

The table below summarizes the TTL input mode functions:

TTL Inputs	Input Signal Mode	Voltage	PeakNet-PA Display	Programmed Action (Chromeleon or PeakNet-PA)
1–8	Positive	0		Turned on
	Edge	+5		Turned off* or no effect**

* The CC80 alarm, relay, and valve bypass actions are turned off.
** The standby and shutdown actions are not affected.

NOTE A DIP switch can be used to change the TTL input signal mode. For details, see Section 12.4.

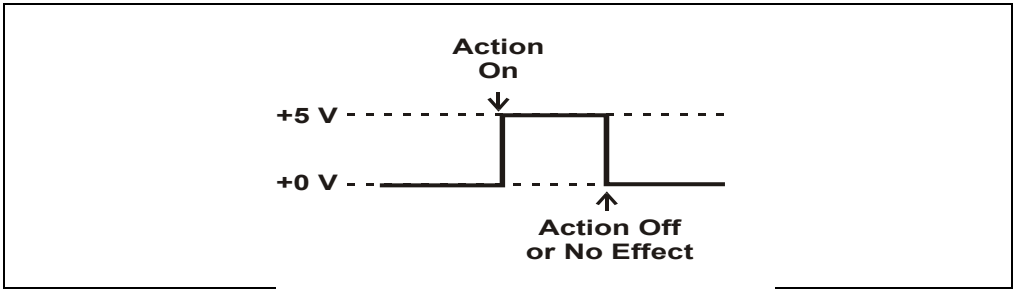


Figure 12-1. Positive Edge TTL Input Signal Mode

12.2 Relay Output Control

Relay outputs 1 and 2 can be programmed to switch any low-voltage control. Switched current must be less than 200 mA and 60 V peak blocking.

Relay loads in excess of 200 mA or with included power supplies over 60 V may damage the relay drivers on the CPU module.

The relay output states are controlled via the software. There are three control options:

- Change the relay's state immediately (*Direct Control*)

  Chromeleon-PA: see Section 12.2.1; PeakNet-PA: see Section 12.2.2

- Program the relay's state change in a CC80 PGM File or Method (*Method Control*)

  Chromeleon-PA: see Section 12.2.1; PeakNet-PA: see Section 12.2.2

- Configure the relay's state change as a function of an alarm condition or a TTL input

  Chromeleon-PA: see Section 12.1.1; PeakNet-PA: see Section 12.1.2

12.2.1 Relay Output Control in Chromeleon-PA

NOTE This description of the TTL input signal mode is applicable if you are running Chromeleon-PA and a CC80 with Moduleware Version 5.29 and later installed.

For Direct Control of relay output states:

1. In the Server Configuration program, double-click the CC80 to open its Properties dialog box. Select the **Devices** tab.
2. Click the **Relay1** and/or **Relay2** check boxes to close or open the relays. With the default settings for CC80s with Moduleware Version 5.26 and later installed, checking the box closes the relay (current flows) and clearing the box opens the relay (no current flows).

3. Click **OK** or **Apply**.

   NOTE All settings selected on the Devices tab page will be automatically copied to the Relay and State Devices Options page of the Program Wizard.

4. On the control panel, you can link any switch to the new relay function. Place the mouse cursor on the control. Right-click and select the **Properties...** command on the context menu.

   The Properties dialog box appears.

5. Select the **Link** tab.
6. Under **Object**, select the relay. In the **Object Property** field, select a property from the list. Clicking **OK** links the control to the destination and property.

For Method Control of relay output states:

1. Start the Chromeleon Server Monitor, and then start Chromeleon.
2. Open the PGM File that will control the relay outputs.
3. Add the following commands:

```
0.000      RELAYNAME.State          =On/Off

0.000      RELAYNAME.Duration       =Value[ sec]
```

NOTE If the relay outputs are configured to change states with alarm events (see Section 12.1.1), do not configure them in CC80 PGM Files to control devices. If they are configured with alarms, always include a sample preparation step at the beginning of the CC80 PGM File that closes the relays. Include the step in all CC80 PGM Files used with the relay's channel.

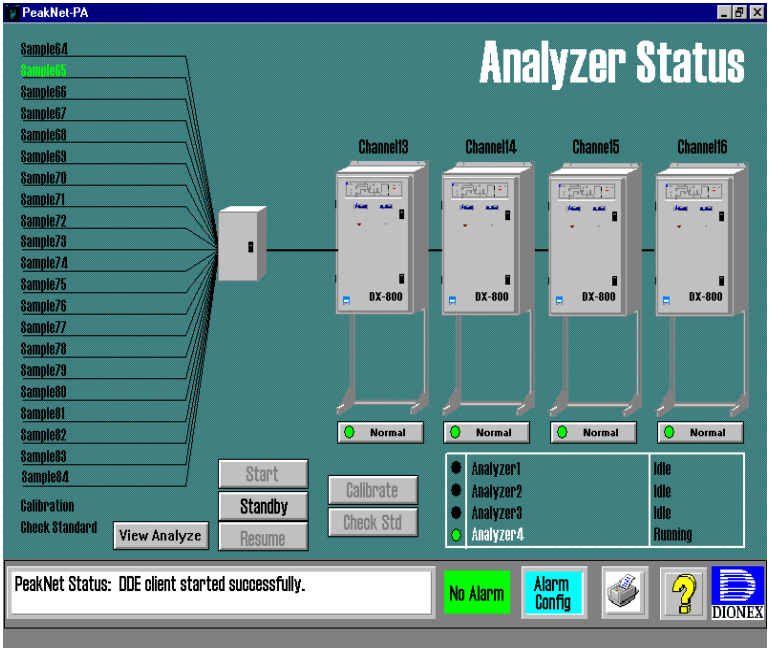
4. Save and close the PGM File.

12.2.2 Relay Output Control in PeakNet-PA

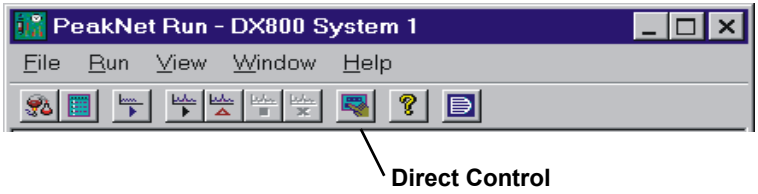
NOTE **This description of the TTL input signal mode is applicable if you are running PeakNet-PA and a CC80 with Moduleware Version 5.26, 5.27, or 5.28 installed.**

For Direct Control of relay output states:

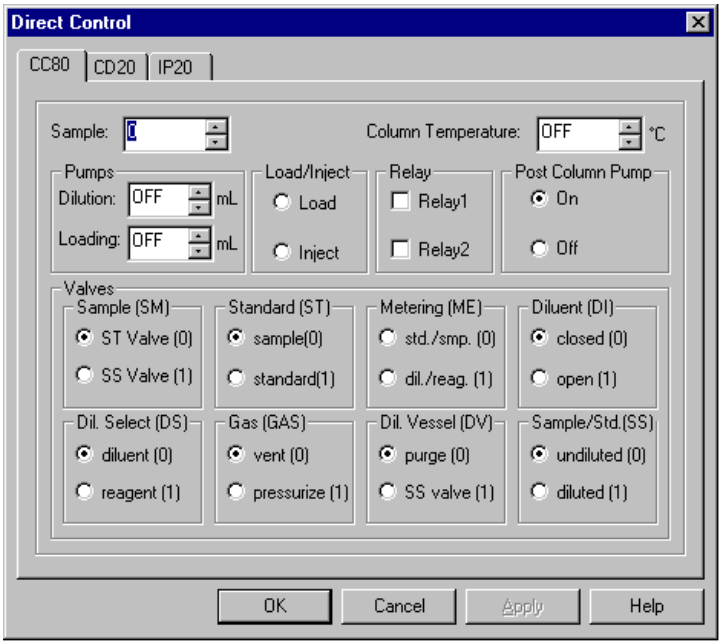
1. On the InTouch Analyzer Status screen, click the picture of the channel whose relays you are setting.



2. On the Run program system window, select the **Direct Control** toolbar button.



3. The Direct Control dialog box appears. Select the **CC80** tab.



4. Click the **Relay1** and/or **Relay2** check boxes to close or open the relays. With the default settings for CC80s with Moduleware Version 5.26 and later installed, checking the box closes the relay (current flows) and clearing the box opens the relay (no current flows).
5. Click **OK** or **Apply**.

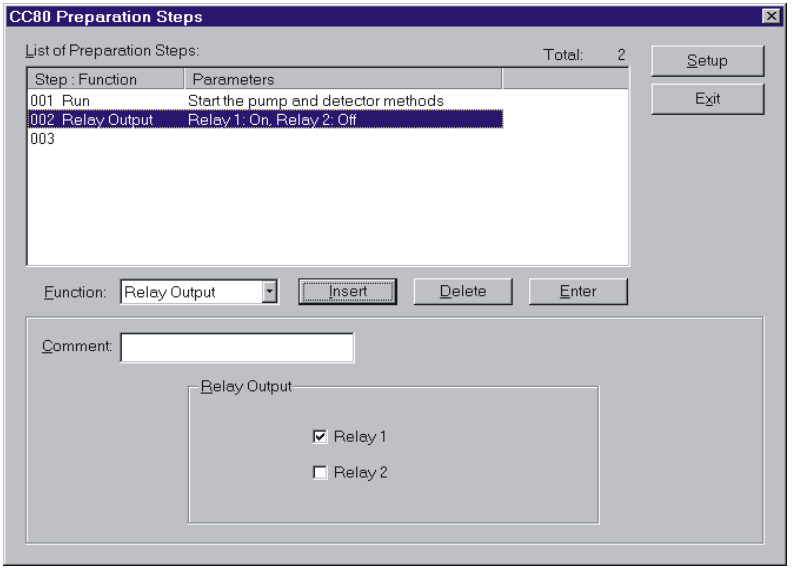
For Method Control of relay output states:

1. Open the PeakNet-PA Method program and open the Method that will control the relay outputs.
2. In the Method window, double-click the CC80 module.

   The CC80 Preparation Steps dialog box appears.
3. To add the relay output control step to the end of the Method, select the blank step at the end of the List of Preparation Steps. Otherwise, select the step below where you want to add the new relay control step.

4. Select **Relay Output** from the **Function** drop-down list. Click the **Relay1** and/or **Relay2** check boxes to open or close the relays. With the default settings for CC80s with Moduleware Version 5.26 and later installed, checking the box closes the relay (current flows) and clearing the box opens the relay (no current flows). In the List of Preparation Steps, a closed relay (checked box) is labeled "On."
5. Click the **Insert** button.

NOTE **If the relay outputs are configured to change states with alarm events (see Section 12.1.2), do not configure them in CC80 Methods to control devices. If they are configured with alarms, always include a sample preparation step at the beginning of the CC80 Method that closes the relays. Include the step in all CC80 Method files (*.met) or sample preparation files (*.spr) used with the relay's channel.**



12.3 TTL and Relay Connections

Two TTL input and relay output connectors (**P1** and **P2**) are on the CC80 rear panel. An internal cable connects the CC80 connectors to the **TTL/Relay** connector on top of the AE80 enclosure (see Figure 12-2).

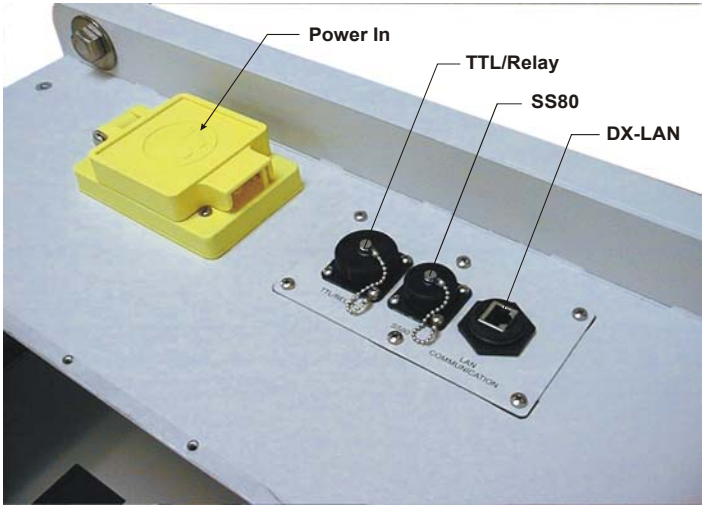


Figure 12-2. Top View of AE80 Enclosure Electrical I/O Panel

To connect a TTL input or Relay output to an external device:

1. Connect the DX-800 TTL/Relay cable (P/N 052899) to the **TTL/Relay** connector on the AE80 top panel (see Figure 12-2).

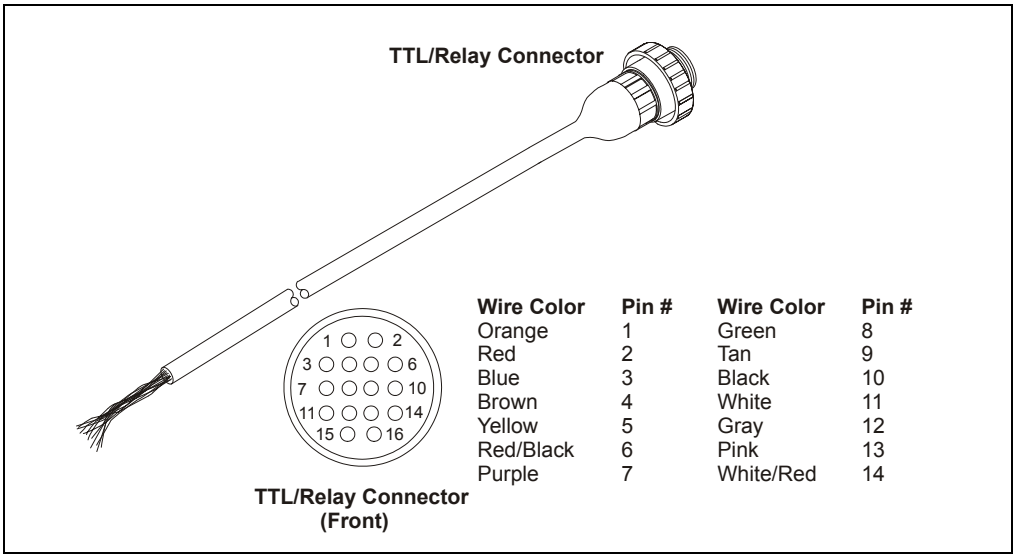


Figure 12-3. TTL/Relay Cable and Connector Pinout

2. Connect the required wires (refer to the table below) to the TTL or relay connector on the external device. Check the polarity of the connection. Connect signal wires to signal (+) pins and ground (-) pins.

TTL/Relay		Wire Color	TTL/Relay		Wire Color
TTL Input 1	+	Orange	TTL Input 6	+	Purple
	-	Red/Black		-	Black
TTL Input 2	+	Red	TTL Input 7	+	Green
	-	Red/Black		-	Black
TTL Input 3	+	Blue	TTL Input 8	+	Tan
	-	Red/Black		-	Black
TTL Input 4	+	Brown	Relay Output 1	+	White
	-	Red/Black		-	Gray
TTL Input 5	+	Yellow	Relay Output 2	+	Pink
	-	Red/Black		-	White/Red

12.4 Alternate TTL Input Signal and Relay Output Modes

The functionality of the CC80 TTL inputs and relay outputs changed with the release of CC80 Moduleware Version 5.26 (and PeakNet-PA Version 5.21). The new default modes are appropriate for nearly all installations. However, because exceptions do exist, the information in this section is provided for reference.

DIP switch #2 on the rear of the CC80 front panel controls the TTL input signal and relay output modes.

TTL Input Signal Modes

DIP switch #2, position 2 (SW2.2), controls the signal mode for the TTL inputs. When SW2.2 is ON (the default), all eight TTL inputs are active on a positive edge signal, as described in Section 12.1.3.

When SW2.2 is OFF, TTL inputs 1 through 4 are active on a negative edge and TTL inputs 5 through 8 are active on a negative pulse.

NOTE In many Dionex modules, the negative edge and negative pulse modes are referred to as *normal* edge and normal pulse. The positive edge mode is referred to as *inverted* edge. However, in order to comply with industrial installation requirements, the CC80 is configured to function differently.

Relay Output Modes

DIP switch #2, position 3 (SW2.3), controls the mode for the relay outputs. When SW2.3 is OFF (the default), the relay contact closures are normally open. Activating a relay closes it (current flows).

When SW2.3 is ON, the relay contact closures are normally closed. Activating a relay opens it (no current flows).

NOTE In the software, the graphical display for the relays is the same for both switch settings. A closed relay icon means the relay is off and an open relay icon means the relay is on.

A • Specifications

NOTE **For specifications for the analytical pump, detector, eluent generator, or SRS, refer to the relevant user manual. For installation requirements, refer to *Installation Requirements and Customer Responsibilities* (Document No. 031176).**

A.1 Electrical

Main Power Requirements	100 to 120 Vac, 15 A, 50/60 Hz maximum; 220 to 240 Vac, 7.5 A, 50/60 Hz maximum The DX-800 power supply is main voltage auto-sensing; no manual adjustment is required.
Air Conditioner or Blower	115 Vac, 12 A, 60 Hz maximum
Fuse Requirements	Five 3.15 amp fast-blow IEC 127 fuses (P/N 954745)

A.2 Environmental

Ambient Operating Temperature	**(with ventilation)** 4 to 40 °C (40 to 105 °F) **(with conductive cooler)** 10 to 35°C (50 to 95 °F) **(with air conditioner)** 10 to 55 °C (50 to 130 °F)
Operating Humidity	5 to 95% relative humidity, noncondensing

A.3 Physical

Dimensions **(with ventilation)**
93 x 58 x 58 cm (37 x 23 x 23 in)
(with purge-and-pressurization unit)
118 x 72 x 58 cm (46 x 28 x 23 in)
(with air conditioner)
113 x 58 x 58 cm (44 x 23 x 23 in)

Weight **(with ventilation)**
124 kg (275 lbs)
(with purge-and-pressurization unit)
132 kg (290 lbs)
(with air conditioner)
168 kg (370 lbs)

Decibel Level 75 db (at "A WEIGHTING" setting)

A.4 Pumps

A.4.1 Dilution Pump

Type Single-piston

Operating Pressure 3.5 to 21 MPa (500 to 3000 psi)

Flow Rate 15 mL/min, maximum

12.4.1 Loading Pump

Type Single-piston

Operating Pressure 3.5 to 21 MPa (500 to 3000 psi)

Flow Rate 3 mL/min, maximum

A.4.2 PC80 Post-Column Reagent Pump (Optional)

Type Single-piston

Operating Pressure 3.5 to 13 MPa (500 to 1900 psi)

Flow Rate 0.2 to 1 mL/min

A.5 Valves

A.5.1 Check Standard (CS) Valve

Type 3-way, electrically-actuated liquid solenoid valve

Operating Pressure 0.7 MPa (100 psi), maximum

A.5.2 Column Switching Valve (Optional)

Type 10-port, electrically-actuated Rheodyne 9650E valve

Operating Pressure 0.7 MPa (100 psi), maximum

A.5.3 Diluent (DI) Valve

Type 2-way, electrically-actuated liquid solenoid valve

Operating Pressure 0.7 MPa (100 psi), maximum

A.5.4 Diluent Select (DS) Valve

Type 3-way, electrically-actuated liquid solenoid valve

Operating Pressure 0.7 MPa (100 psi), maximum

A.5.5 Dilution Vessel (DV) Valve

Type 3-way, electrically-actuated liquid solenoid valve

Operating Pressure 0.7 MPa (100 psi), maximum

A.5.6 Gas Valve

Type 3-way, electrically-actuated gas/liquid solenoid valve

Operating Pressure 0.7 MPa (100 psi), maximum

A.5.7 Load/Inject (LI) Valve

Type 6-port, electrically-actuated Rheodyne 9750E06 valve

Operating Pressure 30 MPa (4000 psi), maximum

A.5.8 Metering (ME) Valve

Type 10-port, electrically-actuated Rheodyne 9650E liquid valve

Operating Pressure 30 MPa (4000 psi), maximum

A.5.9 Sample Select (SM) Valve

Type 3-way, electrically-actuated liquid solenoid valve

Operating Pressure 0.7 MPa (100 psi), maximum

A.5.10 Sample/Standard (SS) Valve

Type 3-way, electrically-actuated liquid solenoid valve

Operating Pressure 0.7 MPa (100 psi), maximum

A.5.11 Standard (ST) Valve

Type 3-way, electrically-actuated liquid solenoid valve

Operating Pressure 0.7 MPa (100 psi), maximum

A.6 Dilution Vessel

Material	SP81, SP82, and SP83: PFA (perfluoroalkoxy) Teflon SP84: High purity polyethylene
Capacity	250 mL
Pressure Relief Valve	Opens at 0.34 MPa (50 psi)

A.7 SS80 Sample Selector (Optional)

Valve(s)	Multiport, electrically-actuated PEEK valves from Rheodyne rated to 5.5 MPa (800 psi); 1, 2, and 3 valves required for control of 7, 14, and 21 sample sources, respectively
Dimensions	50 x 26 x 25 cm (20 x 11 x 10 in)
Weight	14 kg (30 lbs)

A.8 CH-4 Column Heater (Optional)

Power Rating	30 W
Materials	Anodized aluminum
Operating Temperature	From ambient + 5 ºC up to 80 ºC ± 1ºC
Dimensions	Accommodates one 6- or 8-mm OD x 100-, 150-, or 250-mm ID column

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