



LC5 MANUAL INJECTOR INSTALLATION INSTRUCTIONS



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LC5 Manual Injector

1 • Description

1.1 Physical Description

The LC5 Manual Injector provides a Rheodyne injection valve, and mounting hardware and accessories for installing and using the valve in a DX 500 system. The LC5 also includes mounting hardware for installing analytical columns. The LC5 is designed for use in systems that do not require an external electrochemical or conductivity detector cell, or a Self-Regenerating Suppressor (SRS™). These systems typically consist of an AD20 Absorbance Detector, a GP40 Gradient Pump or IP20 Isocratic Pump, a separator column, and optionally a guard column.

Two versions of the LC5 are available: PEEK and stainless steel.

- The PEEK version (P/N 046064) is equipped with a PEEK injection valve, Model 9125 (P/N 046692), and plumbed with PEEK tubing.
- The stainless steel version (P/N 046065) is equipped with a stainless steel injection valve, Model 7725 (P/N 046691), and plumbed with stainless steel tubing.

NOTE

The LC5 does not include brackets or other mounting devices for installing an external detector cell or a suppressor. If you need information about installing these components, contact the nearest Dionex Office.

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Figure 1-1 illustrates the LC5 components.

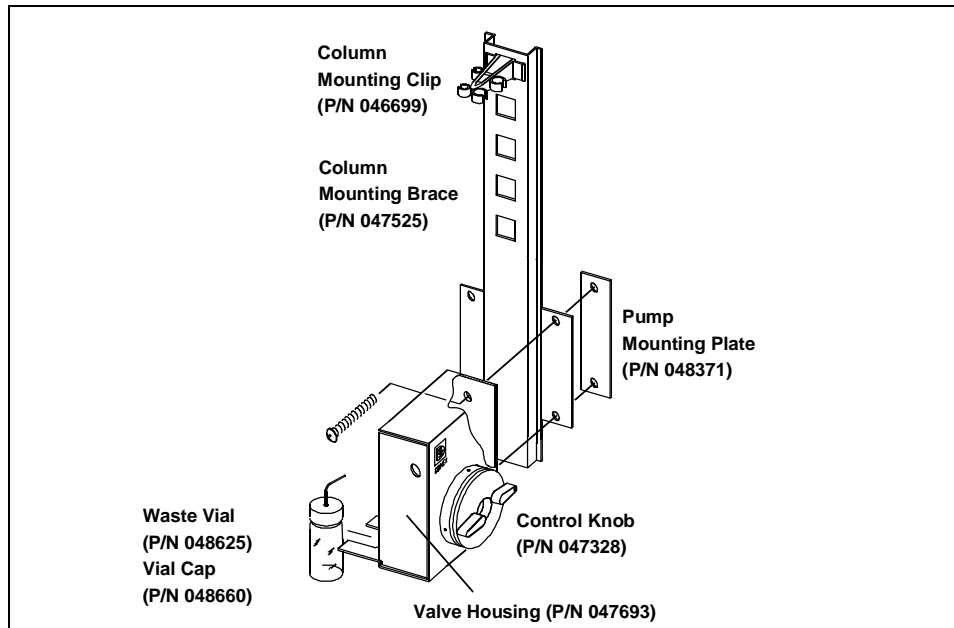


Figure 1-1. LC5 Manual Injector Components

- The column mounting clip has 2-mm clips on one side and 4-mm clips on the other to accommodate 2-mm, 4-mm, and 4.6-mm separator columns. The clip installs onto the column mounting brace.
- The pump mounting plate attaches the LC5 to the side of the pump module.
- The valve housing includes the Rheodyne injection valve, a control knob, and a bracket for holding the waste vial. The valve is a low-volume, 35 MPa (5000 psi) rotary injection valve. The stainless steel model is equipped before shipping with a 20 μ L sample loop; the Ship Kit for the PEEK model includes a 25 μ L loop, which is connected during installation.

- The control knob sets the injection valve to the **LOAD** or **INJECT** position. The needle port in the middle of the knob is used to load sample into the sample loop (see Section 3.1).
- The waste vial slides onto the bracket at the rear of the housing.

The LC5 Ship Kit (P/N 048508, stainless steel; P/N 048509, PEEK) contains all the tubing, fittings, and accessories required for installation and operation of the LC5.

1.2 Functional Description

During an analysis, eluent from the pump enters the Rheodyne injection valve and passes through the sample loop. Eluent then flows out of the injection valve, through the guard column (if present), through the separator column, and on to the detector.

Inside the Rheodyne injection valve, eluent flows through one of two paths, depending on the valve position:

- In the **LOAD** position, eluent flows in from the pump and out to the column without entering the sample loop. When you load the sample, sample flows from the syringe into the valve and through the sample loop, and excess sample flows out to waste.
- In the **INJECT** position, eluent flows in from the pump, through the sample loop, and out to the column (carrying the contents of the sample loop with it).

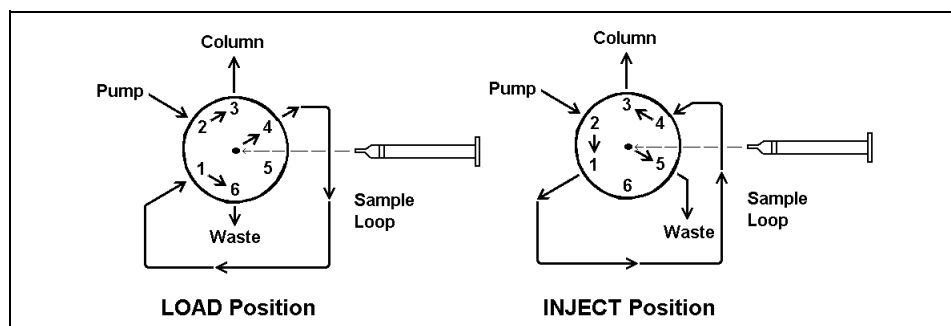


Figure 1-2. Rheodyne Injection Valve Flow Schematics

LC5 Manual Injector

2 • Installation

2.1 Overview

These instructions describe how to install the LC5 in a system that includes an AD20 Absorbance Detector with a GP40 Gradient Pump or IP20 Isocratic Pump. Figure 2-1 shows a typical system configuration.

During installation, the LC5 is attached to the side of the pump module and liquid line connections are made. The plumbing instructions vary, depending on whether the system is PEEK or stainless steel.

NOTE

The instructions in this chapter complement and in some cases duplicate the installation instructions in the pump, detector, and column manuals, but *they do not replace them*. Read the instructions in each of those manuals carefully.

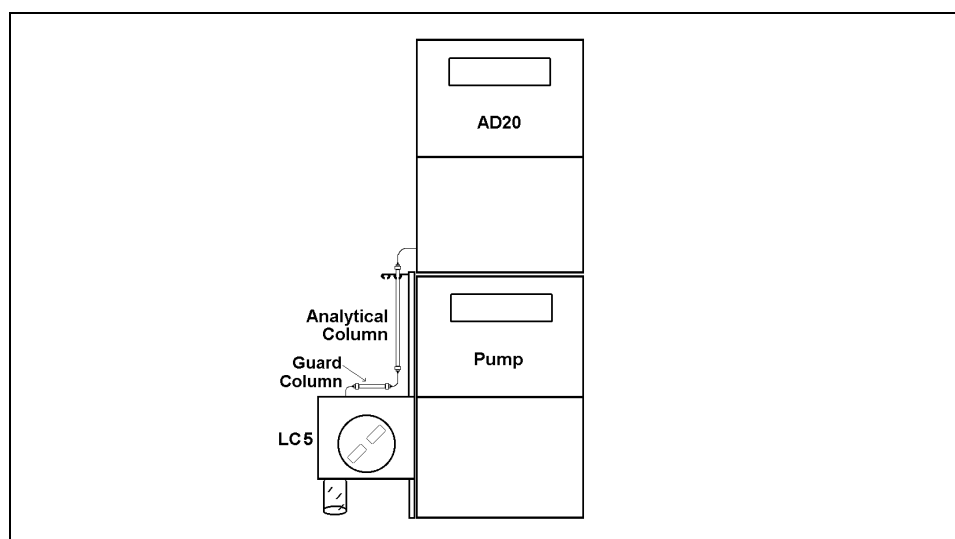


Figure 2-1. LC5 System Configuration

2.2 Attaching the LC5 to the Pump

1. Loosen completely (but do not remove) the two screws holding the pump mounting plate onto the LC5 column mounting brace and valve housing (see Figure 2-2).
2. Open the lower door of the GP40 or IP20 and locate the two slots on the left-hand side of the pump (see Figure 2-2).
3. Keeping the LC5 pump mounting plate separated from the column mounting brace, slide the LC5 back onto the pump module so that the two screws slide into the two slots on the module. The pump mounting plate slides inside the pump module, and the column mounting brace and valve housing stay on the outside of the pump. Slide the LC5 to the back of the slots.
4. Tighten the two screws firmly to secure the LC5 to the pump.

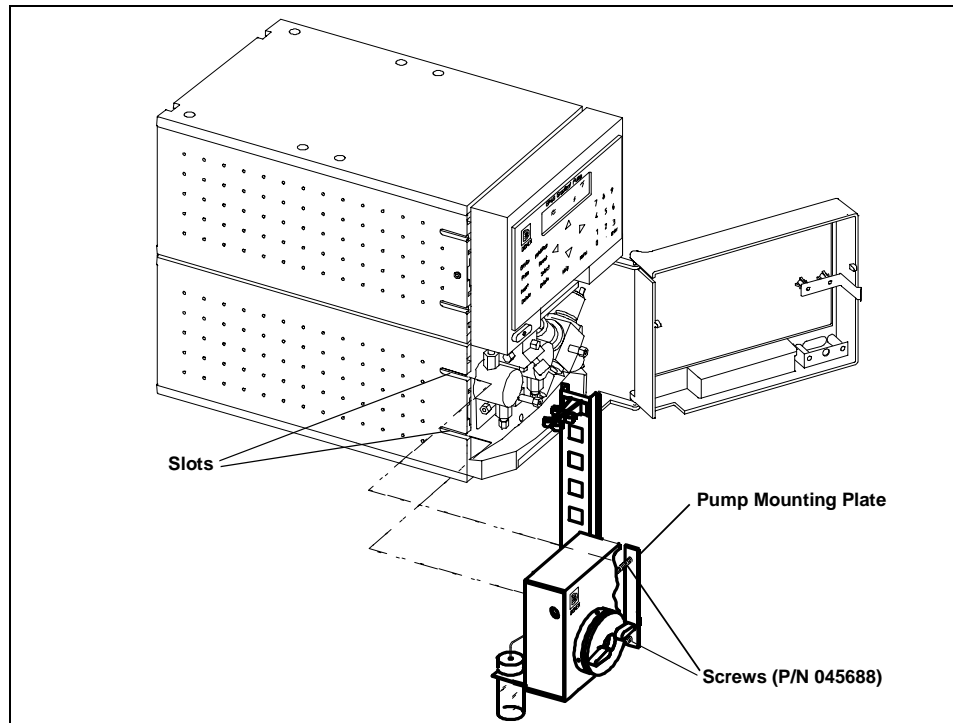


Figure 2-2. Attaching the LC5 to the Pump Module

2.3 Connecting the Liquid Lines

The liquid line connections vary, depending on whether the system is plumbed with PEEK or stainless steel tubing.

- See Section 2.3.1 for stainless steel tubing connections.
- See Section 2.3.2 for PEEK tubing connections.

2.3.1 Stainless Steel Connections

The LC5 Ship Kit contains PEEK covered stainless steel tubing assemblies for connections between system components, and 0.94-mm (0.037-in) ID Tefzel[®] tubing (P/N 037804) for valve waste lines.

NOTE

The stainless steel tubing assemblies are made of microbore stainless steel tubing enclosed in PEEK. If you prefer, use plain stainless steel tubing (with no PEEK covering) in the size appropriate for your system from 0.125-mm (0.005-in) to 0.5-mm (0.020-in) ID. Plain stainless steel tubing is not provided in the Ship Kit.

The LC5 is plumbed with Dionex 1.6-mm (0.062-in) ferrules (P/N 010262) and fittings (P/N 010277). For instructions on how to install ferrule fittings, refer to *Installation of Dionex Ferrule Fittings* (Document No. 034213), provided in the Ship Kit.

Refer to Figures 2-3 and 2-4 while plumbing the system.

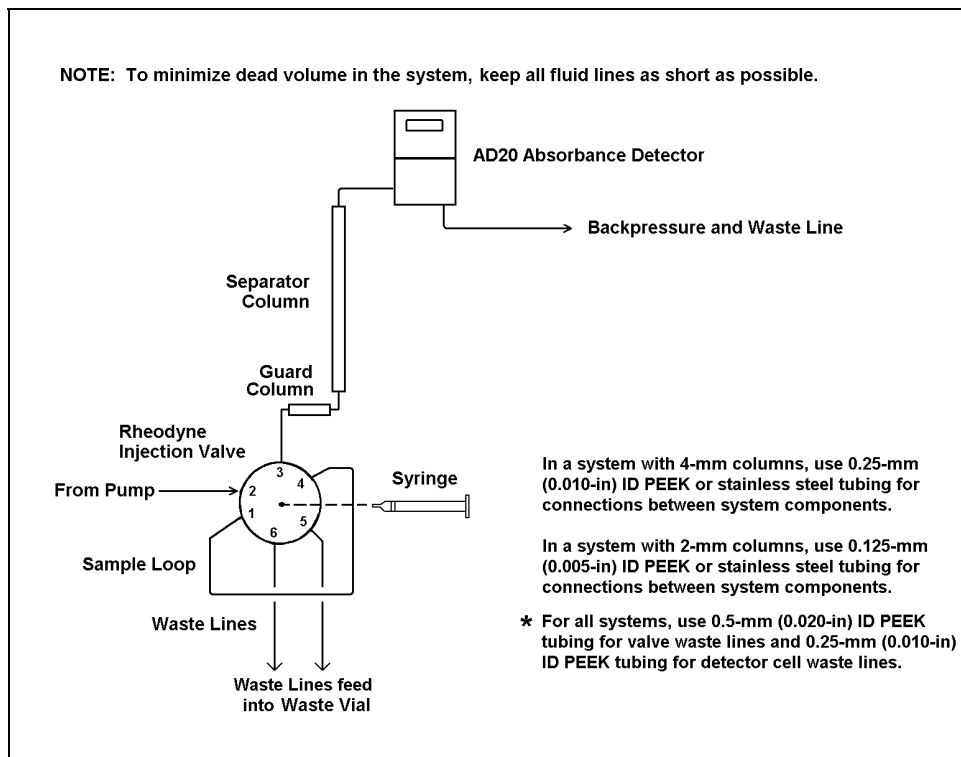


Figure 2-3. LC5 Fluid Schematic

Connect the Rheodyne Injection Valve

1. Locate stainless steel tubing assembly P/N 047820 in the Ship Kit. Connect one end of the assembly to port 2 on the Rheodyne injection valve. (Port numbers are etched on the back of the valve.) Route the tubing through the slot on the lower left side of the GP40 or IP20 and connect it to the pump pressure transducer outlet.
2. Locate stainless steel tubing assembly P/N 047818 in the Ship Kit. Attach one end to port 3 of the Rheodyne valve. The other end will be connected to the separator column or guard column (if used).

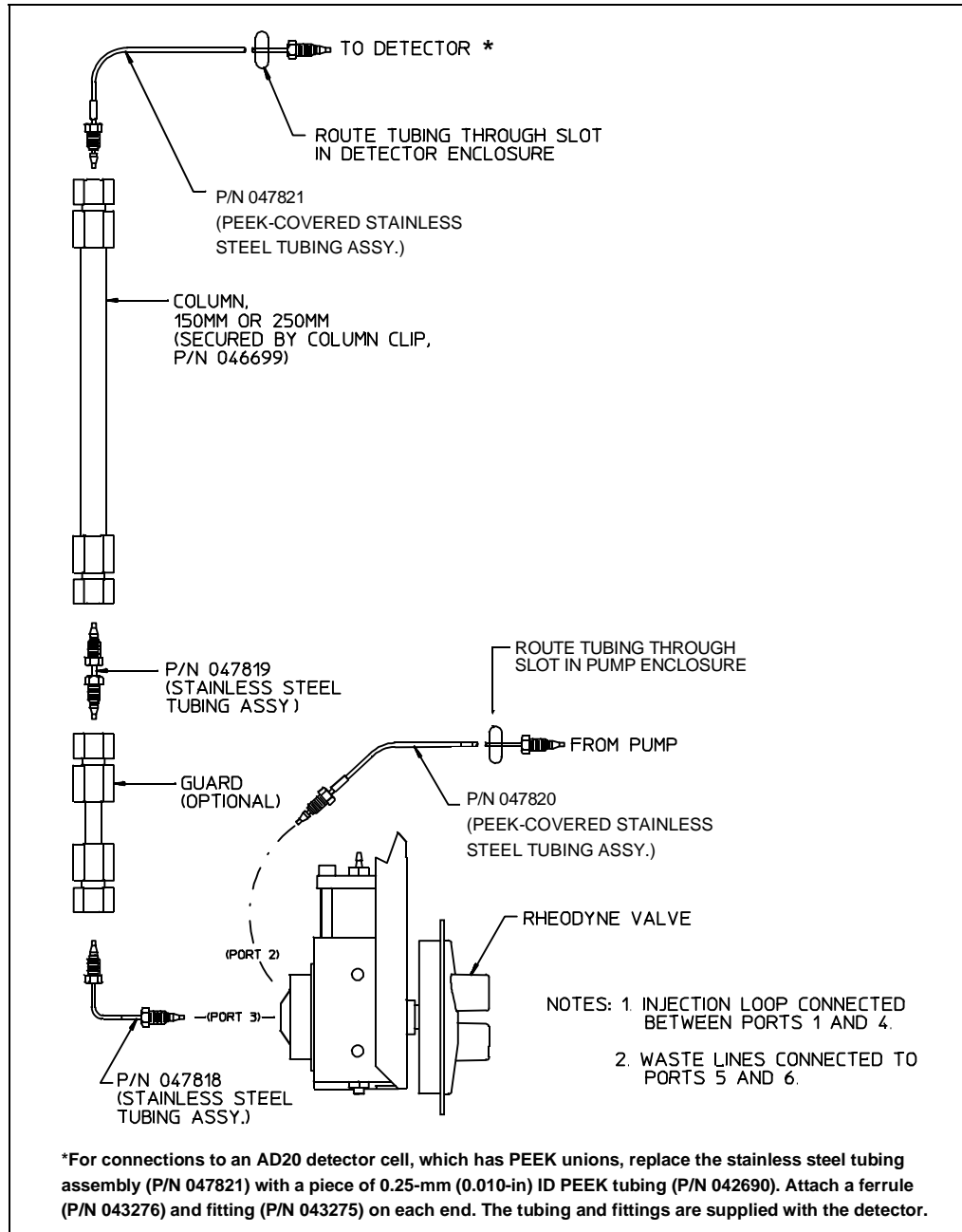


Figure 2-4. Stainless Steel Plumbing Connections

3. Cut two 7.5-cm (3-in) pieces of 0.94-mm (0.037-in) ID Tefzel tubing and install a ferrule and fitting on one end of each piece. Attach one of these lines to port 5 on the Rheodyne valve and the other to port 6. Route the free ends through the opening in the waste vial cap.
4. Slide the waste vial onto the bracket at the rear of the valve housing. The vial cap rests on the bracket.

Connect the Analytical Column

Columns are purchased separately from the LC5.

1. Before installing the column, pump deionized water through the injection valve at 1.0 to 3.0 mL/min for 2 to 5 minutes to clear any air from the liquid lines.
2. Activate the injection valve by switching the position of the control knob between **INJECT** and **LOAD** several times to make sure that no air is trapped in the hydraulic system. Trapped air reduces the column efficiency.
3. Set the flow rate to 2.0 mL/min and verify that the pressure through the system, with no columns installed, is less than 690 KPa (100 psi).
4. Stop the pump.
5. Install the column mounting clip by squeezing the open ends together and inserting them into one of the square openings on the column mounting brace. If you are using a 4-mm column, orient the clip with the larger clips toward the rear. If you are using a 2-mm column, orient the clip with the smaller clips toward the rear.

When the column is correctly mounted, the clip should clasp the column just below the top fittings. The top of the column should be as close as possible to the slot on the left side of the AD20, allowing a short connecting line between the column and the AD20.

6. Each column is shipped with a manual containing specialized installation and start-up instructions. After consulting the column manual for any special requirements, install the column in the LC5.
 - a. Remove the end plugs from the column and store them in a safe place. You must reinstall the end plugs in the column before placing the column in storage.
 - b. If no guard column is used, connect the inlet (bottom) of the analytical column to the tubing assembly connected to port 3 of the Rheodyne valve.
 - c. If connecting a guard column, connect the inlet of the guard column to the tubing assembly connected to port 3 of the Rheodyne valve. Then, locate stainless steel tubing assembly P/N 047819 in the Ship Kit. Connect one end of the tubing to the outlet of the guard column. Connect the other end to the inlet (bottom) of the analytical column.
 - d. **For detectors with PEEK cell unions:**
Cut a piece of 0.25-mm (0.010-in) ID PEEK tubing (P/N 042690) and attach a ferrule (P/N 043276) and fitting (P/N 043275) on each end. Connect one end to the outlet (top) of the column. Route the other end through the slot on the lower left side of the detector and connect it to the detector cell inlet.

For detectors with stainless steel cell unions:

Locate stainless steel tubing assembly P/N 047821 in the Ship Kit. Connect one end to the outlet (top) of the column. Route the other end through the slot on the lower left side of the detector and connect it to the detector cell inlet.

NOTE

A heat exchanger is mounted in the center of the AD20 optical unit, just below the cell. For most applications, connect the column outlet to the inlet of the heat exchanger (the port on the right). Then connect the outlet of the heat exchanger to the detector cell inlet.

7. Snap the column into the column clip on the LC5. The guard column “floats” below the column, held in place only by the connecting tubing.

2.3.2 PEEK Connections

NOTE

See Section 2.3.1 for stainless steel tubing connections.

The LC5 Ship Kit contains tubing in three different IDs. Before beginning the liquid connections, locate the proper tubing sizes for your system:

- For 4-mm column systems, use 0.25-mm (0.010-in) ID PEEK tubing (P/N 042690) for connections between system components.
- For 2-mm column systems, use 0.125-mm (0.005-in) ID PEEK tubing (P/N 044221) for connections between system components.
- For valve waste lines (2-mm and 4-mm systems) use 0.94-mm (0.037-in) ID Tefzel tubing (P/N 037804).

The LC5 is plumbed with Dionex 10-32 ferrules (P/N 043276) and fittings (P/N 043275). For instructions on how to install ferrule fittings, refer to *Installation of Dionex Ferrule Fittings* (Document No. 034213), provided in the Ship Kit.

Refer to Figure 2-3 while plumbing the system.

Connect the Rheodyne Injection Valve

1. Using a ferrule fitting and PEEK tubing in the appropriate ID, connect an eluent line from the pump pressure transducer to port 2 on the Rheodyne injection valve. (Port numbers are etched on the back of the valve.)
2. Attach a 6-cm (2.5-in) piece of PEEK tubing with ferrule fittings to port 3. This tube will be connected to the separator column or guard column (if used).
3. Connect the 25 μ L PEEK (P/N 042857) sample loop between ports 1 and 4.

NOTE

Other sample loop sizes are available. Contact the nearest Dionex Office for information.

4. Cut two 7.5-cm (3-in) pieces of 0.94-mm (0.037-in) ID Tefzel tubing. Install a ferrule and 10-32 fitting on one end of each of the pieces. Attach one of these lines to port 5 on the Rheodyne valve and attach the other to port 6. Route the free ends through the opening in the waste vial cap.
5. Slide the waste vial onto the bracket at the rear of the valve housing. The vial cap rests on the bracket.

Connect the Separator Column

Columns are purchased separately from the LC5.

1. Before installing the separator column, pump deionized water through the injection valve at 1.0 to 3.0 mL/min for 2 to 5 minutes to clear any air from the liquid lines.
2. Activate the injection valve by switching the position of the control knob between **INJECT** and **LOAD** several times to make sure that no air is trapped in the hydraulic system. Trapped air reduces the separator column efficiency.
3. Set the flow rate to 2.0 mL/min and verify that the pressure through the system, with no columns installed, is less than 690 KPa (100 psi).
4. Stop the pump.
5. Install the column mounting clip by squeezing the open ends together and inserting them into one of the square openings on the column mounting brace. If you are using the 4-mm columns, orient the clip with the larger clips toward the rear. If you are using the 2-mm columns, orient the clip with the smaller clips toward the rear.

When the column is correctly mounted, the clip should clasp the column just below the top fittings; the top of the column should be as close as possible to the slot on the side of the AD20, allowing a short connecting line between the column and the AD20.

6. Each column is shipped with a manual containing specialized installation and start-up instructions. After consulting the column manual for any special requirements, install the column in the LC5.
 - a. Remove the end plugs from the separator column and store them in a safe place. You must reinstall the end plugs in the column before placing the column in storage.

Use the appropriate PEEK tubing with ferrule fittings for the following connections.

- b. If connecting a guard column, connect the inlet of the guard column to port 3 of the Rheodyne valve. Then, connect the outlet of the guard column to the inlet (bottom) of the separator column.
- c. If no guard column is used, connect port 3 of the Rheodyne valve to the inlet of the separator column.
- d. Connect the outlet (top) of the separator column to the detector cell inlet. The cell is located behind the detector lower door. Route the tubing through the slot on the lower left side of the detector module.

NOTE

A heat exchanger is mounted in the center of the AD20 optical unit, just below the cell. For most applications, connect the column outlet to the inlet of the heat exchanger (the port on the right). Then connect the outlet of the heat exchanger to the detector cell inlet.

7. Snap the separator column into the column clip on the LC5. The guard column “floats” below the separator columns, held in place only by the connecting tubing (see Figure 2-1).

LC5 Manual Injector

3 • Operation and Maintenance

3.1 Filling the Sample Loop

The Rheodyne injection valve may be filled completely or partially. These techniques differ in accuracy, precision, and the amount of sample required. Refer to the Rheodyne valve operating instructions included in the LC5 Ship Kit before selecting a method for your application.

This section describes three methods for filling the Rheodyne valve sample loop:

- Injecting directly into the valve
- Drawing sample through the waste line
- Loading from an automated sampler

Regardless of the method used, observe the following precaution:



When inserting needles into the needle port on the injection valve, use only 0.028-in OD (22 gauge) x 2-in long needles with 90° point style (square end). Using the incorrect needle size can damage the injector.

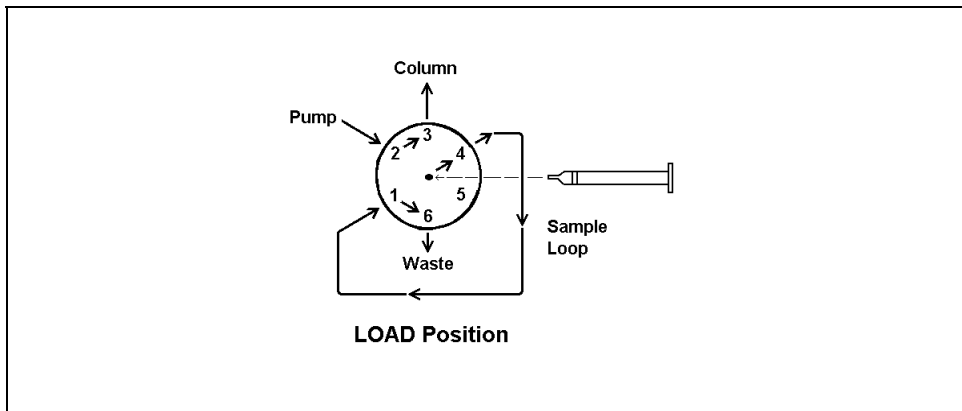


Figure 3-1. Injecting Directly into the Valve

1. **Injecting directly into the valve:**
 - a. Set the injection valve to **LOAD**.
 - b. Insert the syringe into the needle port on the injection valve (see Figure 3-1).
 - c. Overfill the sample loop with several sample loop volumes. Excess sample will flow out through the waste line.
 - d. Leave the syringe in the needle port.
 - e. Set the injection valve knob to **INJECT**.

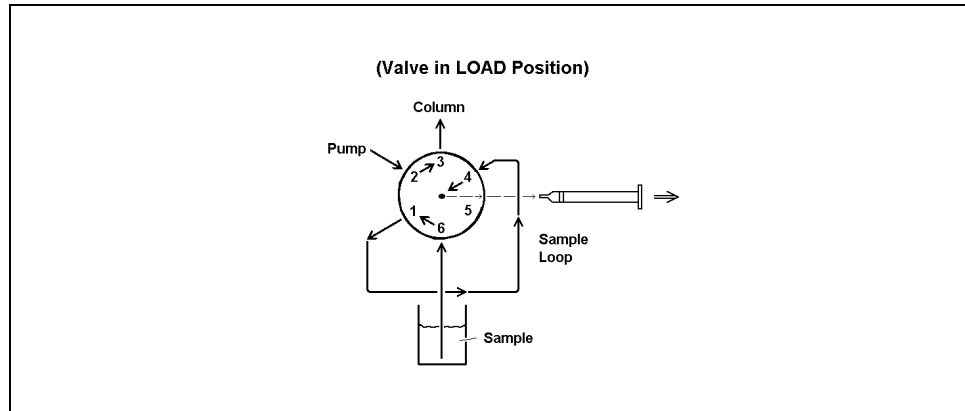


Figure 3-2. Drawing Sample Through the Waste Line

2. **Drawing sample through the waste line:**

- a. Set the injection valve to **LOAD**.
 - b. Insert the syringe into the needle port on the valve and place the valve waste line (port 6) into the sample container (see Figure 3-2).
 - c. Draw sample into the loop through the injection valve waste line. No sample will come into contact with the metal needle of the loading syringe.
 - d. Remove the waste line from the sample container.
 - e. Leave the syringe in the needle port.
 - f. Set the injection valve knob to **INJECT**.
3. **Loading from an automated sampler:** See the autosampler operator's manual for instructions.

3.2 Routine Maintenance

- Periodically check all liquid lines for crimping. Move or reroute pinched lines; replace damaged lines.
- Replace worn-out or damaged fittings as necessary.
- If a leak is detected, locate and repair the leak (see Section 4.1). Rinse all dried eluents off components with deionized water.
- Periodically check the waste vial and empty as needed.
- See the Rheodyne valve manual for maintenance procedures specific to the injection valve.

4 • Troubleshooting

This chapter is a guide to troubleshooting common problems with the LC5. To use this guide, turn to the section that best describes the operating problem. There, you will find the possible causes of the problem listed in order of probability. If you cannot eliminate a problem on your own, notify the nearest Dionex Office.

For troubleshooting procedures specific to the Rheodyne injection valve, refer to the Rheodyne valve manual included in the LC5 Ship Kit.

4.1 Liquid Leaks

- **Leaking fitting**

Locate the source of the leak. Tighten or, if necessary, replace all liquid line connections. See *Installation of Dionex Ferrule Fittings* (Document No. 034213) for tightening requirements.

- **Broken liquid line**

Replace the line and fittings.

- **Blocked or improperly installed waste line**

Make sure the waste lines are not crimped or otherwise blocked. Also make sure open waste drain lines are not elevated above the injection valve at any point after they exit the valve.

4.2 Excessive System Backpressure

- **Restriction in hydraulic system**
 1. Begin pumping eluent through the system (including the columns) at the flow rate normally used.
 2. Follow the hydraulic schematic (see Figure 2-3) and work backward through the system beginning at the cell exit. One at a time, loosen each fitting and watch for pump pressure variations. The connection at which the pressure drops indicates a restriction.
 3. Remove the restriction either by back-flushing or by replacing the section of tubing.
- **Flow rate through the columns is too high**
 1. Check the column flow rate, and verify that it matches the flow rate set in the pump.
 2. Measure the pump flow rate using a 10 mL graduated cylinder and stopwatch. Calibrate the flow rate as necessary.
- **Clogged column bed supports**

Refer to the column manual.
- **Columns are contaminated**

Clean the columns (see *Column Rejuvenation Procedures*, Technical Note 2R, Document No. 032036, or refer to the column manual).

4.3 Peak “Ghosting”

Ghosting is the appearance of extraneous peaks in a chromatogram. These may be late-eluting peaks from a previous injection or they may result from a contaminated, malfunctioning, or incorrectly installed injection valve. These peaks may co-elute with peaks of interest, resulting in non-reproducible peak heights.

- **Insufficient time between sample injections**

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

- **Insufficient flush between sample injections**

Flush the sample loop with at least 10 loop volumes of deionized water or sample between sample injections.

- **Malfunctioning or incorrectly installed injection valve**

Refer to the Rheodyne valve manual included in the Ship Kit and the installation instructions in this manual.

4.4 Non-Reproducible Peak Height or Retention Time

- **Column overloading**

1. Change to a sample loop with a smaller volume.
2. Dilute the sample.

- **Liquid leaks**

Locate and eliminate the leaks (see Section 4.1).

4.5 Abnormal Retention Time or Selectivity

- **System is not equilibrated following an eluent change**

Allow the system to equilibrate with at least 20 column volumes of eluent (for example, 30 minutes at 2.0 mL/min for 4-mm anion separator columns).

- **Flow rate through system is incorrect**

1. Select the correct flow rate.
2. Calibrate the pump flow rate.
3. Locate and eliminate any liquid leaks.

- **Contaminated or incorrect eluent**

Remake the eluent using reagent grade chemicals and ASTM filtered Type I (18 megohm) grade deionized water.

- **Contaminated or degraded sample**

Take appropriate precautions when preparing and storing samples to prevent contamination and degradation.

- **Column is contaminated**

1. Clean the column (see *Column Rejuvenation Procedures*, Technical Note 2R, Document No. 032036, or refer to the column manual).
2. If cleaning is unsuccessful, replace the column.