Hardware Manual for the Wyatt DNDC Injection System

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M1010 Revision A

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1 Introduction

1.1 Overview

The Wyatt DNDC Injector kit is ideal for use with a Wyatt Optilab rEX for the determination of dn/dc values in the "batch" mode. This kit also enables you to calibrate an Optilab using NaCl standards (to ensure accurate concentration measurements are made in the flowing mode) and facilitates other batch measurements such as creating a Zimm plot with a MALS detector.

The centerpiece of the DNDC Injector kit is a specially-designed injector module that makes batch RI measurements a breeze. Connect your syringe pump or HPLC pump to the injector inlet, and follow up with your RI instrument for a simple and super-stable RI measurement platform. Creating a stable RI measurement environment is crucial for accurate dn/dc measurements and RI instrument calibration, as the Optilab detects even the slightest changes in refractive index.

The standard DNDC Injector kit operates at pressures up to 500 psi, intended for "off-line" batch measurements involving the Optilab alone. A high pressure version of the DNDC Injector kit is available to meet your solution injection needs at low and high operating pressures (up to 7000 psi), with your Optilab and possibly additional instruments involved. The High-Pressure DNDC Injector option is compatible with both organic and aqueous solvents, while the Low Pressure DNDC Injector option is compatible with only aqueous solvents.

1.2 The DNDC Injector

The standard DNDC Injector (see Figure 1-1) operates at pressures up to 500psi, intended for "off-line" batch measurements involving the Optilab alone. A high pressure version of the DNDC Injector (see Figure 1-2) is available to meet your solution injection needs at low and high operating pressures (up to 7000 psi), with your Optilab and possibly additional instruments involved. The High-Pressure DNDC Injector option is compatible with both organic and aqueous solvents, while the Low Pressure DNDC Injector option is compatible with only aqueous solvents.

The DNDC Injectors come standard with a 1 mL sample injection loop. The High-Pressure DNDC Injector is shipped with additional injection loops of 20 µL and 100 µL. Refer to "Replacing the Sample Loop" on page 2-9 for instructions for replacing the sample injection loop. Contact Wyatt Technology for further information.

Figure 1-1: Low Pressure DNDC Injector

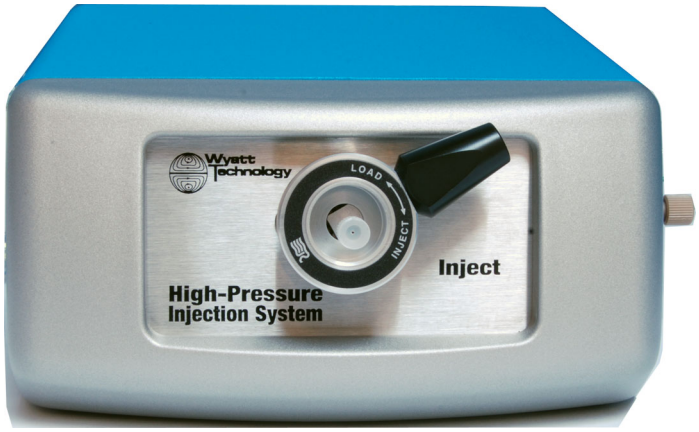

Figure 1-2: High-Pressure DNDC Injector

1.3 About This Manual

The *Hardware Manual for the DNDC Injection System* describes how to set up and use the DNDC Injector.

The chapters in this manual are organized as follows:

Chapter 1: "Introduction" introduces the DNDC Injector and this manual, and describes the support options available from Wyatt Technology.

Chapter 2: "Installation and Use" takes you through the necessary first steps for unpacking, connecting, and testing the instrument.

1.4 How to Contact Wyatt Technology Corporation

We solicit and encourage questions and comments about this manual and the DNDC Injector. Please contact:

Wyatt Technology Corporation
6300 Hollister Ave.
Santa Barbara, CA, 93117

Telephone: (805) 681-9009
FAX: (805) 681-0123
E-mail: support@wyatt.com

1.4.1 Technical Support

Wyatt Technology Corporation offers a variety of support options to help you get the most from your DNDC Injector.

If you are not in the U.S., you can also contact the Wyatt Technology Distributor in the country where you purchased your product.

Before contacting technical support, try to resolve any problems through this manual and the ASTRA V for Windows on-line help system.

Internet

You can use the Internet to ask questions and receive answers via e-mail, as well as visit Wyatt Technology's world-wide-web site.

World-Wide-Web URL:	http://www.wyatt.com
Electronic mail address:	support@wyatt.com

1.5 Where to Go from Here

Continue to Chapter 2: "Installation and Use" to check your shipment and make some necessary initial checks.


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2 Installation and Use

This chapter helps you get the DNDC Injector unpacked, tested, and connected. You will also make some first time adjustments.

2.1 Unpacking the Instrument

Please read the shipping parts list (packing slip) included with your instrument shipment and check that everything arrived in good condition.

1. Carefully examine the shipping container. If it is damaged or shows signs of mishandling, contact Wyatt Technology immediately.
2. Unpack the instrument.
3. Place the DNDC Injector on a level surface and inspect the instrument for damage. If you see any damage, contact Wyatt Technology immediately.
4. Check that the boxes contain all of the items listed as included with your instrument shipment in addition to the instrument (the packing slip sent with the instrument contains the most up-to-date list).

2.2 Installing the DNDC Injector

To install the Low Pressure DNDC Injector, do the following:

1. In order to facilitate plumbing, it is recommended that you place the DNDC Injector to the left of the instrument that will receive the injections (see Figure 2-2).

Note: The DNDC Injector is shipped filled with IPA.

2. Make fluid line connections using standard HPLC 10-32 threaded fittings for 1/16" O.D. tubing
   a. Connect the output of the Solvent Pump to the IN port of the DNDC Injector.
   b. Connect the OUT port of the DNDC Injector to the IN port of the instrument.
   c. Connect the WASTE port of the DNDC Injector to a waste bottle. This bottle will be used to collect the overflow from the injection load process.

Figure 2-1: Side panel

3. Connect the OUT port of the instrument to a waste bottle or recycle system.

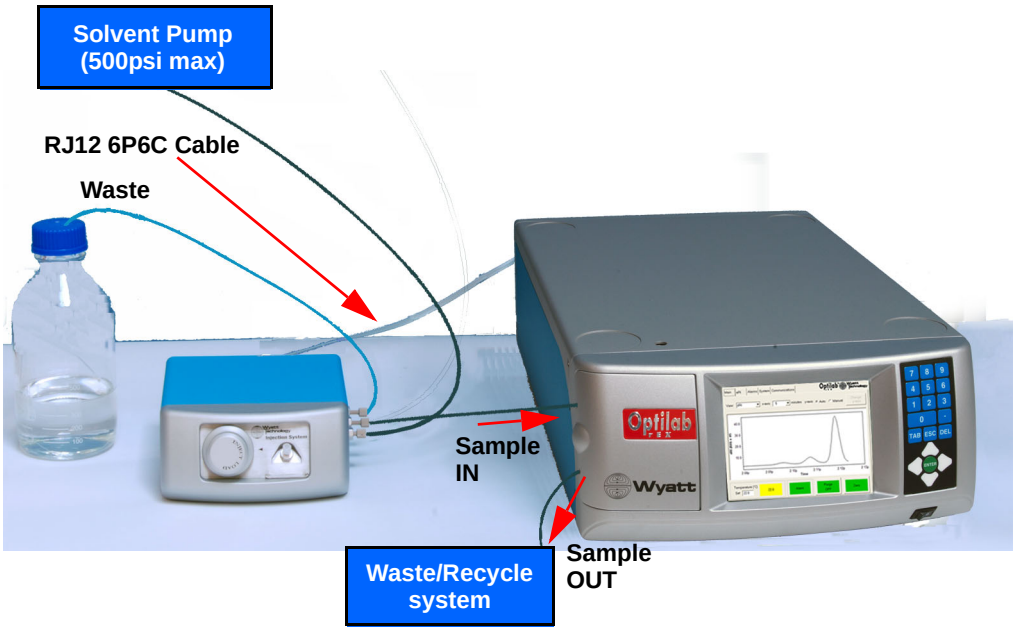


Figure 2-2: Low Pressure DNDC Injector with Optilab rEX Instrument

4. **(Optional)** Using the provided RJ12 6P6C cable, connect the connector on the back of the DNDC Injector to the Auto Inject In connector on the back panel of the Wyatt instrument (see Figure 2-4). This contact closure signal will notify the software that an injection has been made.

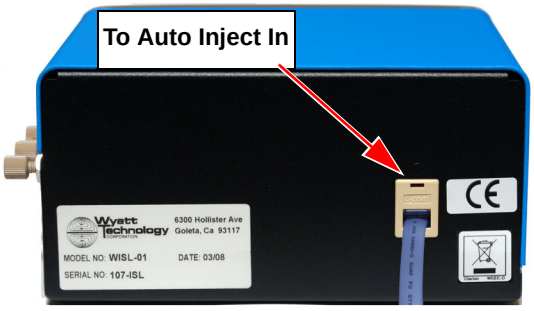


Figure 2-3: Back panel

5. Verify that all the fittings are secure.

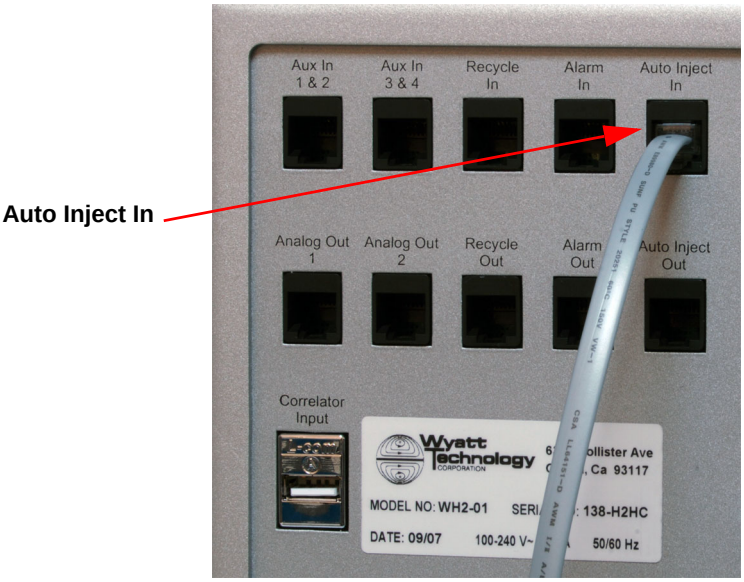


Figure 2-4: Wyatt Instrument back panel

The DNDC Injector is now installed and ready to use.

To install the High-Pressure DNDC Injector DNDC Injector, do the following:

1. In order to facilitate plumbing, it is recommended that you place the DNDC Injector to the left of the instrument that will receive the injections (see Figure 2-6).

Note: The DNDC Injector is shipped filled with IPA.

2. Make fluid line connections using standard HPLC 10-32 threaded fittings for 1/16" O.D. tubing.

Figure 2-5: Side panel

   a. Connect the output of the Pump to the IN port of the DNDC Injector.
   b. Connect the OUT port of the DNDC Injector to the IN port of the instrument
   c. Connect the WASTE port of the DNDC Injector to a waste bottle. This bottle will be used to collect the overflow from the injection load process.

3. Connect the OUT port of the last instrument in the fluid path to a waste bottle or recycle system.

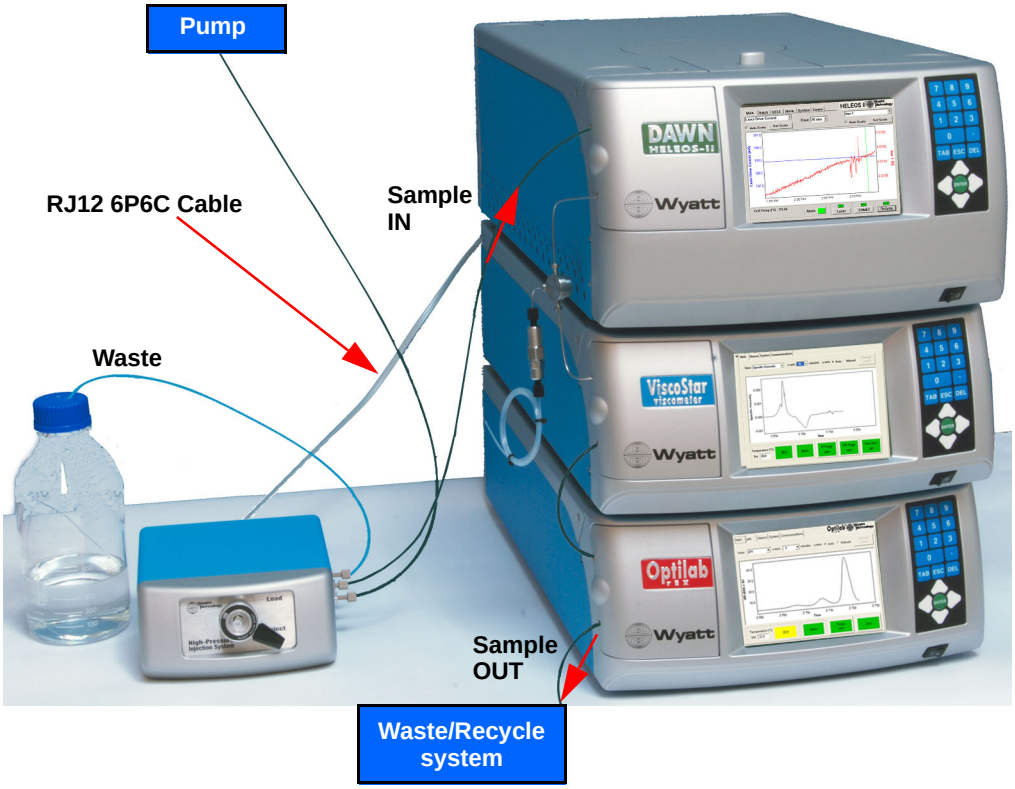


Figure 2-6: High-Pressure DNDC Injector with Instruments

4. **(Optional)** Using the provided RJ12 6P6C cable, connect the connector on the back of the DNDC Injector to the Auto Inject In connector on the back panel of the Wyatt instrument (see Figure 2-8). This contact closure signal will notify the software that an injection has been made.

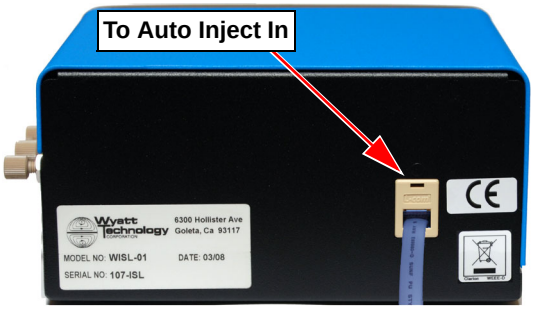


Figure 2-7: Back panel

5. Verify that all the fittings are secure.

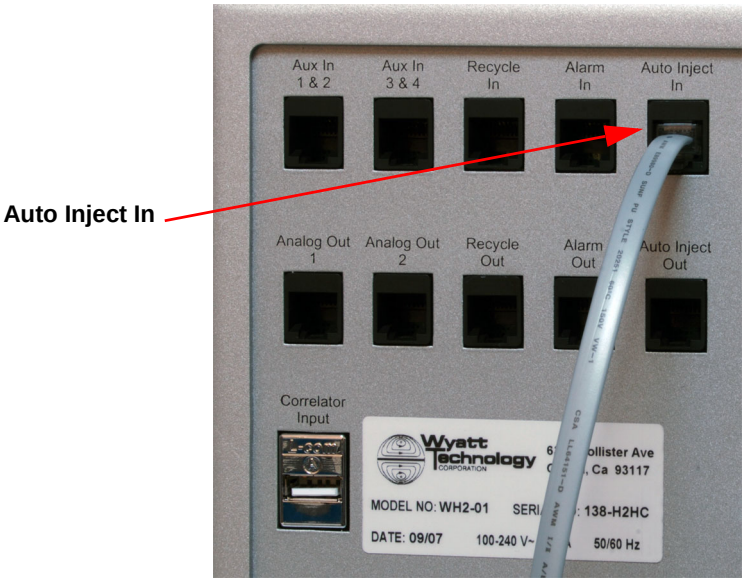


Figure 2-8: Wyatt Instrument back panel

The DNDC Injector is now installed and ready to use.

2.3 Injecting Samples into your Instrument

1. Verify that the knob on the front of the DNDC Injector is in the LOAD position.
2. Turn on the pump and verify that the fluid from the sample reservoir is being sent through the OUT port of the DNDC Injector to the IN port of the instrument.
3. Load the sample to be measured into the port in the front panel of the DNDC Injector.

Note: Load enough of the sample so that it fills the entire injection loop. It is recommended that 2-5 loop volumes be injected.

4. Turn the knob of the DNDC Injector all the way to the INJECT position.
5. If a Wyatt instrument is being used in conjunction with the DNDC Injector, verify that the injection signal was received on the instrument display by identifying either the red or green vertical line on the graph (red for Optilab rEX and green for other Wyatt instruments) (see Figure 2-9).
6. Once the sample has been sent into the instrument, the DNDC Injector can be switched back to the LOAD position and is ready for another sample.
7. It is recommended that the injection loop be flushed between samples.

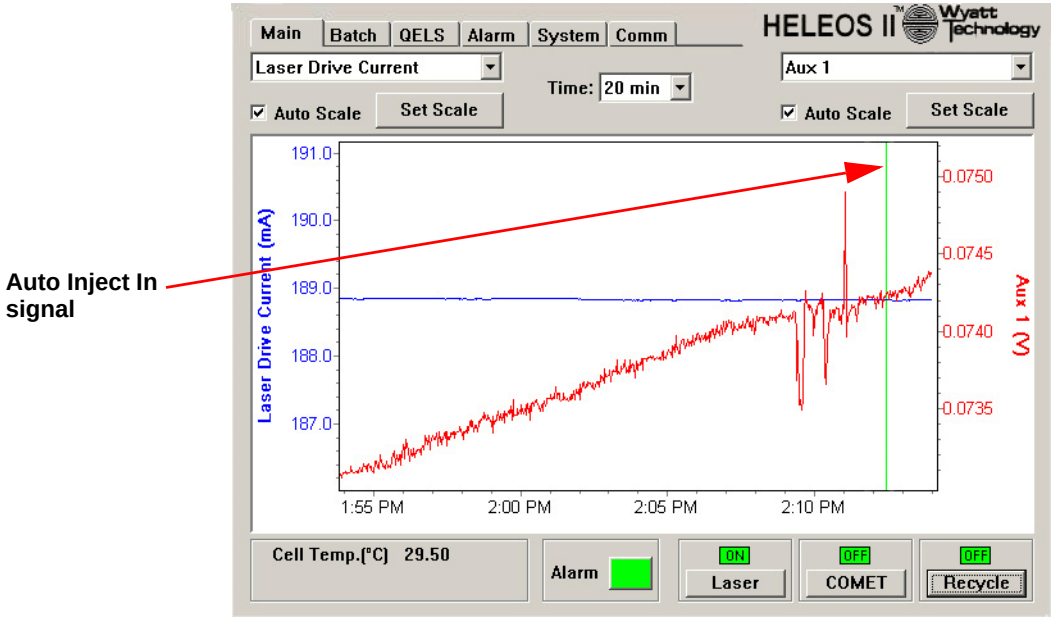


Figure 2-9: Inject signal on Wyatt Instrument display

2.4 Cleaning the Valve

Flush the DNDC Injector with an appropriate solvent as required to ensure that sample does not remain within the DNDC Injector.

Note: Inject enough of the solvent so that the entire injection loop is flushed with 2-5 loop volumes.

1. Set the DNDC Injector to the LOAD position.
2. Connect the OUT port to a waste reservoir.
3. Flush the valve through the inject port with an appropriate solvent.
4. Set the DNDC Injector to the INJECT position.
5. Pump the solvent through the IN port of the DNDC Injector. Flush with an appropriate amount of solvent depending on the injection loop size (2-5 loop volumes).
6. Once the system has been flushed, it may be disconnected.

2.5 Operational Guidelines

Caution: The rotor seal in the Injector valve is sensitive to alkaline attack when exposed to solutions having a pH of 10 or more. Contact Wyatt Technology for other options or further information.

- Use solvents with a PH less than 10 for the High-Pressure DNDC Injector.

Caution: Crystals in the injector valve may scratch the valve seal. Proper cleaning is required after using solutions that may form crystals.

- Flush with water after using salt or buffer solutions to prevent crystal formation in valve.

Wetted surfaces:

- Low pressure: ceramic, peek polymer, teflon polymer, stainless steel
- High pressure: 316 Stainless Steel, alumina ceramic, Vespel polymer

Maximum temperature: 80°C

Maximum pressure:
Low Pressure System: 500 psi
High Pressure System: 7000 psi

Injection sensing switch:

- Contact closure when in Inject position
- RJ12 6P6C cable, pins 3, 4; 100V, at 200 mA

2.6 Using the DNDC Injector with Third-party Instruments

- Connect the plumbing according to the instructions provided with the third-party instrument.
- To transmit an injection contact closure signal from the injection sensing switch, located within the DNDC Injector, to a third-party instrument, connect the RJ12 6P6C cable to the DNDC Injector back panel, and connect the red and green wires to the injection signal input terminals on the third-party instrument. The red and green wires correspond to pins 3 and 4 respectively on the RJ12 6P6C cable.
- Verify that the third-party instrument is compatible with all of the DNDC Injector operational guidelines as described in paragraph 2.5.

2.7 Replacing the Sample Loop

You can change the injector sample loop to allow for different sample volume requirements. The Low Pressure DNDC Injector is shown in Figure 2-10, below. The High-Pressure DNDC Injector is shown in Figure 2-11, on page 10. Contact Wyatt Technology for further information.

1. Remove four hex-head screws securing the top cover to the DNDC Injector and remove the cover.

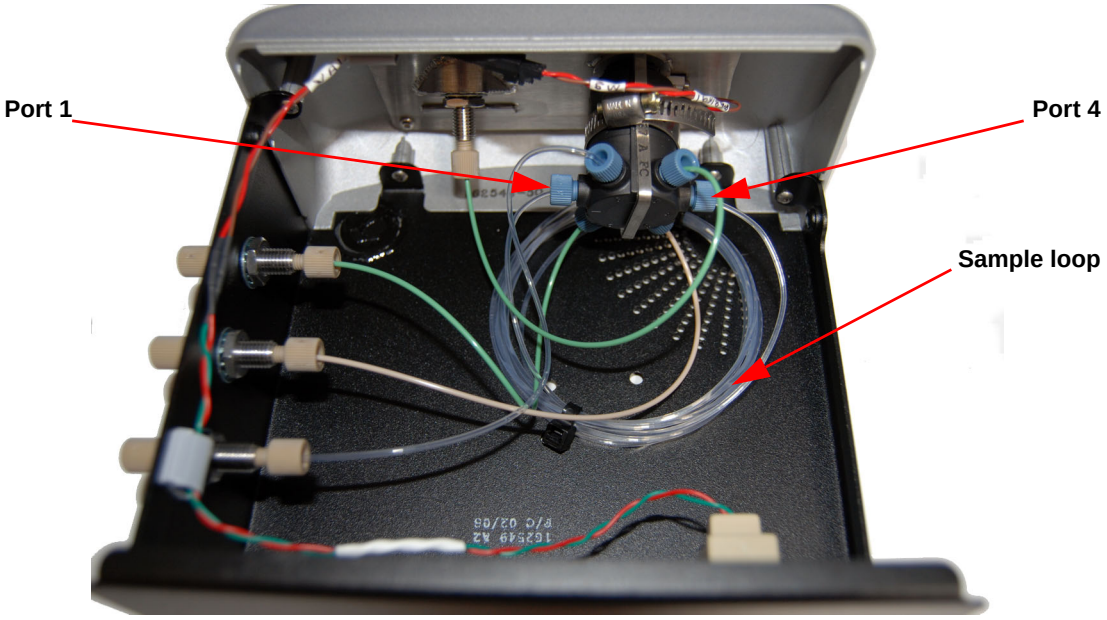
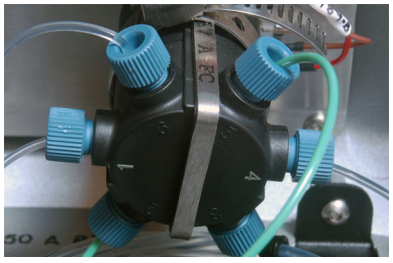


Figure 2-10: Low Pressure DNDC Injector

2. Unscrew the fittings from ports 1 and 4 on the valve and remove the loop. The ports are labeled on the back of the valve as shown in the photos at the right.
3. Install the new loop to ports 1 and 4 with the appropriate fittings and tighten securely.
4. Check for leaks and flush the valve and new loop at operating pressures. Refer to "Cleaning the Valve" on page 2-7.
5. Replace the top cover and secure with the four hex-head screws.



Low-Pressure Valve

High-Pressure Valve

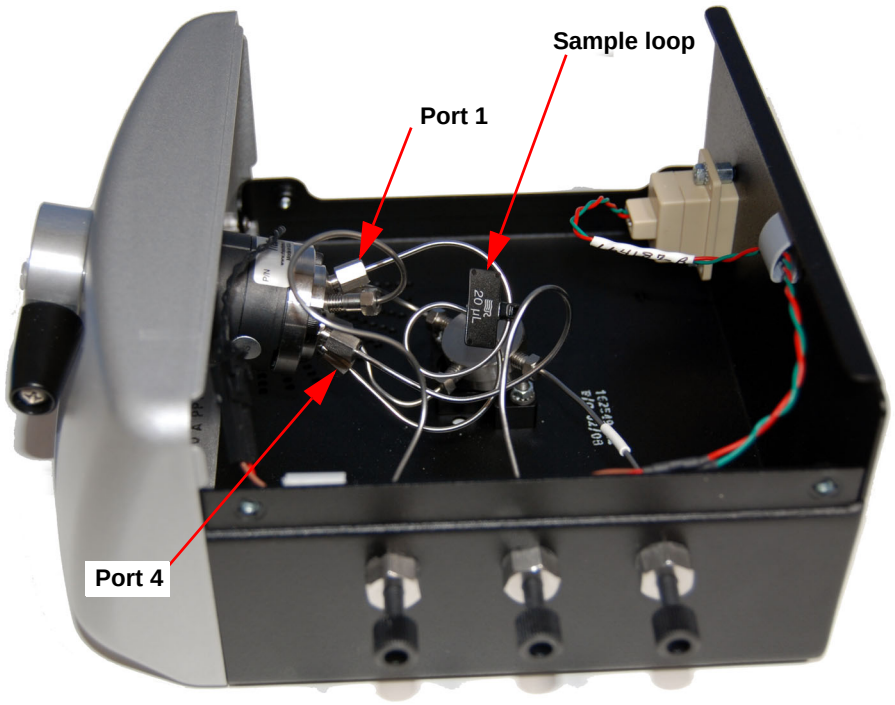


Figure 2-11: High-Pressure DNDC Injector