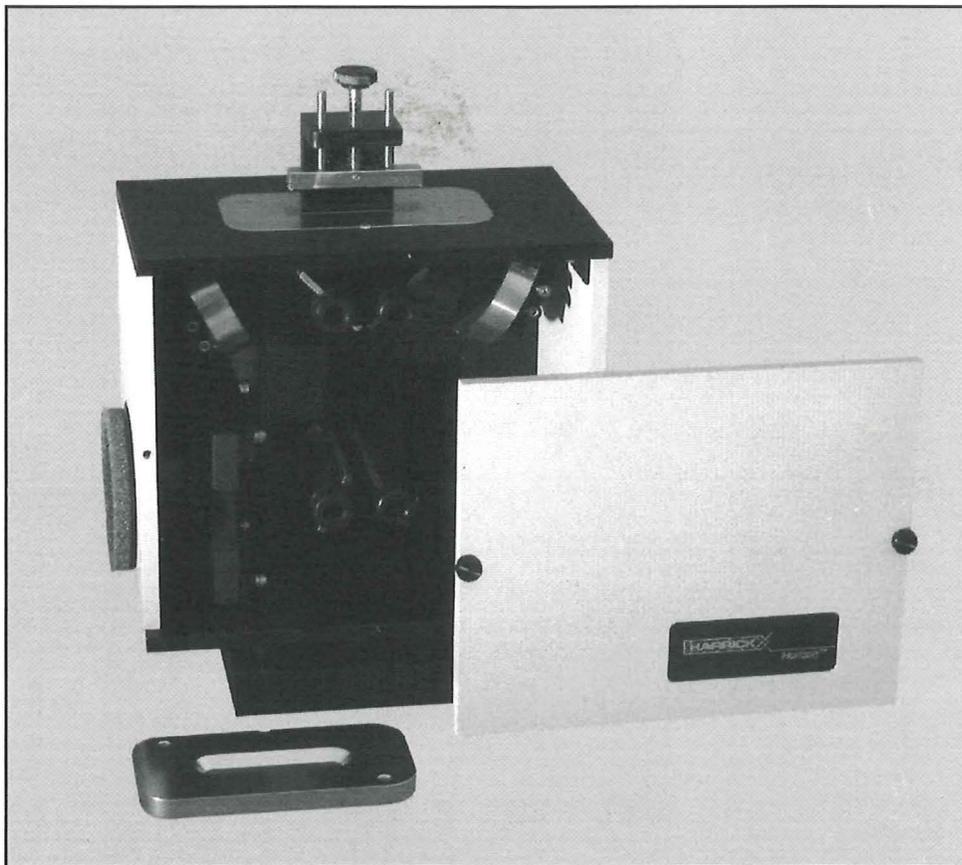


# HORIZON™

## USER'S MANUAL







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**UNPACKING**

Before installing the Horizon™ make sure all the parts on the included check-off list are present. If any parts are missing or damaged, contact Harrick Scientific immediately.

**TECHNICAL SUPPORT**

For additional information please contact our Technical Support Center at 800-248-3847 between 9 a.m. and 5 p.m. EST; or e-mail your questions to: [techsupport@harricksci.com](mailto:techsupport@harricksci.com)

**FEEDBACK**

Your comments and suggestions are welcome. Please send them to:

Harrick Scientific Products, Inc.  
Box 277/ 141 Tompkins Ave, Pleasantville NY 10570  
Phone: 800-248-3847; Fax: 914-747-7209  
E-mail: [info@harricksci.com](mailto:info@harricksci.com)

This multiple reflection ATR accessory, the Horizon™, is a powerful tool for examining liquids, pastes, powders, and soft surface solids. Its unobstructed, horizontal sampling surface makes analysis easy. Samples of various sizes are simply placed on top of the ATR crystal. For high quality spectra without atmospheric interference, the Horizon™ comes in a purgeable box that connects to the spectrometer purge. This permits sample and crystal exchange with minimal interruption of the purge through the spectrometer and accessory. This is ideal for quality control and other applications that require rapid sample exchange. Flow cells and temperature controlled cells, in addition to a variety of ATR crystals, are available for use with the Horizon™.

### OPEN BEAM SPECTRUM

Prior to installation, collect an open beam background spectrum (no accessory in the sample compartment). This spectrum should be used later to verify the throughput of the Horizon™.

### GETTING READY

Before installing the Horizon™, familiarize yourself with the accessory and its various components by referring to the photo below (Figure 1).

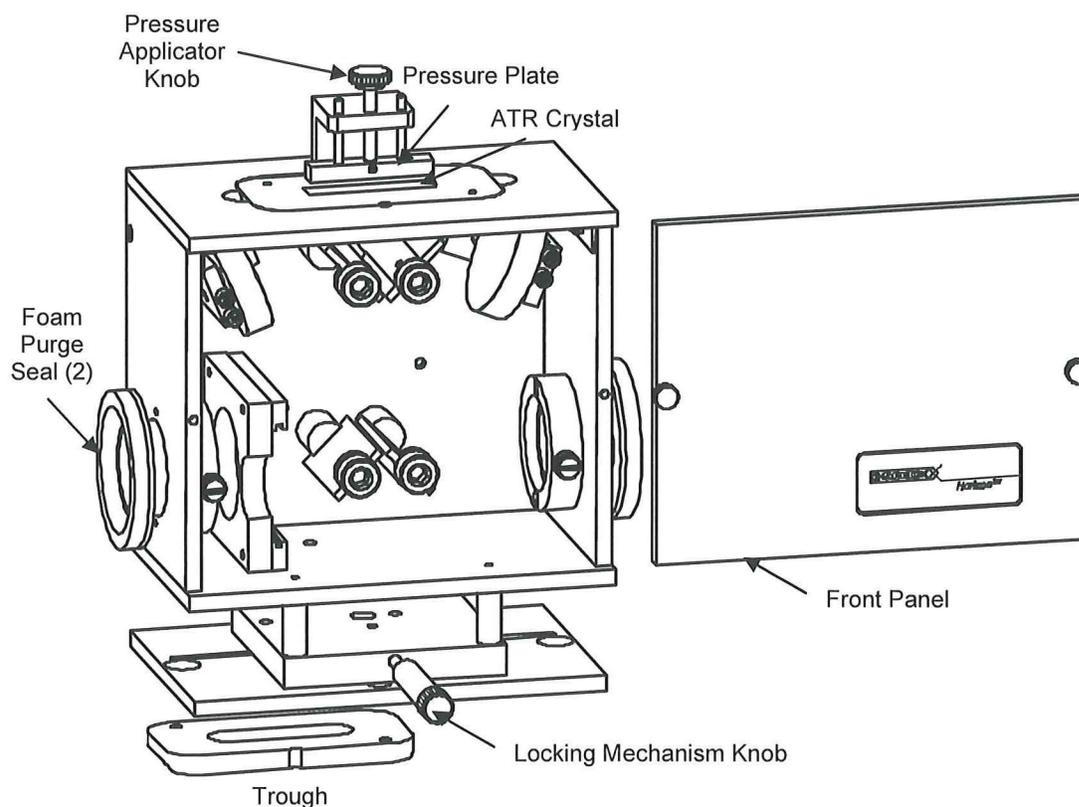


Figure 1 • Horizon™ with the Solid Sampling Plate Installed.

## INSTALLATION AND ALIGNMENT

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### HORIZON™ INSTALLATION

#### **RAIL MOUNTING**

If your spectrometer is equipped with original manufacturer's rails:

- Install the Horizon™ onto the rails.

**NOTE:** *If you received the Harrick rail plate with your Horizon™, first mount the supplied rails directly onto the floor of the sample compartment (see Appendix A).*

- Move the Horizon™ along the rails until the spectrometer focal point is in the center of the attachment.
- Secure the Horizon™ in place by tightening the locking mechanism knob (Figure 1).

#### **FIXED FLOOR MOUNTING**

- Install the Horizon™ onto the floor of the sample compartment using the base plate provided.

### SAMPLING PLATE INSTALLATION

- Unpack the trough or solid sampling plate supplied with the Horizon.
- Place the sampling plate on top of the Horizon, as shown in Figure 2.

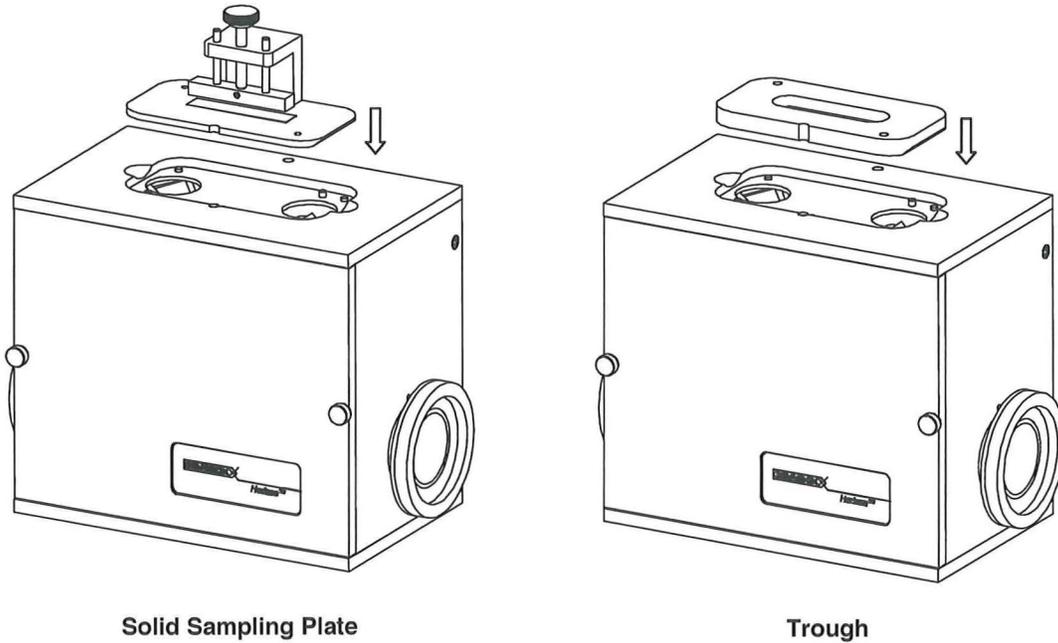


Figure 2 • Installing the Sampling Plate

## INSTALLATION AND ALIGNMENT

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### ALIGNMENT

The Horizon™ has been pre-aligned prior to shipment. Only minor adjustments should be required to optimize the performance of the Horizon™ in your spectrometer:

- Once the Horizon™ is installed, set the spectrometer to measure the “energy” on the detector.
- Loosen the two thumbscrews on the front panel and lift off the front panel (see Figure 3).

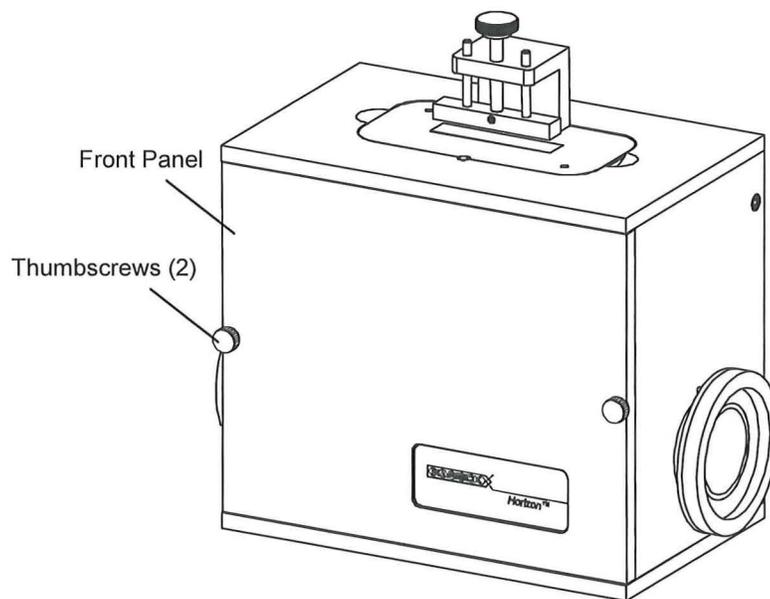


Figure 3 • Opening the Front Cover of the Horizon™.

## INSTALLATION AND ALIGNMENT

---

- Using the supplied 3/32" ball driver, adjust the tilt and turn adjustments on mirrors M3 and M4 (Figure 4). Optimize the energy at one before moving on to the next.
- If needed, small adjustments to mirrors M2, M5, M1 and M6 can be made using the supplied 1/4" T-wrench. Again, optimize the energy at one before moving on to the next.

**NOTE:** Adjustments to mirrors M2, M5, M1 and M6 should be minimal to avoid misalignment. If misalignment should occur, contact Harrick Scientific for additional alignment details.

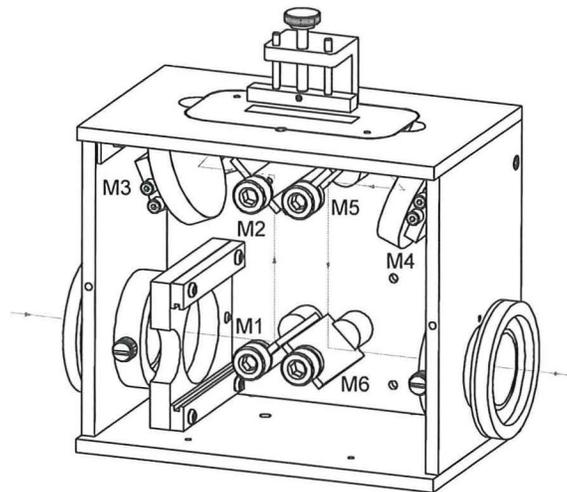


Figure 4 • Horizon™ Alignment

# INSTALLATION AND ALIGNMENT

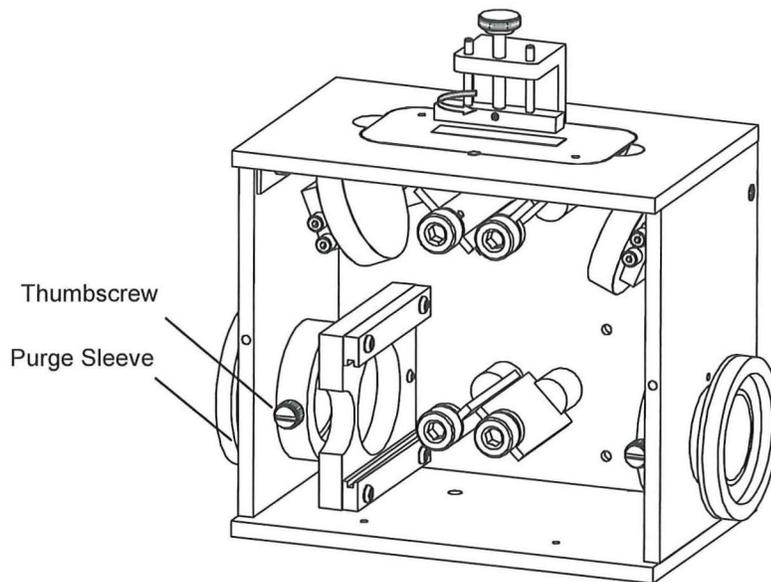
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## PURGE INSTALLATION

### **PURGE SLEEVES**

If your Horizon™ is equipped with retractable purge sleeves:

- Loosen the thumbscrews.
- Push the purge sleeves out to extend them against the sample compartment walls (see Figure 5).
- Tighten the thumbscrews to secure the purge sleeves in place.



**Figure 5 • Purge Sleeve**

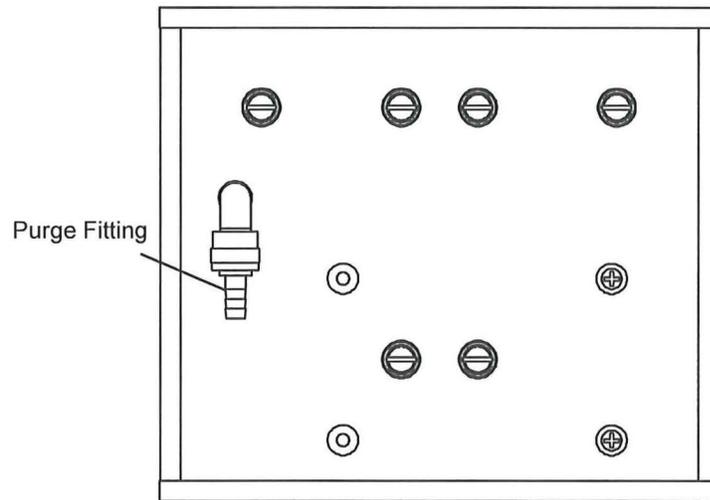
- Reinstall the front panel.
- Tighten the thumbscrews to secure the front panel in place.

## INSTALLATION AND ALIGNMENT

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### **PURGE LINE**

For quicker purging or if the spectrometer has windows on the beam ports, connect an additional purge line to the fitting on the back of the Horizon™ (see Figure 6).



**Figure 6 • Back View of the Horizon™ showing the Purge Fitting**

To confirm the performance of your accessory, it should be tested before first use and at regular intervals thereafter.

### VERIFYING THE THROUGHPUT

- Make sure that the specified background spectrum is the previously collected open beam background spectrum.
- Clean the ATR crystal (see page 12 for details).
- Collect a transmittance spectrum with the Horizon™ in the sample compartment.

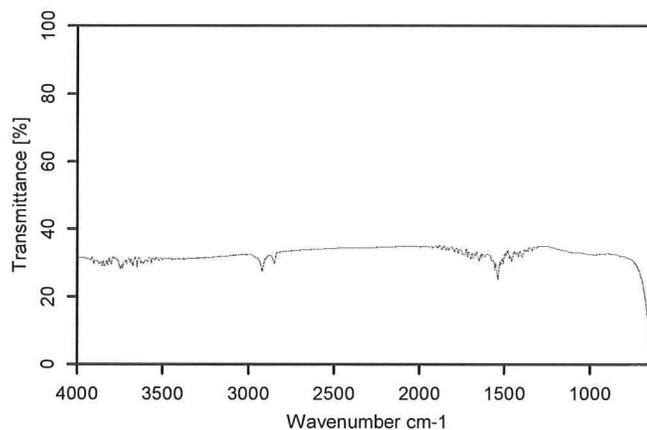


Figure 7 • Horizon™ Throughput

- Read the maximum value at 2500 cm<sup>-1</sup> and record it for future reference.
- The Horizon™ throughput at that wavenumber should be at least 20% and the spectrum should resemble the Horizon™ throughput spectrum shown in Figure 7.

### OPTIONAL POLARIZER INSTALLATION

- Loosen the two thumbscrews that secure the front panel onto the Horizon™.
- Remove the front cover.
- Slide the polarizer into the slide plate mount provided inside the Horizon™ (see Figure 8).
- Set the polarizer for the desired polarization.
- Replace the front cover on the Horizon™ and tighten the thumbscrews to secure it in place.

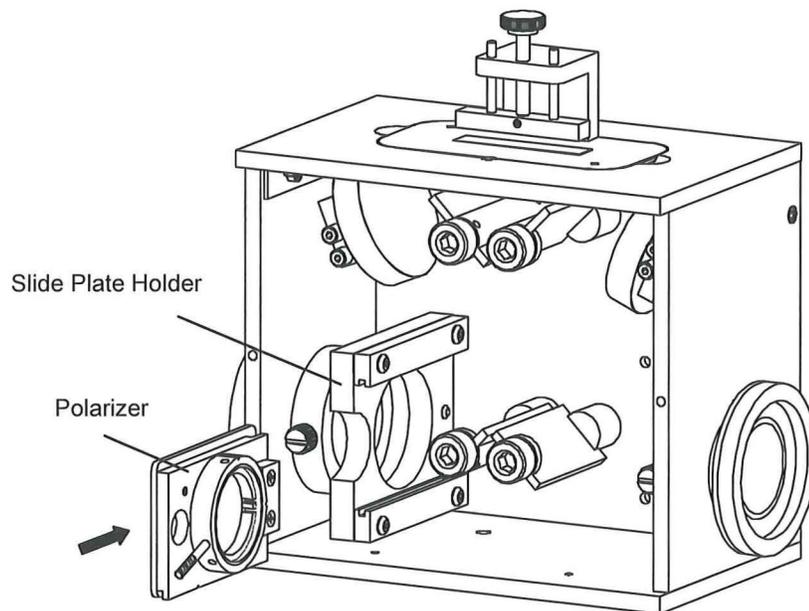


Figure 8 • Polarizer Installation

**NOTE:** The polarizer can be installed on either side of the unit. Please see Appendix E for instructions on mounting the polarizer on the other side.

### CLEANING THE CRYSTAL

- The ATR crystal should be cleaned before each use.



**CAUTION:**

*The ATR crystal scratches easily so it should be cleaned with care. Wipe only with damp lens tissue or cotton swabs.*

- To clean the crystal, wipe with a cotton swab or lens tissue dampened with low residue solvent. Use very light pressure while wiping. We recommend using methyl ethyl ketone, since it leaves virtually no residue on the crystal.

**NOTE:** *The sampling plate can be removed from the Horizon™ for a more thorough cleaning and the ATR crystal can be completely removed from the trough for cleaning if needed.*

### BACKGROUND SPECTRUM

- Collect the background single beam spectrum with the Horizon™ in the sample compartment.

### SOLID SAMPLING PLATE

#### SOLID SAMPLES

- Retract the pressure head by turning the pressure applicator knob counterclockwise.
- Place the sample face down on the ATR crystal. We recommend covering the entire surface of the crystal for reproducible results.
- Turn the pressure applicator knob clockwise until adequate pressure is applied. Pressure is sufficient if increasing it no longer significantly changes the absorption band intensity.



**CAUTION:**

*The acquisition of ATR spectra requires intimate contact between the ATR crystal and the sample. However, over tightening the pressure applicator can damage the crystal and/or sample.*

### INSTALLING THE SOLID SAMPLING PLATE FLOW-THROUGH ADAPTERS

- Lift the solid sampling plate off the Horizon™.
- Using a Philips screwdriver, loosen the two screws on the underside of the solid sampling plate to remove the pressure applicator.
- Make sure that the o-ring on the flow-through adapter is clean and free of dust.
- Place the flow-through adapter (luer, Swagelok, or temperature-controlled) on the sampling plate.
- Using the supplied 3/32" ball driver and screws secure the adapter to the sampling plate (see Figure 10).
- Return this assembly to the top of the Horizon™.
- Swing the clamp arm so the clamp is over the adapter.
- Tighten the thumbscrew to clamp the adapter in place.

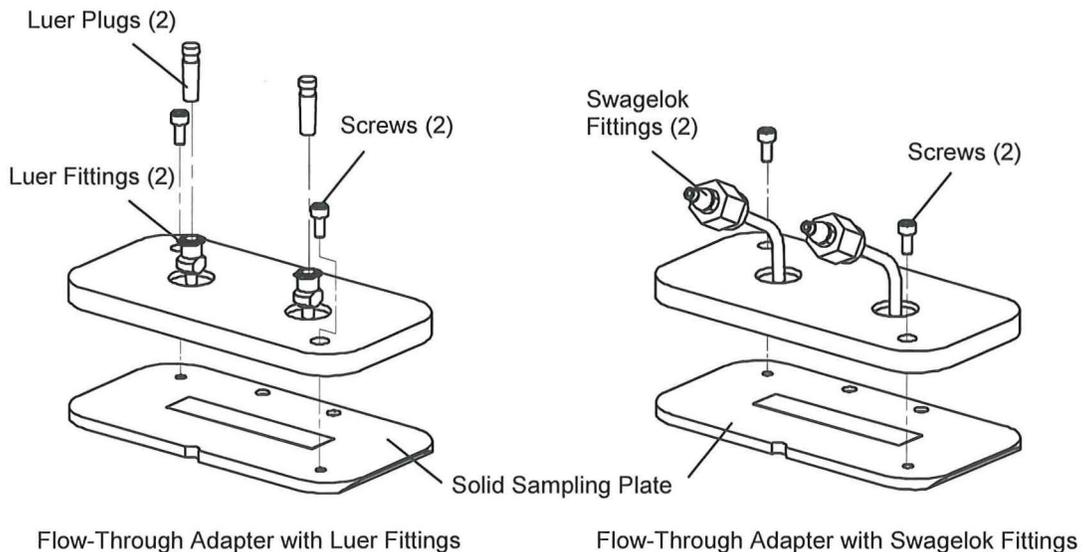


Figure 10 • Installing the Adapters on the Solid Sampling Plate

### INSTALLING THE TROUGH FLOW-THROUGH ADAPTERS

- Lift the trough off the Horizon™.
- Make sure the o-ring on the flow-through adapter is clean and free of dust.
- Place the flow-through adapter (luer, Swagelok or temperature-controlled) on the sampling plate.
- Using the supplied 5/32" ball driver and screws secure the adapter to the sampling plate (see Figure 11).
- Return this assembly to the top of the Horizon™ and lower the clamp to secure it in place.

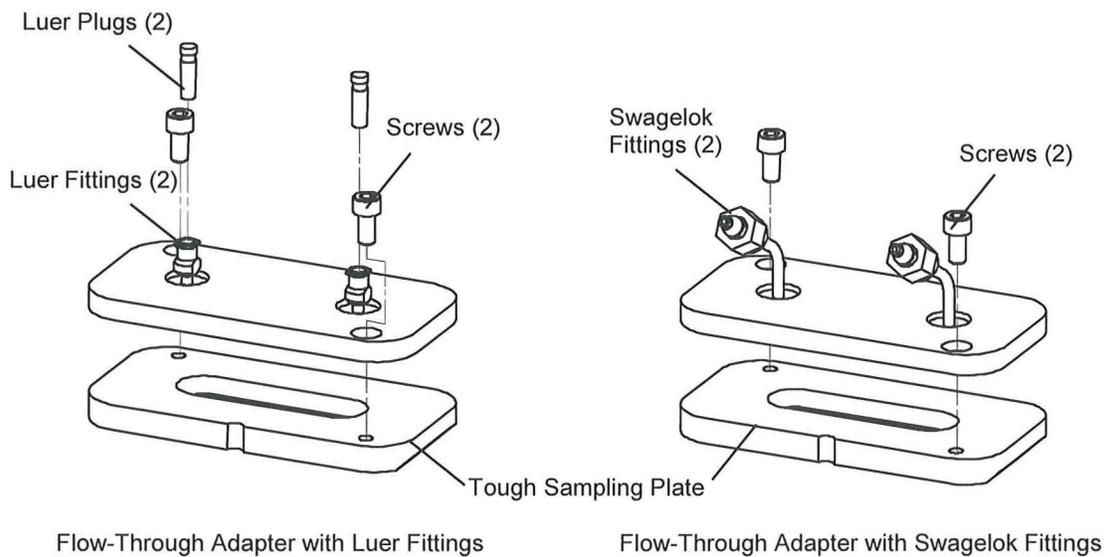


Figure 11 • Installing the Flow-Through Adapter on the Trough

## FLOW-THROUGH ADAPTERS

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### LUER FITTINGS (STATIC APPLICATIONS)

- Collect the background spectrum.
- Remove the Luer plugs.
- Use a Luer-Lok syringe to fill the adapter cell with the liquid sample (approximately 0.4 ml for the solid sampling plate adapter and 4 ml for the trough adapter).
- Reinstall the plugs to seal the cell.
- Collect the sample spectrum.
- Clean the adapter cell by removing the adapter from the sampling plate or trough and rinsing with a suitable solvent.

**NOTES:** To fill the adapter cell in a remote location (e.g. a hood), remove the Horizon™ sampling plate with the adapter attached.

The adapters with luer fittings can be modified for flow applications with appropriate connectors.

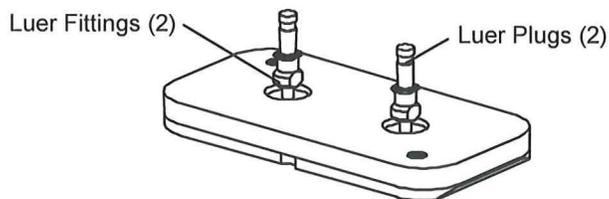


Figure 12 • Static Configuration of the Flow-Through Adapters with Luer Fittings

## FLOW-THROUGH ADAPTERS

### LUER FITTINGS (FLOW APPLICATIONS)

- Collect the background spectrum.
- Remove the Luer plugs.
- Connect the inlet and outlet, using appropriate adapters available elsewhere, to the Luer fittings on the cell.
- Release the clamp and remove the sampling plate or trough with its adapter from the top of the accessory.
- Turn the flow on and check for leaks. Fix any leaks before proceeding.
- Return the solid sampling plate or trough with its flow-through adapter to the Horizon™ and clamp it in place.
- Collect the sample spectrum.
- Clean the crystal.
- To clean the cell, flow some of the new sample or some solvent through it. For more thorough cleaning, remove the cell from the sampling plate and rinse it with solvent.

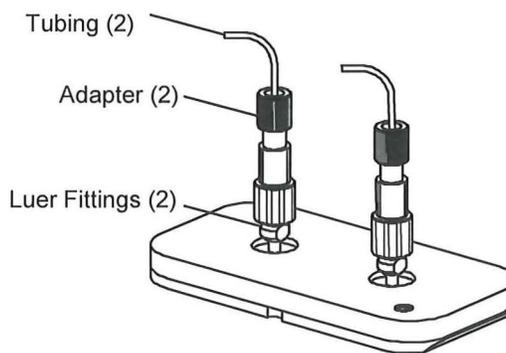


Figure 13 • Flow Configuration of the Flow-Through Adapters with Luer Fittings



**CAUTION:**

*Be sure to secure the mounted crystal assembly with the clamp when it is connected in a flow configuration.*

**NOTE:** For an example of the appropriate adapters, please visit the FAQs on our web site, [www.harricksci.com](http://www.harricksci.com).

## ***FLOW-THROUGH ADAPTERS***

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### ***SWAGELOK FITTINGS (FLOW APPLICATIONS)***

- Collect the background spectrum.
- Connect the inlet and outlet to the adapter using the Swagelok fittings.
- Release the clamp and remove the sampling plate or trough with its adapter from the top of the accessory.
- Turn the flow on and check for leaks. Fix any leaks before proceeding.
- Reinstall the sampling plate or trough with the adapter attached.
- Clamp it in place.
- Collect the sample spectrum.
- To clean the adapter cell, flow some of the new sample or some solvent through it. For more thorough cleaning, remove the adapter from the sampling plate and rinse it with solvent.

### **TEMPERATURE CONTROLLED ADAPTERS**

The heatable flow-through liquid adapters (Figure 14) are used in the same way as the unheatable cell described on the previous pages.

There are several ways regulate the temperature of this cell:

- Flow temperature-controlled fluid through its heating/cooling conduit
- Connect the heaters to an appropriate temperature controller.
- Use both of the above together.

For near-ambient temperatures, either flow temperature-controlled fluid through the heating/cooling conduit or flow cool water (below ambient) through the cell and heat to control the temperature.

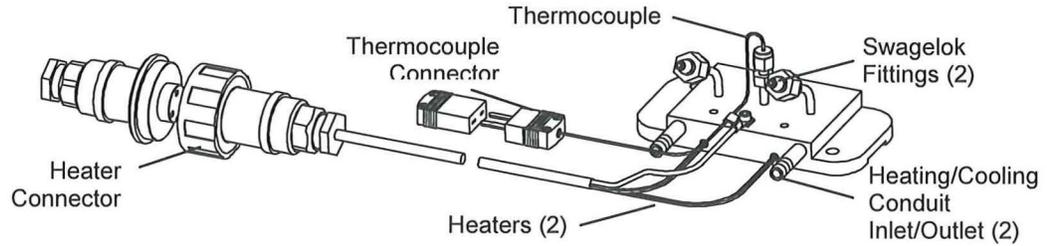
To regulate the temperature:

- Connect the heating/cooling conduit to the inlet and outlet using 3/16" i.d. flexible tubing as desired.
- Connect the thermocouple and heater to a suitable temperature controller.
- Initiate temperature control and allow the cell to stabilize in temperature.
- Collect the background spectrum.
- For flow applications, release the clamp and remove the sampling plate or trough with its adapter from the top of the accessory. Turn the flow on and check for leaks. Fix any leaks before proceeding. Then reinstall on the Horizon™ and secure with the clamp.
- For static applications, inject the sample and allow the temperature to stabilize.
- Collect the sample spectrum.
- To clean the adapter cell, flow some of the new sample or some solvent through it. For more thorough cleaning, remove the adapter from the sampling plate and rinse it with solvent.

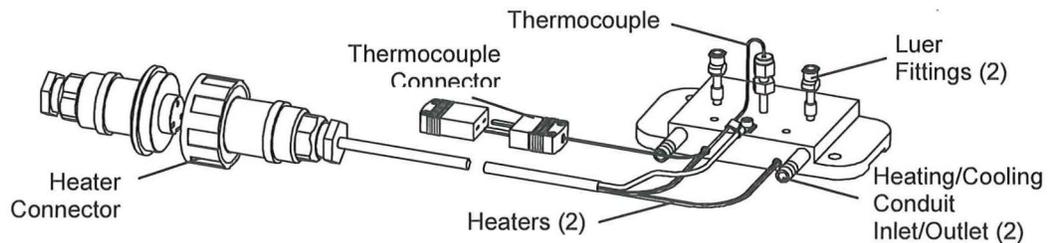
**NOTES:** *The heatable flow-through liquid cell is compatible with the Harrick Automatic Temperature Controller.*

*For sub-ambient temperature control, please contact Harrick Scientific.*

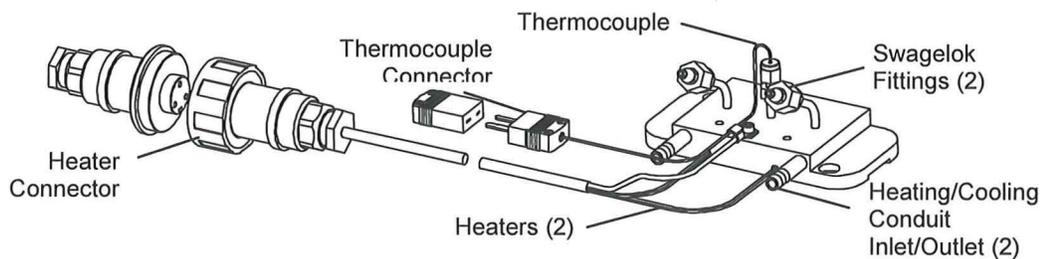
## FLOW-THROUGH ADAPTERS



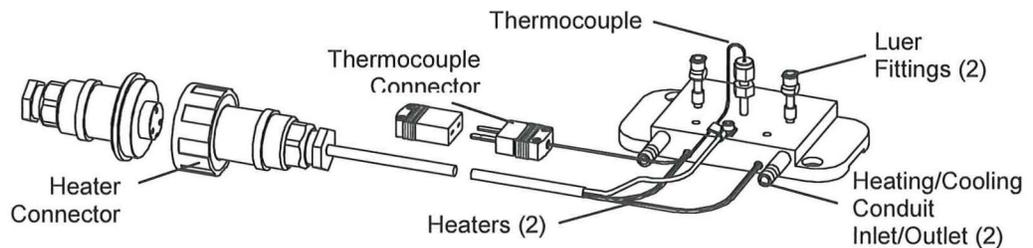
Adapter for Solid Sampling Plate with Swagelok Fittings



Adapter for Solid Sampling Plate with Luer Fittings



Adapter for Trough with Swagelok Fittings



Adapter for Trough with Swagelok Fittings

Figure 14 • The Temperature Controlled Adapters



**CAUTION:**

*Be sure to secure the mounted crystal assembly with the clamp when it is connected in a flow configuration.*

### MOUNTING THE HARRICK RAIL PLATE

To install the supplied rail plate onto the floor of the sample compartment of your spectrometer:

- Remove any existing sample holders from the floor of the spectrometer.
- Install the rail plate in the orientation indicated in Figure 15. See Table 1 on the next page for the appropriate screws/holes for your spectrometer.

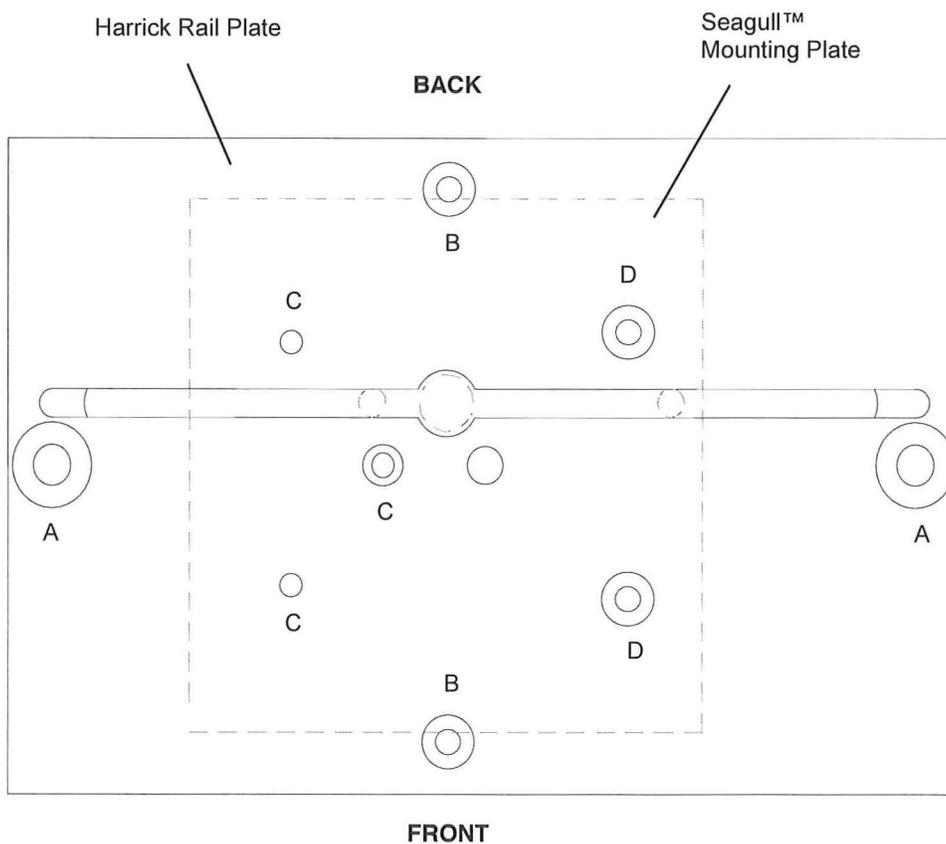


Figure 15 • Screw and Pin Positions for Rail Plate

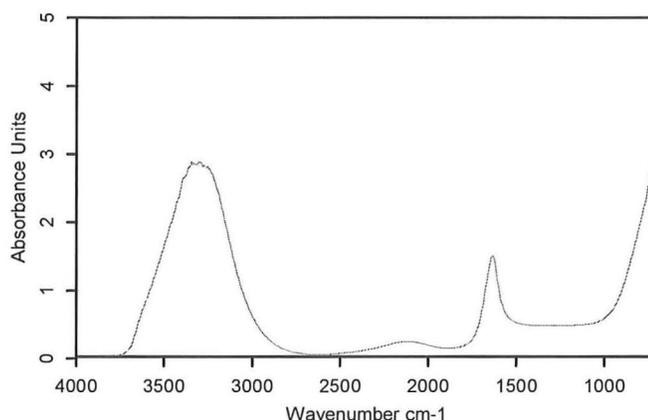
<b>SPECTROMETERS</b>	<b>HOLES</b>
DIGILAB (All Models)	<i>A</i>
MATTSON (Polaris, Galaxy, RS Infinity, Genesis, Satellite)	<i>B</i>
PERKIN ELMER (Spectrum 1)	<i>C</i>
THERMO-NICOLET (Nexus, Avatar, Magna, Impact)	<i>D</i>

**Table 1 • Screw and Pin Positions for Rail Plate**

**HORIZON™ VALIDATION**

For applications requiring higher photometric accuracy, a validation procedure on a specific liquid sample is recommended. An example, using water, is shown here (Figure 16).

- Collect a background spectrum with the Horizon™ in the sample compartment.
- Place a few drops of a liquid sample to cover most of the ATR crystal.
- Collect a sample spectrum.
- Convert the spectrum into absorbance.



**Figure 16 • Absorbance of Water**

- Choose two peaks at different ends of the spectrum. Write down the wavenumbers and absorbance values at these peaks. For example, if water is used as the liquid sample (Figure 16) the absorption peaks at 2120 cm<sup>-1</sup> and 1636 cm<sup>-1</sup> should be within 10% of 0.253 and 1.510 respectively.
- Every time the validation procedure is performed, the data should be within the noise level of those recorded the first time. On the next page, a table is provided to record these values.

**APPENDIX B**

---

<b>LIQUID SAMPLE USED</b>				
<b>WAVENUMBER (cm<sup>-1</sup>)</b>				
<b>ABSORBANCE VALUE</b>				

### REPLACING THE TROUGH ATR CRYSTAL AND GASKET

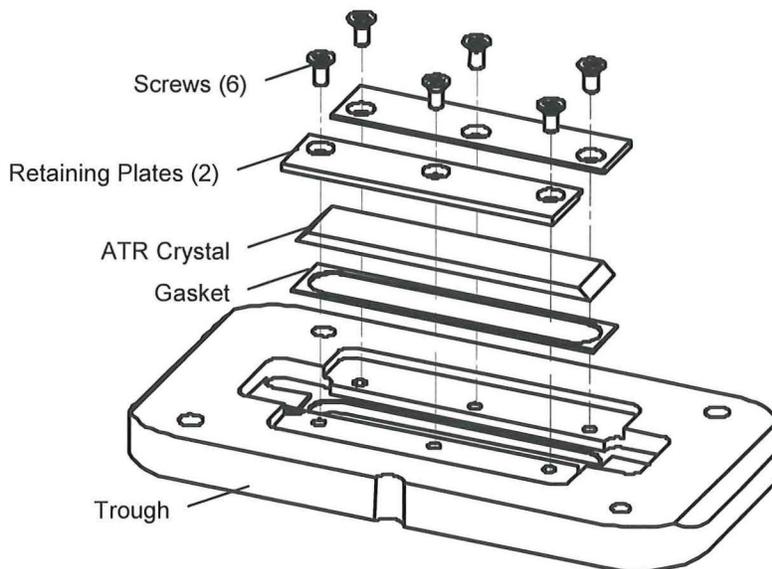
The trough ATR crystal is gasket-sealed in place. To replace either the crystal or the gasket:

- Lift the empty trough off the Horizon™ and rest it, face down, on a flat surface.
- Using a small Phillips head screwdriver, unscrew the six screws that secure the retaining plates in place (see Figure 17).
- Carefully remove the six screws and the two retaining plates.
- Place a piece of lens tissue or other soft cloth over the crystal and its holder.
- Grasp the holder, keeping one hand over the lens tissue.
- Lift up the holder and turn it over. The ATR crystal should drop out of the holder. Note that it does sometimes stick to the gasket. If this happens, rest the holder with the crystal facing down on the lens tissue and very gently apply even pressure to the sampling surface of the crystal to push it out of its holder.
- Remove the gasket.
- Clean or replace the ATR crystal and gasket.



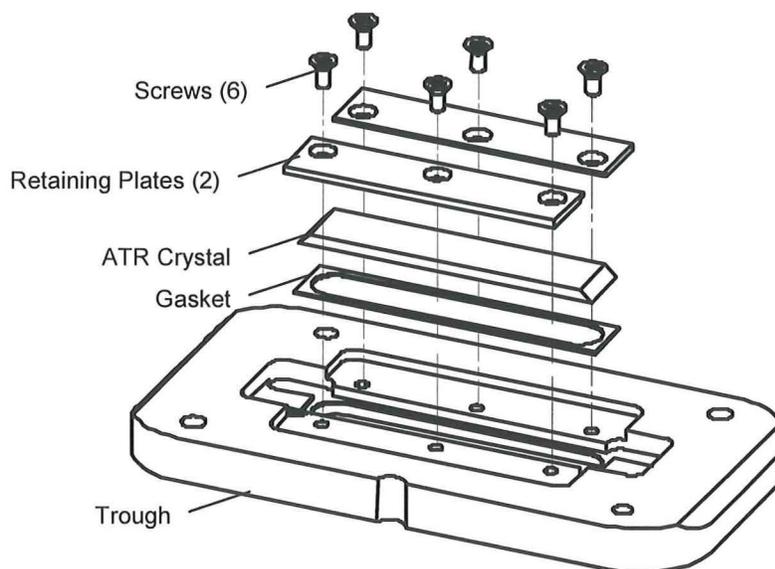
**CAUTION:**

*The ATR crystal scratches easily so it should be handled with care.*



**Figure 17 • Removing the ATR crystal from the Trough.**

- To reassemble the trough, first make sure the gasket and its recess are clean and free of dust.
- Center the gasket in the recess of the trough.
- Gently place the crystal on top of the gasket. Orient the crystal so the large flat face is down and the bevels are up.
- Place the retaining plates on top of the crystal.
- Using a small Phillips head screwdriver, thread all six screws back into the retaining plates.
- Working clockwise, tighten each screw, a little at a time, until the crystal is secured in place.
- Check to make sure the crystal is clean and then replace the trough on the Horizon™.



**Figure 18 • Reassembling the Trough.**

**NOTE:** Be sure to check the trough for leaks before using with liquid on the Horizon™.

### REPLACING THE O-RING ON THE FLOW THROUGH ADAPTERS

All of the flow-through adapters, ambient or temperature-controlled, o-ring seal to either the solid sampling plate or trough. To replace the o-ring:

- Lift the flow-through adapter assembly off the Horizon™ and rest it on a flat surface.
- Unscrew the adapter from the sampling plate. Use the supplied 5/32" ball driver for the trough adapter or the 3/32" driver for the solid sampling plate adapter. Set the screws aside.
- Lift the adapter off the solid sampling plate or trough.
- Turn the adapter over and pry the o-ring out of the groove using a fingernail or toothpick.
- Clean the o-ring groove and make sure that it is free of dust.
- Make sure the new o-ring is free of dust and then push it into the groove on the adapter.
- Place the adapter back onto the trough or solid sampling plate.
- Thread and tighten the two screws using either the 5/32" or 3/32" ball driver.

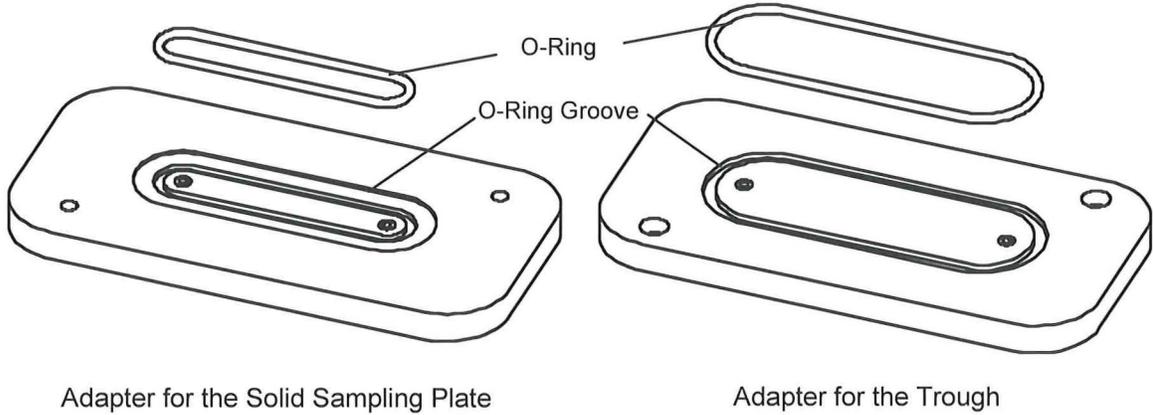


Figure 19 • Replacing the O-Ring on the Temperature Controlled Adapters.

**NOTE:** Be sure to check the flow-through adapter for leaks before using it on the Horizon™.

**OPTIONAL PARTS**

Solid Sampling Plate, Ge.....	HON-SSP-J
Trough, Ge.....	HON-LSP-J
Flow-Through Adapter, Solid Sampling Plate (Luer).....	HON-FSL
Flow-Through Adapter, Solid Sampling Plate (Swagelok).....	HON-FSS
Flow-Through Adapter, Trough (Luer).....	HON-FLL
Flow-Through Adapter, Trough (Swagelok).....	HON-FLS
Syringe with Luer-Lok Fitting, 2 ml (10 pcs).....	KIT-SYR
Temperature-Controlled Adapter, Solid Sampling Plate (Luer).....	HON-FSL-TC3
Temperature-Controlled Adapter, Solid Sampling Plate (Swagelok).....	HON-FSS-TC3
Temperature-Controlled Adapter, Trough (Luer).....	HON-FLL-TC3
Temperature-Controlled Adapter, Trough (Swagelok).....	HON-FLS-TC3
Automatic Temperature Controller, 110V.....	ATC-024-1
Automatic Temperature Controller, 220/240V.....	ATC-024-2

**REPLACEMENT PARTS**

Solid Sampling Plate, ZnSe.....	HON-SSP-M
Trough, ZnSe.....	HON-LSP-M
Trough Gasket, Viton.....	121-622-1
Trough Gasket, Kalrez.....	121-622-2
Trough Flow-Through Adapter O-Ring, Viton.....	ORV-032
Trough Flow-Through Adapter O-Ring, Kalrez.....	ORK-032
Solid Sampling Plate Flow-Through Adapter O-Ring, Viton.....	ORV-027
Solid Sampling Plate Flow-Through Adapter O-Ring, Kalrez.....	ORK-027
Temperature-Controlled Flow-Through Adapter Thermocouple.....	008-144
Temperature-Controlled Flow-Through Adapter Heater Assembly.....	HON-HTR
Temperature-Controlled Flow-Through Adapter Heater Only.....	HTRS-25



*Manual Part No. HON-M-01*

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