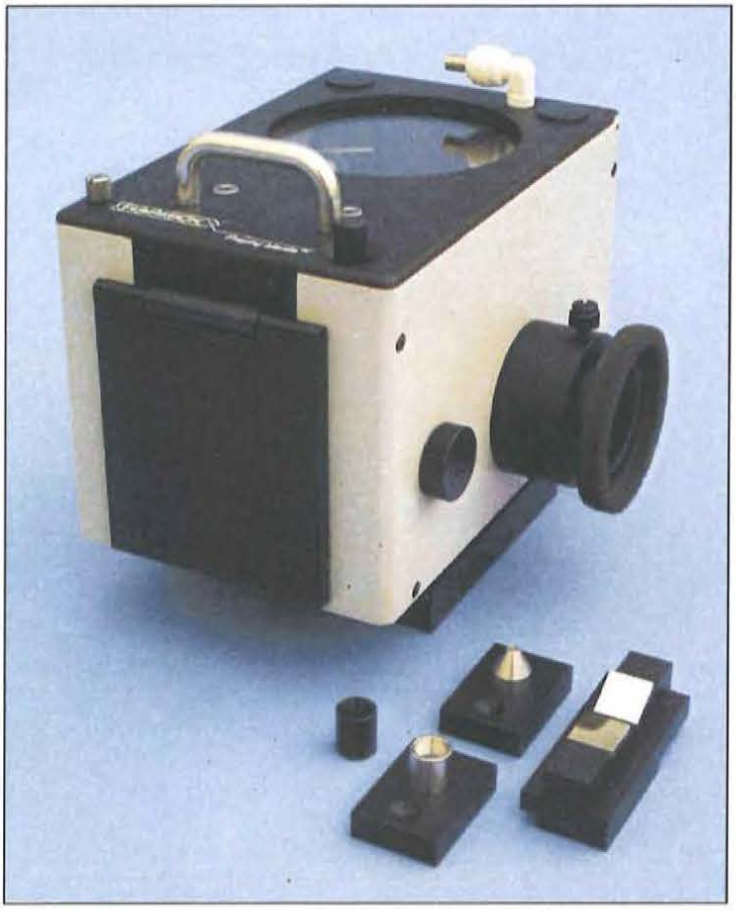
HARRICK

www.harricksci.com

THE PRAYING MANTIS™

USER'S MANUAL



HARRICK SCIENTIFIC PRODUCTS, INC.
141 Tompkins Ave, 2nd floor • Pleasantville, NY 10570 • (800) 248-3847 • FAX (914) 747-7209

HARRICK

TABLE OF CONTENTS

General Information

Unpacking 1
Technical Support 1
Feedback 1

About the Praying Mantis™ 2

Installation and Alignment

Open Beam Spectrum 3
Getting Ready 3
Purge Installation 4
Installing the Praying Mantis™ 5
Aligning the Praying Mantis™ 6
Verifying the Throughput 8
Specular Reflectance 8

Operation

Background Spectrum 9
Sample Spectrum 9

Ambient Chamber 10

HVC

About the High Temperature Reaction Chamber 12
Getting Ready 13
Window Installation 14
Dome Installation 15
Installing the HVC 16
Fluid/Electrical Connections 17
Collecting the Background Spectrum 18
Sample Spectrum 19

CHC

About the Low Temperature Reaction Chamber 20
Getting Ready 21
Window Installation 22
Dome Installation 23
Installing the CHC 24
Fluid/Electrical Connections 27
Collecting the Background Spectrum 28
Sample Spectrum 29

Reaction Chamber Maintenance
Leak Checking 30
Cleaning the Reaction Chambers 30
Replacing the O-rings 31
Replacing the Heater 31
Replacing the Thermocouple 32

Appendix A
Mounting the Harrick Rail Plate 33

Appendix B
Optional and Replacement Parts 35

UNPACKING

Before installing the Praying Mantis™ Diffuse Reflection Accessory 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

FEEDBACK

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

Harrick Scientific Products, Inc.
PO Box 277
141 Tompkins Ave, 2nd floor
Pleasantville, NY 10570
Phone: 800-248-3847; Fax: 914-747-7209
E-mail: info@harricksci.com
Web: www.harricksci.com

The Praying Mantis™ (DRP) accessory is specifically designed for examining powders by diffuse reflection spectroscopy. The optical design of the Praying Mantis™ incorporates two 6X, 90° off-axis ellipsoid mirrors. The ellipsoids are optically arranged so that their near focal points coincide and they are arranged to discriminate against the collection of specularly reflected radiation. This is achieved by placing the collecting ellipsoid 60° away from the direction of the specularly reflected radiation. The sample is placed in the common focal point of the two ellipsoid mirrors. The beam is condensed to a spot less than 2mm in diameter. This allows analysis of very small quantities of sample. A purge fitting and two purge seals are provided if purging is desired.

The sample is loaded in to a sample cup. Two cups are included, regular and micro-sampling cups. The sample is typically diluted in a non-absorbing powder. The same non-absorbing powder is used to collect the background spectrum. An optional ambient chamber allows the sample to be loaded in a controlled atmosphere (glove box) and then analyzed without being exposed to room atmosphere.

Two reaction chambers are available for use with Praying Mantis™, the high temperature chamber HVC and the low temperature chamber CHC. The reaction chambers enable a reaction gas to be introduced and reacted with the sample so that the reaction can be studied in situ, reaction rates determined and intermediates and reaction products identified. The reaction chambers are enclosed with a dome with three windows, two for the spectrometer radiation to enter and exit the chamber and the third for viewing, illuminating, or irradiating the sample. This enables the use of the reaction chambers for photochemical studies. The standard material for the viewing window is UV quartz and the other two windows are KBr.

OPEN BEAM SPECTRUM

Prior to installation:

- Make sure all sample holders are removed from the sample compartment.
- 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 Praying Mantis™.

GETTING READY

Before installing the Praying Mantis™, familiarize yourself with the accessory and its various components by referring to the drawing of the Praying Mantis™ found below (Figure 1).

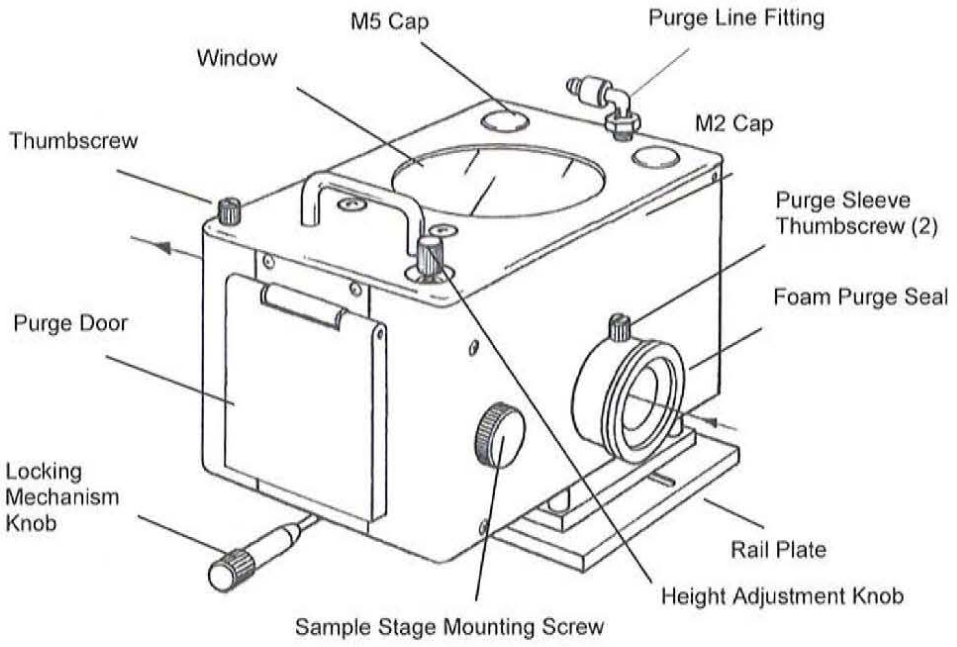


Figure 1 • Front View of the Praying Mantis™

PURGE INSTALLATION

PURGE SLEEVES

Loosen the thumbscrews and push the purge sleeves in to retract them (Figure 2).

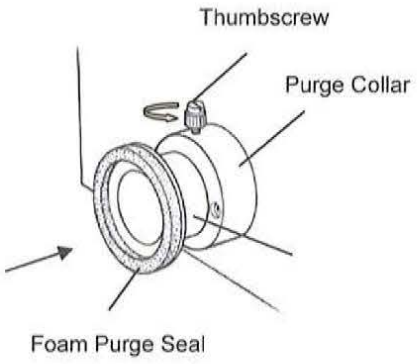


Figure 2 • Purge Sleeves

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 Praying Mantis as illustrated in Figure 3.

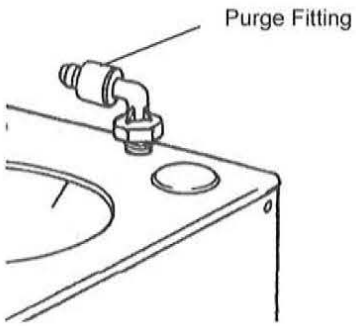


Figure 3 • Purge Line

INSTALLING THE PRAYING MANTIS™

RAIL MOUNTING

If your spectrometer is equipped with rails:

- Install the Praying Mantis™ onto the rails.

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

- Move the Praying Mantis along the rails until the spectrometer focal point is in the center of the attachment.
- Lock the Praying Mantis in place by tightening the locking mechanism knob.
- Extend the purge sleeves until they firmly contact the sides of the sample compartment.
- Lock the purge sleeves in place with the thumbscrews.

FIXED FLOOR MOUNTING

- Install the Praying Mantis™ onto the floor of the sample compartment using the base plate provided.
- Extend the purge sleeves to the walls of the spectrometer and tighten the thumbscrews on the purge collars.

ALIGNING THE PRAYING MANTIS™

The Praying Mantis™ has been pre-aligned prior to shipment. Hence it requires only minor adjustments to optimize its performance.

- Open the door on the front of the attachment (Figure 1).
- Slide the alignment fixture (Figure 4) into the Praying Mantis™, with the horizontal mirror going in first. In this orientation, the tilted mirror is in the sampling position.
- Gently push the alignment fixture in against the stop.

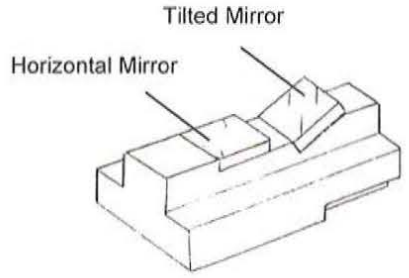


Figure 4 • Alignment Fixture

- Remove the plastic caps over mirrors M2 and M5. This allows access to the turn and tilt adjustments for these mirrors (Figure 5).
- Set the spectrometer to measure the "energy" on the detector.
- Adjust the turn and tilt controls for M5 with the supplied 3/32" hex driver until the signal on the detector is maximized.
- Adjust the height of the alignment fixture with the height adjustment knob to maximize the signal.
- Adjust the turn and tilt controls for M2. Repeat this sequence until there is no further increase in the signal on the detector.

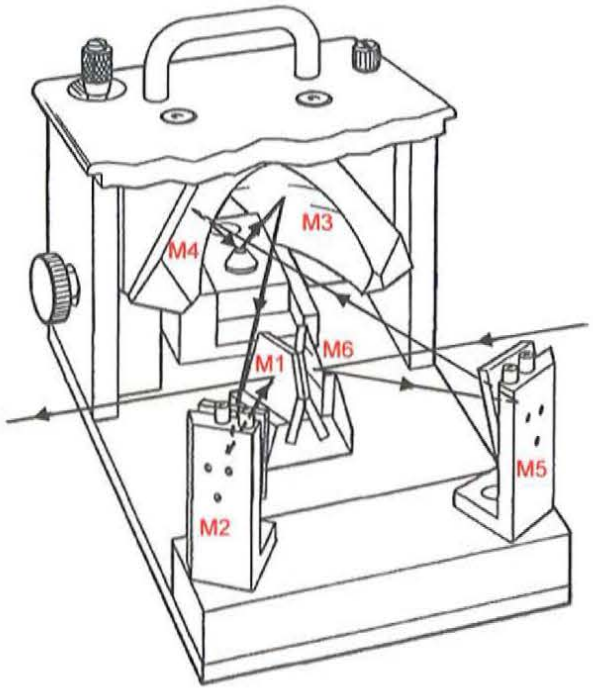


Figure 5 • Interior View of the Praying Mantis™

If using **rail mounting:**

- Loosen the thumbscrews on the purge sleeves.
- Unlock the locking mechanism.
- Slide the Praying Mantis™ along the rails until the signal is maximized.
- Lock the locking mechanism, extend the purge sleeves to the walls of the spectrometer and tighten the thumbscrews on the purge collars.

VERIFYING THE THROUGHPUT

- Make sure that the specified background spectrum is the previously collected open beam background spectrum.
- Collect a transmittance spectrum with the Praying Mantis™ in the sample compartment.

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

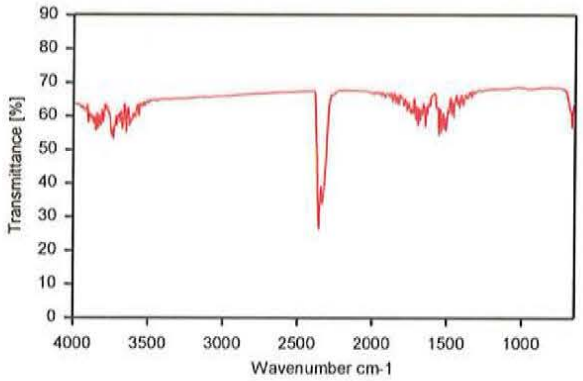


Figure 6 • Praying Mantis™ Throughput

- Read the maximum value at 2500 cm^{-1}.
- The Praying Mantis™ throughput at that wavenumber should be at least 40% and the spectrum should resemble the Praying Mantis™ throughput spectrum shown above.

SPECULAR REFLECTANCE

- Slide the alignment fixture (Figure 4) into the Praying Mantis™, with the tilted mirror going in first. In this orientation, the horizontal mirror is in the sampling position.
- Gently push the alignment fixture in against the stop.
- The detector now measures the specular reflectance from the mirror. The energy should be near-zero. If it is not less than 10% of the throughput measured earlier, realign with the tilted mirror or contact Harrick Scientific.

BACKGROUND SPECTRUM

- Overfill one of the sampling cups (Figure 7) with the reference material (i.e. KBr). Use the provided sample funnel to fill the microsampling cup.
- Level off the surface using a flat blade.
- Open the purge door and slide the sample holder (with the sampling cup going in first) into the Praying Mantis™, pushing it in against the stop.
- Close the purge door.
- Make small adjustments to the height of the sample using the micrometer to maximize the signal on the detector.
- Record the background spectrum.

Microsampling Cup | Standard Sampling Cup

Figure 7 • Sampling Cups

SAMPLE SPECTRUM

- Replace the reference material with the sample.
- Record the sample spectrum.

NOTE: *If the sample is a strong absorber it may need to be diluted (approximately 5%) in a nonabsorbent matrix.*

USING THE OPTIONAL AMBIENT SAMPLE CHAMBER

- Before using the ambient chamber, verify that the windows, o-ring and groove on the bottom of the dome are clean and free of dust (see page 17).
- Put the ambient chamber in a glove box or similar enclosed environment.
- Unscrew the two thumbscrews to remove the dome.
- Carefully fill the sample cup with the reference. Clean up any spills.
- Install the dome making sure that the larger orientation slot on the dome engages the orientation pin on the ambient chamber.

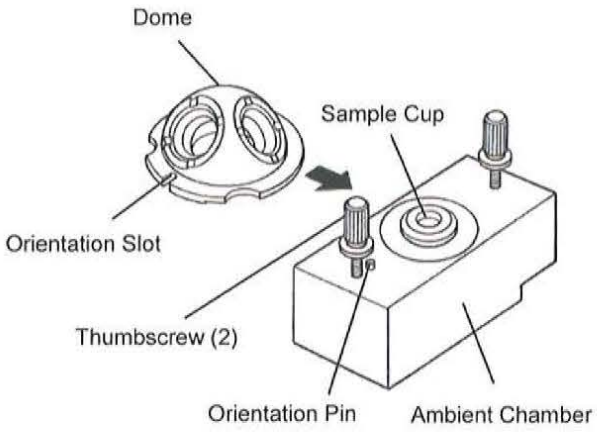


Figure 8 • The Ambient Chamber

- Remove the sealed ambient chamber from the glove box.
- Open the purge door and slide the ambient chamber into the Praying Mantis™, orienting it so that the two notches on the bottom of the ambient chamber go in first.
- Close the purge door.

- Make small adjustments to the height of the sample using the micrometer to maximize the signal on the detector.
- Record the background spectrum.
- Replace the reference material with the sample.
- Record the sample spectrum.

ABOUT THE HIGH TEMPERATURE REACTION CHAMBER (HVC)

The HVC is designed for operation up to 910°C under vacuum (the lifetime of the heater is significantly reduced at temperatures above 450°C). The pressure range is from high vacuum to pressures up to 3.44MPa or 25.8 ktorr (the high pressure dome is required for pressures above 133 µPa or 1 ktorr). At higher pressures, the maximum operating temperature may be lower

HVC is made of chemically resistant 316 stainless steel. Within the chamber is a temperature-controlled sample stage with integral sample cup. This stage incorporates a cartridge heater and a thermocouple. It is thermally isolated from the outer chamber wall. A water-cooling jacket controls the temperature of the outer surface of the chamber and windows during high or low temperature operation. The reaction chamber has three gas ports for evacuating, pressurizing or flowing gas through the sample. These ports are equipped with 1/4" VCO fittings. The vacuum port leads directly under the sample cup; the two gas ports lead into the sides of the chamber.

The chamber is enclosed with a dome with three windows, two for the spectrometer radiation to enter and exit the chamber and the third for viewing, illuminating, or irradiating the sample. This enables the use of the reaction chambers for photochemical studies. The standard material for the observation window is UV quartz and KBr for the other two windows.

CAUTION:
Parts for the high pressure and low pressure domes should not be exchanged. The high pressure domes undergo high pressure testing and are guaranteed to work under the rated pressure.

GETTING READY

Before installing the High Temperature Reaction Chamber (HVC) familiarize yourself with it by referring to the drawing of the HVC found below (Figure 9).

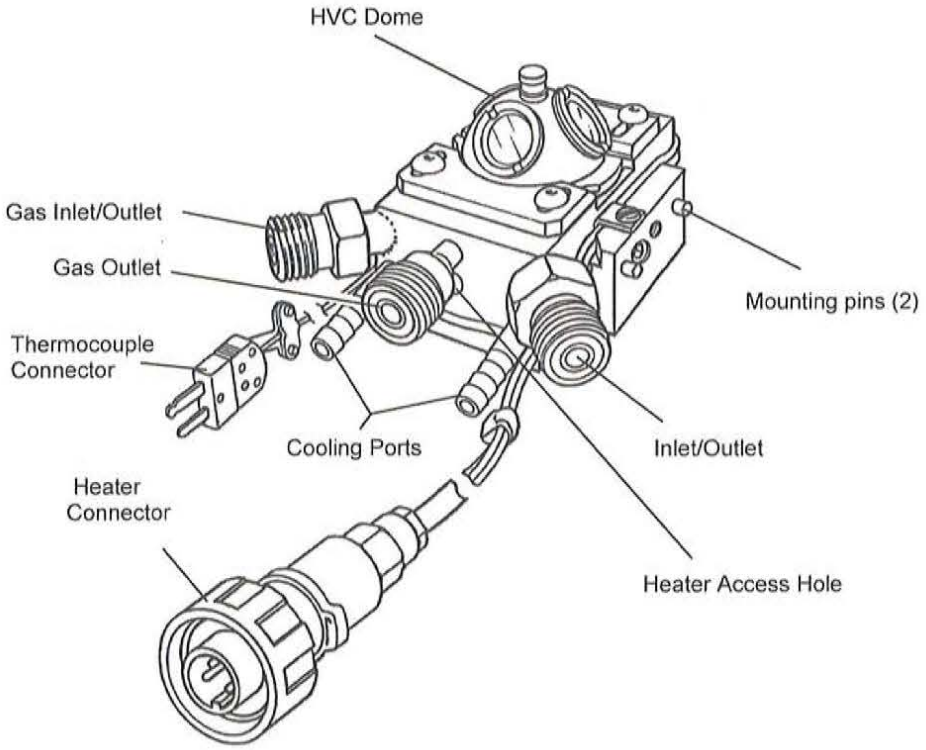


Figure 9 • The High Temperature Reaction Chamber HVC

WINDOW INSTALLATION

If the windows are not already installed or need to be cleaned or changed follow the steps below (Figure 10).

NOTE: *The observation window is the window that is located between the two semicircular indentations on the rim of the dome.*

- Insert an o-ring in one of the window ports.
- Hold the retaining ring upside-down and place a PTFE washer inside.
- Then carefully place a window on top of the PTFE washer.
- Hold the retaining ring so that it continues to retain the window and thread it into the window port.
- Tighten to secure the window in place using the tool provided for tightening and loosening the retaining rings.
- Repeat these steps until all three windows are installed.

NOTE: *Be careful not to touch the windows during installation.*

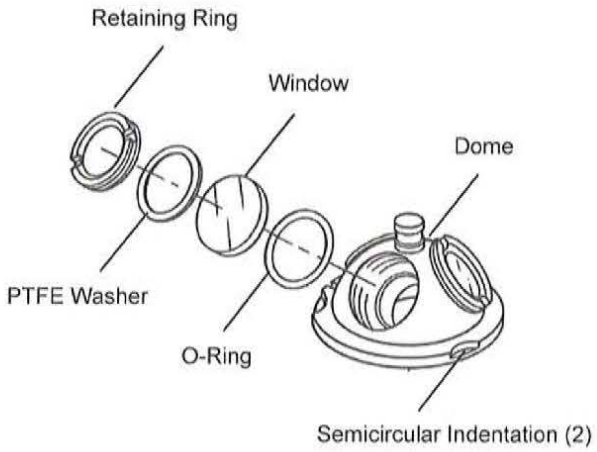


Figure 10 • Installing the HVC Dome Windows

DOME INSTALLATION

Although it is not necessary to install the dome until later, it is recommended to become familiar with the procedure before proceeding to the next step.

- Prior to installation of the dome make sure that the o-ring and groove on the bottom of the dome are clean and free of dust.
- Retract the retaining plates on the HVC as far as possible.
- Install the dome making sure that the orientation slot on the dome engages the orientation pin on the HVC (Figure 11).
- Slide the retaining plates all the way over the rim of the dome.
- Tighten the retaining plate screws to secure the dome.

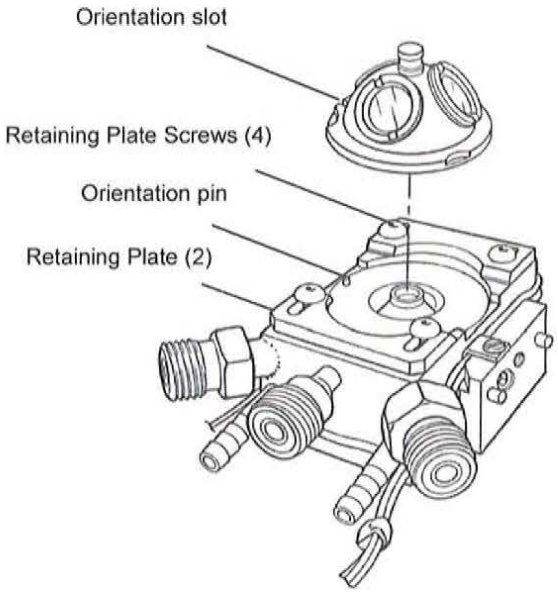


Figure 11 • Installing the HVC Dome

INSTALLING THE HVC

Before installing the HVC in the Praying Mantis™, make sure that the Praying Mantis™ is aligned in the spectrometer.

- Unscrew the thumbscrew on the top plate of the Praying Mantis™ (Figure 1).
- Carefully swing the top plate of the Praying Mantis™ out of the way.
- Grasp the sample stage (Figure 12) and unscrew its mounting screw.
- Slide the sample stage slightly to the left to dislocate its mounting pins.
- Remove the sample stage.
- Locate the mounting pins on the side of the HVC (Figure 9) in the pin holes where the sample stage was located.
- Reinstall and tighten the sample stage mounting screw.

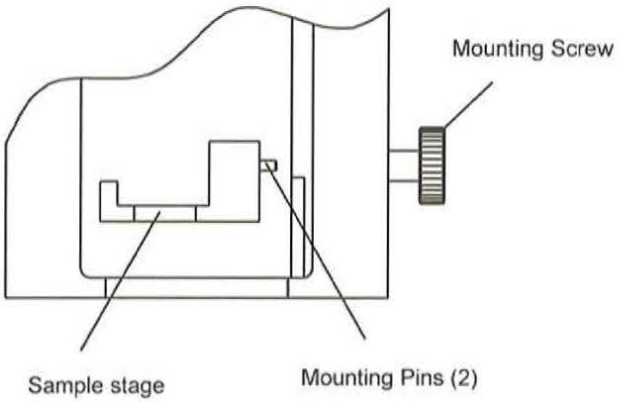


Figure 12 • Installing the HVC

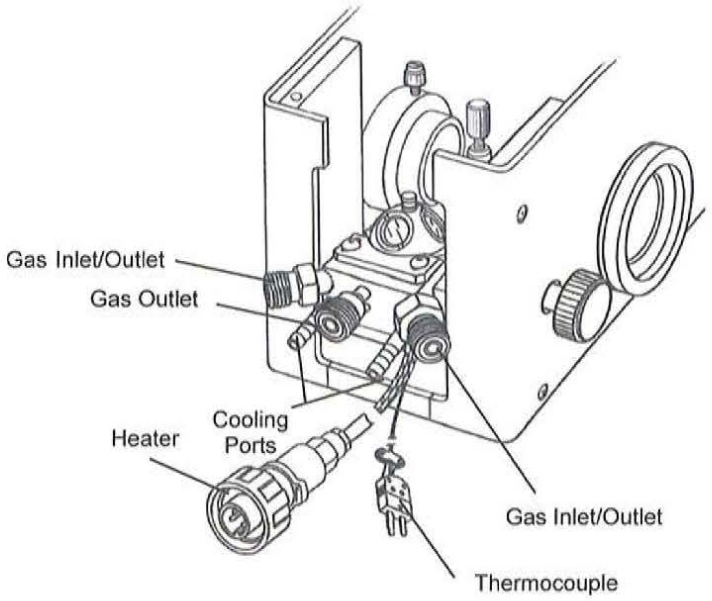


Figure 13 • The HVC Installed

FLUID / ELECTRICAL CONNECTIONS

- If temperature control is desired, connect the thermocouple and the heater (Figure 13) to a suitable temperature controller.
- If the HVC is to be operated at temperatures above 100°C, use 1/4" tubing to connect the two cooling ports (see Figure 13) to a water inlet/outlet or a coolant circulator.
- If vacuum is desired, connect the gas outlet (1/4" VCO fitting, see Figure 13) to a vacuum pump or other source of vacuum using 3/8" I.D. vacuum tubing. Seal off the two gas inlet/outlet ports.
- If reaction or process gas/es are to be passed through the sample, connect the gas inlet/out ports (1/4" VCO fitting, see Figure 13) as needed to the gas source/s. Connect the gas outlet and seal off any unused gas ports.
- If reaction or process gas/es are to be passed over the sample, seal off the gas outlet. Connect one of the gas inlet/outlet ports to the gas source and the other as the outlet.

COLLECTING THE BACKGROUND SPECTRUM

- Place a sample screen into the sample cup and locate the plastic overflow tray over the sample cup (Figure 14).
- Fill the sample cup with the reference material using the provided packing tool. Draw the straightedge across the top of the cup to level off the surface.
- Carefully remove the overflow tray.
- Install the dome on the HVC (see page 15).
- Swing the Praying Mantis™ cover back into place and tighten the thumbscrew.
- Set the temperature and pressure to desired operating conditions.
- Set the spectrometer to measure the "energy" on the detector.
- Adjust the micrometer (Figure 1) to maximize the signal on the detector.
- Collect the background spectrum.

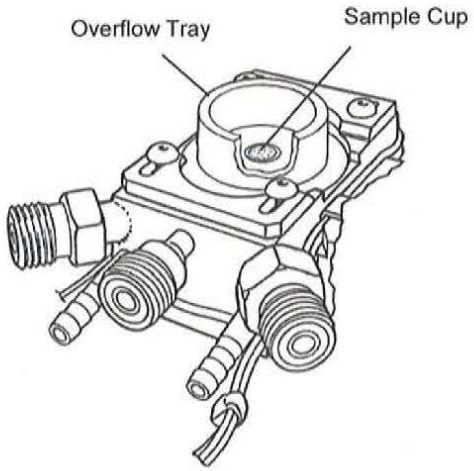


Figure 14 • Filling the Cup

SAMPLE SPECTRUM

- Restore the reference material to ambient conditions.
- Remove the dome.
- Empty the sample cup. This can be done by vacuuming out the reference sample or by removing the HVC from the Praying Mantis™ and dumping out the material.
- If needed, clean the sample cup.
- Fill the sample cup with the sample (follow procedure in the alignment section).
- Install the dome.
- Install the HVC into the Praying Mantis™ if it was removed to empty the sample cup.
- Swing the top plate back into place and tighten the thumbscrew (Figure 1).
- Restore the desired sampling conditions.
- Collect the sample spectrum.
- Empty the sample cup and clean it before running the next sample.

ABOUT THE LOW TEMPERATURE REACTION CHAMBER (CHC)

The CHC is designed for operation from -150°C up to 600°C under vacuum. The pressure range is from high vacuum (133 μPa or 10^{-6} torr) to pressures up to 304kPa or 2.3 ktorr (for pressures above 133 kPa or 1 ktorr use either the high pressure dome or use SiO_2 or ZnSe windows). At higher pressures, the maximum operating temperature may be lower.

The CHC is made of chemically resistant 316 stainless steel. Within the chamber is a temperature-controlled sample stage with an integral sample cup. This stage incorporates a cartridge heater and two thermocouples, one in the sampling stage and one in the sample cup. The sample stage is thermally isolated from the outer chamber wall. A water-cooling jacket controls the temperature of the outer surface of the chamber and windows during high or low temperature operation. The chamber has three gas ports for evacuating, pressurizing or flowing gas through the sample. These ports are equipped with 1/4" VCO fittings. One of the ports leads directly under the sample cup, the other two lead into the sides of the chamber.

The chamber is enclosed with a dome with three windows, two for the spectrometer radiation to enter and exit the chamber and the third for viewing, illuminating, or irradiating the sample. This enables the use of the reaction chambers for photochemical studies. The standard material for the observation window is UV quartz and KBr for the other two windows.

> ⚠ ***CAUTION:***
> *Parts for the high pressure and low pressure domes should not be exchanged. The high pressure domes undergo high pressure testing and are guaranteed to work under the rated pressure.*

GETTING READY

Before installing the Low Temperature Reaction Chamber (CHC) familiarize yourself with it by referring to the drawing of the CHC found below (Figure 15).

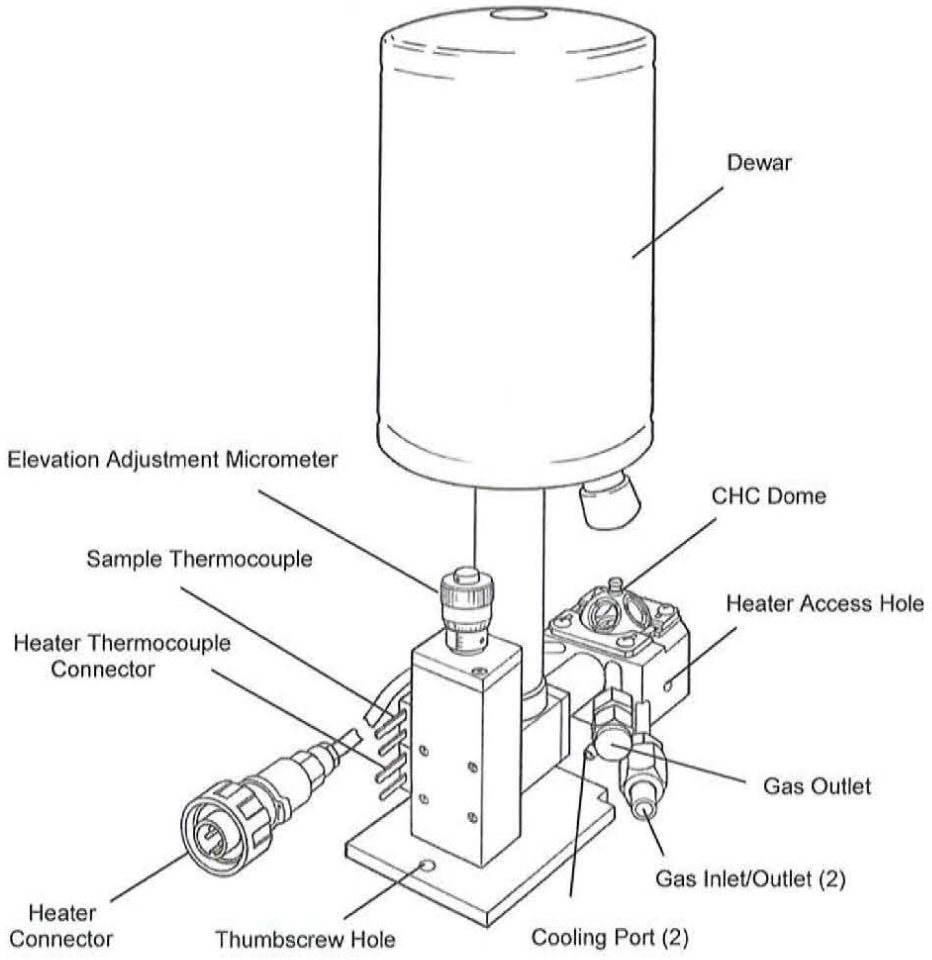


Figure 15 • The Low Temperature Reaction Chamber CHC

WINDOW INSTALLATION

If the windows are not already installed or need to be cleaned or changed follow the steps below (Figure 16).

NOTE: *The observation window is the window that is located between the two semicircular indentations on the rim of the dome.*

- Insert an o-ring in one of the window ports.
- Hold the retaining ring upside-down and place a PTFE washer inside.
- Then carefully place a window on top of the PTFE washer.
- Hold the retaining ring so that it continues to retain the window and thread it into the window port.
- Tighten to secure the window in place using the tool provided for tightening and loosening the retaining rings.
- Repeat these steps until all three windows are installed.

NOTE: *Be careful not to touch the windows during installation.*

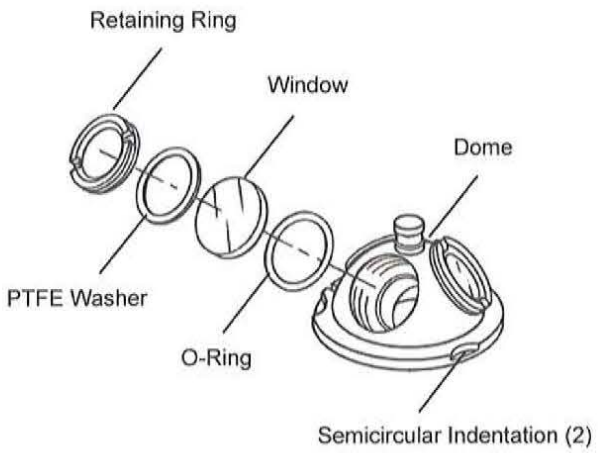


Figure 16 • Installing the CHC Dome Windows

DOME INSTALLATION

Although it is not necessary to install the dome until later, it is recommended to become familiar with the procedure before proceeding to the next step.

- Prior to installation of the dome make sure that the o-ring and groove on the bottom of the dome are clean and free of dust.
- Retract the retaining plates on the CHC as far as possible.
- Install the dome making sure that the orientation slot on the dome engages the orientation pin on the CHC (Figure 17).
- Slide the retaining plates all the way over the rim of the dome.
- Tighten the retaining plate screws to secure the dome.

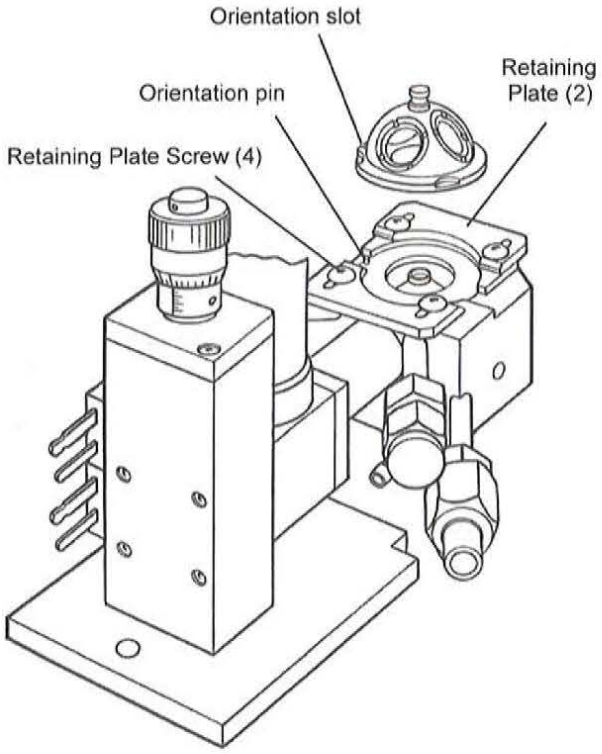


Figure 17 • Installing the CHC Dome

INSTALLING THE CHC

Before installing the CHC in the Praying Mantis™, the Praying Mantis™ should have been aligned in the spectrometer.

- Unscrew the thumbscrew on the top plate of the Praying Mantis™.
- Carefully swing the top plate of the Praying Mantis™ out of the way.
- Grasp the sample stage and unscrew its mounting screw.
- Slide the sample stage slightly to the left to disengage its mounting pins.
- Remove the sample stage.

For spectrometers with a low working height (2" or less), some additional assembly is required to mount the CHC on the Praying Mantis. This includes the Varian FTIR spectrometers with serial numbers starting with DRPDI4, DRPDI5, DRPDI6, DRPDI7 and DRPDI8.

- Lift the accessory out of the sample compartment and rest it on its back.
- Loosen the two setscrews that secure the knob and slide the knob off its rod (see Figure 18).

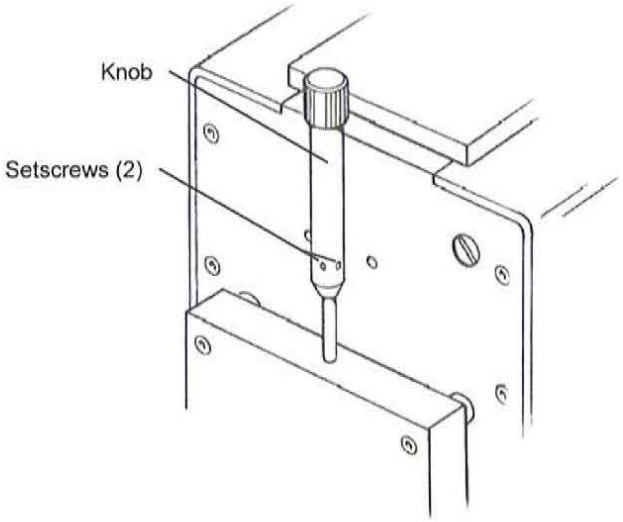


Figure 18 • The Camlock Plate

- Slide the locking adapter over the rod, as shown in Figure 19.
- Tighten the two setscrews to secure the locking adapter.
- Mount the CHC mounting plate on the Praying Mantis™ body, as described on the next page. Be sure to carefully slide the mounting plate between the bottom plate of the Praying Mantis and the camlock plate.

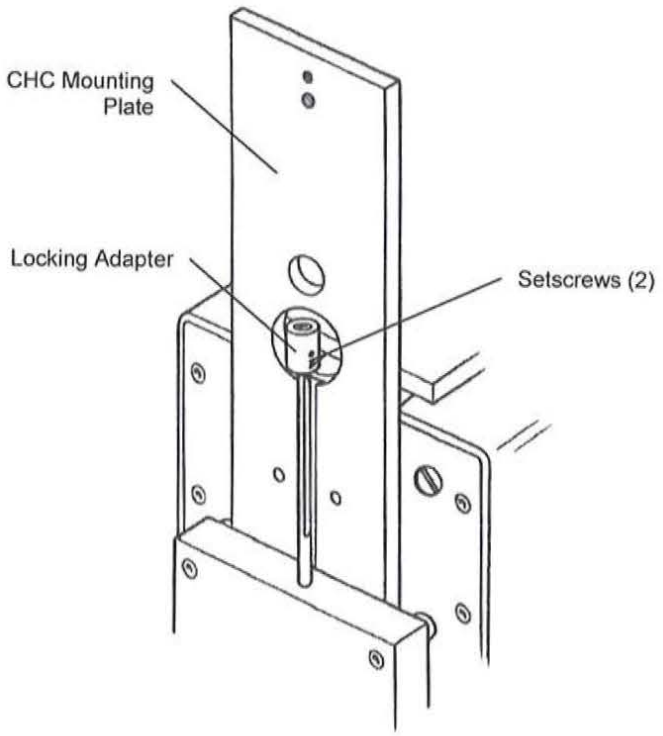


Figure 19 • Installing the Locking Adapter

- Slide the CHC mounting plate (Figure 20) under the Praying Mantis™ body locating the CHC mounting plate pin in the hole in the bottom of the Praying Mantis™.
- Use the two pan head screws provided to secure the mounting plate in place.

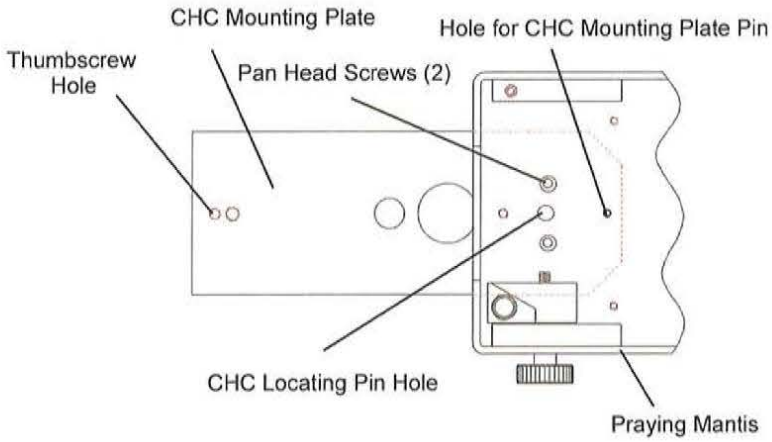


Figure 20 • Installing the CHC Mounting Plate (Top View)

- Mount the CHC by guiding the locating pin which is directly under the CHC body into the locating hole in the DRP base.
- Fasten the thumbscrew (Figure 21) to secure the CHC to the CHC mounting plate.

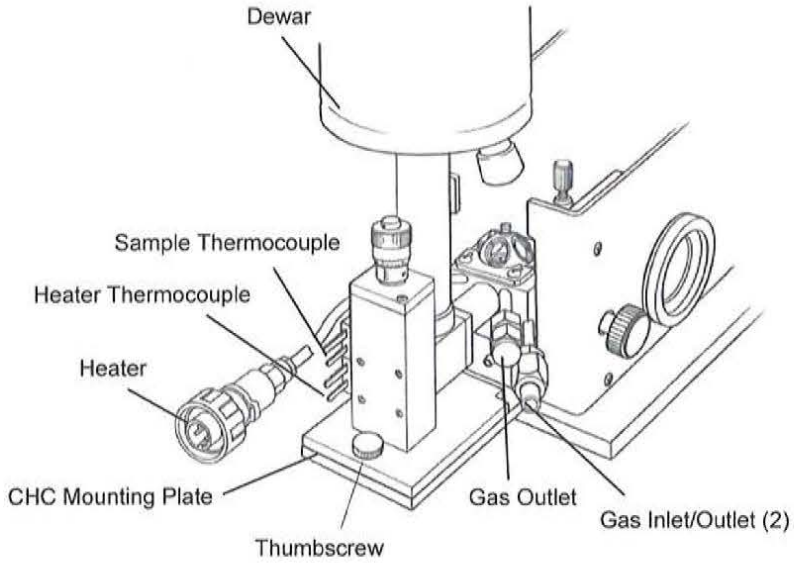


Figure 21 • The CHC installed

FLUID / ELECTRICAL CONNECTIONS

- If temperature control is desired, connect the thermocouple and the heater (Figure 21) to a suitable temperature controller.
- If the CHC is to be operated at temperatures above 100°C or below 0°C, use 1/4" tubing to connect the two cooling ports (see Figure 22) to a water inlet/outlet or a coolant circulator.
- If vacuum is desired, connect the gas outlet (1/4" VCO fitting, see Figure 22) to a vacuum pump or other source of vacuum using 3/8" I.D. vacuum tubing. Seal off the two gas inlet/outlet ports.
- If reaction or process gas/es are to be passed through the sample, connect the gas inlet/out ports (1/4" VCO fitting, see Figure 22) as needed to the gas source/s. Connect the gas outlet and seal off any unused gas ports.
- If reaction or process gas/es are to be passed over the sample, seal off the gas outlet. Connect one of the gas inlet/outlet ports to the gas source and the other as the outlet.

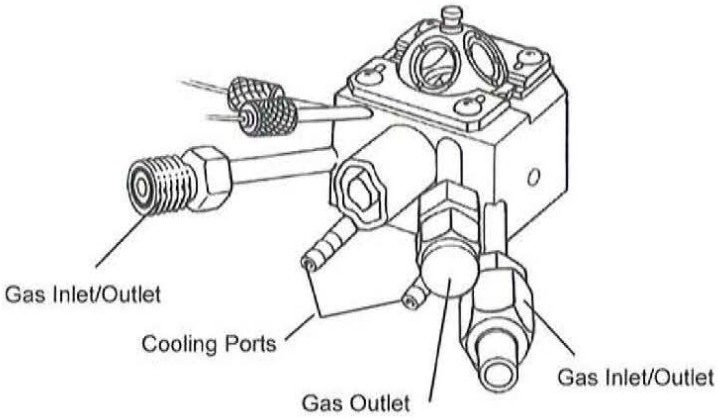


Figure 22 • The CHC installed

COLLECTING THE BACKGROUND SPECTRUM

- Place a sample screen into the sample cup and locate the plastic overflow tray over the sample cup (Figure 21).
- Fill the sample cup with the reference material using the provided packing tool. Draw the straightedge across the top of the cup to level off the surface.
- Carefully remove the overflow tray.
- Install the dome.
- Swing the Praying Mantis™ cover back into place and tighten the thumbscrew (Figure 1).
- Fill the Dewar with liquid nitrogen or other coolant.
- Set the temperature and pressure to desired operating conditions.
- Set the spectrometer to measure the "energy" on the detector.
- Adjust the elevation adjustment micrometer on the CHC (Figure 15) to maximize the signal on the detector.
- Collect the background spectrum.

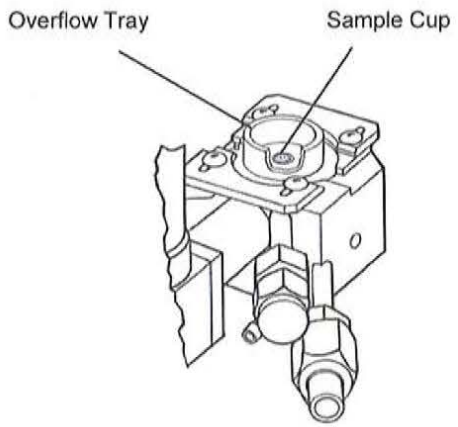


Figure 23 • Filling the Cup

SAMPLE SPECTRUM

- Restore the reference material to ambient conditions.
- Remove the dome.
- Empty the sample cup. This can be done by vacuuming out the reference sample or by removing the CHC from the Praying Mantis™ and dumping out the material.
- If needed clean the sample cup.
- Fill the sample cup with the sample (follow procedure in the alignment section).
- Install the dome (see page 23).
- Install the CHC into the Praying Mantis™ if it was removed to empty the sample cup.
- Swing the top plate back into place and tighten the thumbscrew (Figure 1).
- Restore the desired sampling conditions.
- Collect the sample spectrum.
- Empty the sample cup and clean it before running the next sample.

LEAK CHECKING

The Reaction Chambers have been carefully checked for leaks before shipment. However, each time the Reaction Chambers are disassembled and reassembled, leaks may develop due to improper setting of the o-rings. If leaks occur, carefully inspect all o-rings and sealing surfaces for damage and contamination. Small leaks can be pinpointed using a Helium Leak Detector. Contact Harrick Scientific Products, Inc. for advice and/or repair information.

CLEANING THE REACTION CHAMBERS

To thoroughly clean the reaction chambers follow the procedure below.

To clean the HVC:

- Vacuum out the sample or remove the HVC from the Praying Mantis™, remove the dome, turn the HVC upside-down and dump out the sample.
- Use solvent to clean off the remaining sample.
- Unscrew the eight screws that secure the bottom cover of the HVC.
- Remove the bottom cover to reveal three access holes.
- Gingerly wipe or blow clean air through these holes to clean the interior of the HVC.
- When the interior is clean, make sure the o-rings on the bottom plate are clean and free of dirt.
- Re-install the bottom cover.

To clean the CHC:

- Vacuum out the sample or remove the CHC from the Praying Mantis™, remove the dome, turn the CHC upside-down and dump out the sample.
- Use solvent to clean off the remaining sample.
- Unscrew the four screws that secure the bottom cover of the CHC.
- Remove the bottom cover to reveal the access hole.
- Gingerly wipe or blow clean air through the hole to clean the interior of the CHC.
- When the interior is clean, make sure the o-ring on the bottom plate is clean and free of dirt.
- Re-install the bottom cover.

REPLACING THE O-RINGS

The o-rings used by the Reaction Chambers should be replaced periodically. The Reaction Chambers have o-rings for sealing the windows, o-rings for sealing the access holes, o-rings on the fittings, and an o-ring to seal the dome to the Reaction Chamber.

REPLACING THE HEATER

To replace the HVC heater:

- Remove the HVC from the Praying Mantis™.
- Loosen the screw on the side of the HVC that anchors the heater wire to the HVC.
- Remove the two screws at the back of the HVC that clamp down the heater and thermocouple wires.
- Push a small, blunt object through the heater access hole (Figure 9) at the front of the HVC.
- Slide the heater out the back of the unit.
- To install a new heater, coat the heater with MgO powder (Maalox™ or the equivalent).
- Slide it into the HVC until it hits the stop.
- Make sure that the heater is inserted completely into the body before re-securing the wire.

To replace the CHC heater:

- Remove the CHC from the Praying Mantis™.
- Push a small, blunt object through the heater access hole (Figure 15) at the opposite side of the heating wires.
- Slide the heater out the other side of the unit.
- To install a new heater, coat the heater with MgO powder (Maalox™ or equivalent antacid).
- Slide it into the CHC until it hits the stop.
- Make sure that the heater is inserted completely into the body before re-securing the wire.

REPLACING THE THERMOCOUPLE

To replace the HVC thermocouple:

- Remove the HVC from the Praying Mantis™.
- Loosen the screw on the side of the HVC that anchors the thermocouple wire to the HVC.
- Remove the two screws at the back of the HVC that clamp down the heater and thermocouple wires.
- Gently pull out the thermocouple.
- Slide the new thermocouple into the HVC until it hits the stop.
- Make sure that the thermocouple is inserted completely into the body before re-securing the wire.

To replace the CHC thermocouple:

- Remove the CHC from the Praying Mantis™.
- Gently pull out the thermocouple.
- Slide the new thermocouple into the CHC until it hits the stop.
- Make sure that the thermocouple is inserted completely into the body before re-securing the wire.

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 24. See Table 1 on the next page for the appropriate screws/holes for your spectrometer.

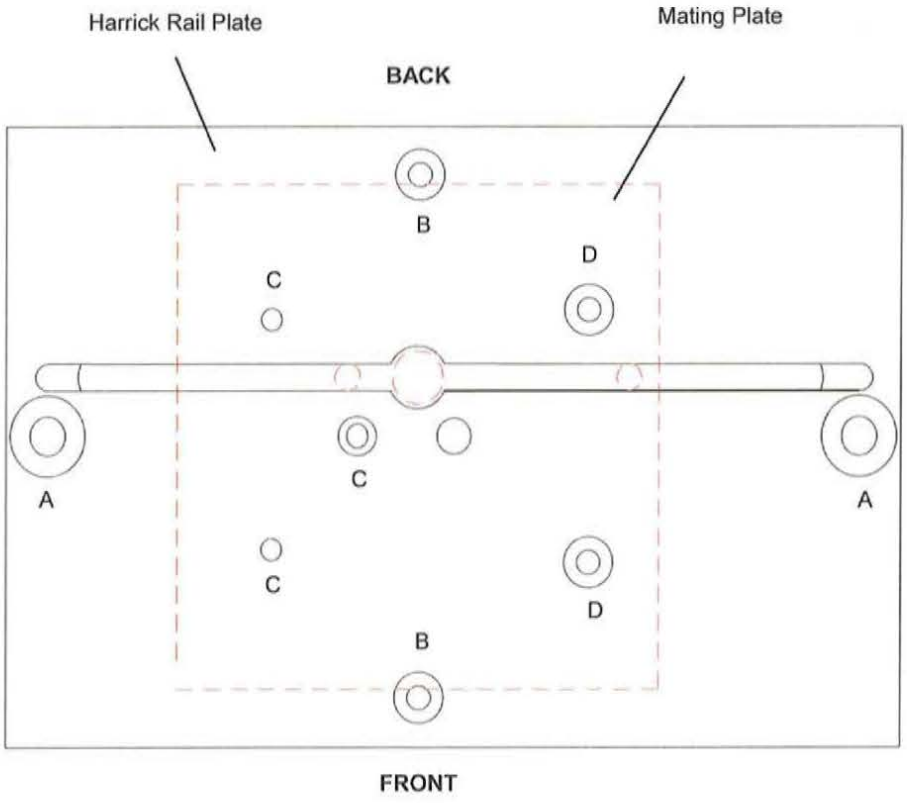


Figure 24 • Screw and Pin Positions for Rail Plate

FTIR SPECTROMETERS	HOLES
VARIAN or DIGILAB (All Models)	A
MATTSON (Polaris, Galaxy, RS Infinity, Genesis, Satellite)	B
PERKIN ELMER (Spectrum 1)	C
THERMO-NICOLET (Nexus, Avatar, Magna, Impact)	D

Table 1 • Screw and Pin Positions for Rail Plate

OPTIONAL AND REPLACEMENT PARTS

OPTIONAL PARTS (Praying Mantis™)

Ambient Sample Chamber	DRP-ASC
High Temperature Reaction Chamber, 24V (FTIR)	HVC-DRP-4
Low Temperature Reaction Chamber, 24V (FTIR)	CHC-CHA-3
High Temperature Reaction Chamber, 24V (UV-Vis)	HVC-VUV-4
Low Temperature Reaction Chamber, 24V (UV-Vis)	CHC-VUV-3
Spectroscopic Grade KBR Powder	KBR-100

OPTIONAL PARTS (Reaction Chambers)

Temperature Controller, 110V	ATC-024-1
Temperature Controller, 220V	ATC-024-2
Vacuum Pump, 110V	VPE-001
Vacuum Pump, 220V	VPE-002
UV Quartz Window for the Vacuum/Low Pressure Domes	WAD-U23
Si Window for the Vacuum/Low Pressure Domes	WED-U23
CaF2 Window for the Vacuum/Low Pressure Domes	WFD-U23
ZnS Window for the Vacuum/Low Pressure Domes	WID-U23
ZnSe Window for the Vacuum/Low Pressure Domes	WMD-U23
KBr Window for the Vacuum/Low Pressure Domes	WPD-U23
O-Ring (#23) for the Dome, Kalrez	ORK-023
O-Ring (#13) for Windows of the Dome, Kalrez	ORK-013
O-Ring (#10) for the VCO Fittings, Kalrez	ORK-010

HVC Reaction Chambers Only

High Pressure Dome, ZnS Windows	HVC-DWI-3
High Pressure Dome, ZnSe Windows	HVC-DWM-3
High Pressure Dome, UV Quartz Windows	HVC-DWA-3
ZnS Window for the High Pressure Dome	WID-U43
ZnSe Window for the High Pressure Dome	WMD-U43
UV Quartz Window for the High Pressure Dome	WAD-U43
O-Ring (#16) for the Bottom Cover, Kalrez	ORK-016

CHC-CHA Reaction Chambers Only

O-Ring (#001) for Thermocouple Fitting, Kalrez	ORK-001
O-Ring (#26) for the Bottom Cover, Kalrez	ORK-026
O-Ring (#19) for the Dewar, Kalrez	ORK-019

REPLACEMENT PARTS (Praying Mantis™)

Alignment Fixture	DRP-ALN
Sampling Accessory Kit	DRA-SAP
Micro-sampling Cup	DRP-SAP
Sampling Cup	DRP-S10

REPLACEMENT PARTS (Reaction Chambers)

Packing Tool	116-836
Screen Set, two each of three mesh size	116-439
K-Type Thermocouple	008-144
Flex Mounting Plug – Male	008-266
UV Quartz Window for the Vacuum/Low Pressure Domes	WAD-U23
KBr Window for the Vacuum/Low Pressure Domes	WPD-U23
O-Ring (#23) for the Dome, Viton	ORV-023
O-Ring (#13) for Windows of the Dome, Viton	ORV-013
O-Ring (#10) for the VCO Fittings, Viton	ORV-010

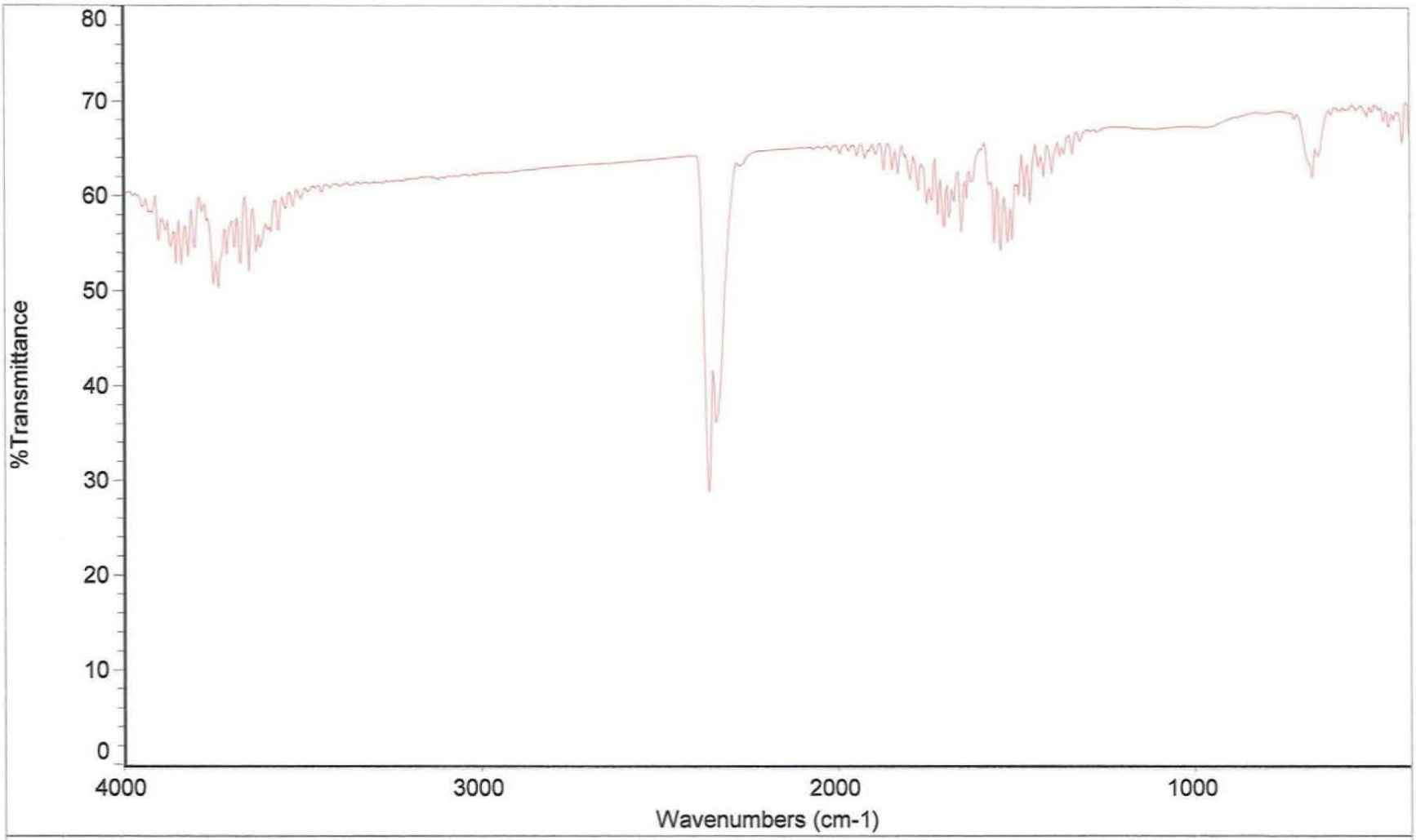
HVC Reaction Chambers Only

UV Quartz Window for the High Pressure Dome	WAD-U43
1.00"x0.25" Cartridge Heater, 100W, 24V	HTRS-26
24V Heater Assembly	HVC-HT4
O-Ring (#16) for the Bottom Cover, Viton	ORV-016
Overflow tray	116-835

CHC-CHA Reaction Chambers Only

24V Heater Assembly	HVC-HTR
1.00"x0.25" Cartridge Heater, 75W, 24V	HTRS-16
O-Ring (#001) for Thermocouple Fitting, Viton	ORV-001
O-Ring (#26) for the Bottom Cover, Viton	ORV-026
O-Ring (#19) for the Dewar, Viton	ORV-019
Overflow tray	116-854

Manual Part No. DRP-M-04



Date: Wed Feb 24 12:32:26 2010 (GMTWed Feb 24 12:32:17 2010 (GMT-05:00)

DRPNI85999011001

Scans: 8

Resolution: 8.000