

# UNITY 2™

## Installation Manual

Version 1.3 (Changes: Sections 2.2 & 2.7)

June 2009

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# 1. UNITY 2 Pre-installation Check List

## 1.1. Minimum computer specification for UNITY 2 control

CPU	400MHz Pentium
RAM	64 MB
Free Disk Space	20 MB
Operating System	Windows 95, 98, ME, 2000, NT4, XP (32-bit) and Vista (32-bit)
Minimum resolution	800x600
Other requirements	Windows compatible mouse, at least one free serial comms port*

\*The PC requires a free serial comms port for communication with UNITY 2. An additional serial comms port is required for the following accessories:

- each ULTRA™ module (*i.e.* ULTRA, ULTRA 50:50™, AutoSecure ULTRA™)
- CIA8™ canister accessory
- **series 1** Air Server™ (3, 6 or 8 channel)
- **series 1** MFC

**Note:** Neither Series 2 Air Server (3 or 8 channel) nor Series 2 Mass Flow Controllers (**U-MFC100-2S**, **U-MFC200-2S**) require additional serial ports

## 1.2. GC equipment requirements

UNITY 2 is usually connected to a gas chromatograph configured with appropriate conventional or mass spectrometer (MS) detectors. No conventional GC injector is required for UNITY 2 operation. Ready and external start connections are required on the GC.

## 1.3. Access into the GC oven

The UNITY 2 heated transfer line is lined with 0.25 mm I.D., 0.35 mm O.D. uncoated deactivated fused silica which butt connects with the capillary analytical column inside your GC oven.

It is important that the heated and insulated portion of the transfer line extends as far as the skin of the GC oven such that the GC oven heating begins at the point where heating of the transfer line ends. A 25 mm diameter access hole is thus required into the GC, with a 6.5 mm hole in the GC inner oven wall. Further information is provided in Section 2.1.

## 1.4. GC configuration/parameter selection

From a GC perspective, UNITY 2 may simply be regarded as a multipurpose, stand alone GC injector for capillary or 1/8 inch packed columns. No conventional GC injector is required for UNITY 2 operation. The rest of the GC system - column, oven, data handling, detector, etc. - should be configured and used, as per normal chromatographic practice for the analytes of interest.

If multiple applications are to be carried out or if samples are uncharacterised; for example when monitoring unknown atmospheres, a good general purpose GC configuration comprises 25-30 m, 0.25mm or 0.32 mm ID, 1 or 2 µm phase thickness bonded methyl silicone capillary column with a FID or mass spectrometer detector.

## 1.5. Laboratory location

### 1.5.1. Space requirements

- UNITY 2 can sit either side of the gas chromatograph.
- Efficient cold trap cooling requires at least a **10 cm gap** on both sides of UNITY 2

### 1.5.2. Quality of the laboratory air

UNITY 2 is a powerful concentration device and is often used to determine trace levels of organic analytes. It is advisable to store and operate UNITY 2 in a clean laboratory environment with minimal atmospheric concentrations of organic vapours.

### 1.5.3. Quality of the laboratory gas lines

As UNITY 2 is a concentrator, even trace level contaminants in laboratory gas lines can become significant interferences in the chromatograms produced.

- Recommended gas lines are refrigeration-grade copper tubing connected using approved swage-fittings.
- Laboratory gas line joints and connections must never be brazed.
- Position the gas supplies as close as possible to the analytical system *i.e.* such that the gas lines are as short as possible.
- Use a high quality, stainless steel diaphragm cylinder head regulator for the carrier gas supply.

## 1.6. Services

### 1.6.1. Power

UNITY 2 is automatically compatible with all conventional mains power supplies ranging from 90 to 255 V and 50 or 60 Hz. It is not necessary to manually select or switch voltages. The maximum power consumption of UNITY 2 is 650 W.

### 1.6.2. Pressure controlled supply of dry air or nitrogen (purge gas)

UNITY 2 requires:

- A pressure-regulated supply of dry air or nitrogen (**dewpoint lower than -50°C**) at **between 55 and 70 psi** both to actuate the main valve and to purge the cold trap box.

It is recommended that a secondary pressure regulator be used to control the supply of dry gas to UNITY 2 in addition to that controlling the general laboratory line pressure. Any conventional pressure regulator should suffice for this and suitable pneumatic control may already be available on your GC. Alternatively, Markes International Ltd. supply a pneumatic control accessory (P/N U-GAS01) for both air and carrier gas.

- It is recommended that the pressure in the laboratory air line be 10 psi higher than that supplied to UNITY 2.

### **1.6.3. Pressure controlled carrier gas supply**

- Helium is invariably used as the carrier gas for capillary chromatography and nitrogen for packed column or sensor work.
- 5.0 grade (i.e. 99.999%) or higher purity helium / nitrogen gas is recommended in either case.
- Although Hydrogen may be used as a carrier gas for standard GC and thermal desorption applications, care must be taken in case the high temperatures involved in thermal desorption cause hydrogenation of reactive and / or unsaturated species.

UNITY 2 requires a regulated supply of carrier gas at a pressure to suit the analytical column / system selected. The UNITY 2 gas flow path has minimum (<2 psi) impact on total system impedance. Suitable pneumatic control for the carrier gas may already be available on your GC. The performance of most common capillary columns is optimised at between 1 and 2 ml/min typically requiring between 10 and 30 psi head pressure.

- High quality pressure regulators incorporating a stainless steel diaphragm are recommended for carrier gas control.
- The pressure in the laboratory carrier gas line should be at least 10 psi higher than that supplied to UNITY 2.

### **1.6.4. Filters**

Deoxo and organic filters should be included in the carrier gas line just upstream of connection to the UNITY 2 - GC analytical system (see Accessories for Thermal Desorption catalogue).

### **1.6.5. UNITY 2 and Electronic Carrier Control (ECC)**

Please refer to the UNITY 2 ECC Installation Manual.

For optimum performance the carrier gas pressure to the ECC module should be regulated to approximately 10 to 15 psi above the column head pressure.

**Note:** As ECC only controls the carrier gas, suitable pneumatic control of the dry gas will still be required. A U-GAS01 from Markes International includes a carrier gas regulator to step down the carrier pressure and a separate regulator and gauge for control of the dry air or nitrogen, and is therefore recommended in this case.

## **1.7. Unpacking UNITY 2**

Remove the instrument from its packaging.

It is strongly recommended that the instrument packaging is retained for future use if ever the system is to be shipped using conventional carriers. Shipping the instrument in non-standard packaging may irreversibly damage the equipment and invalidate the warranty.

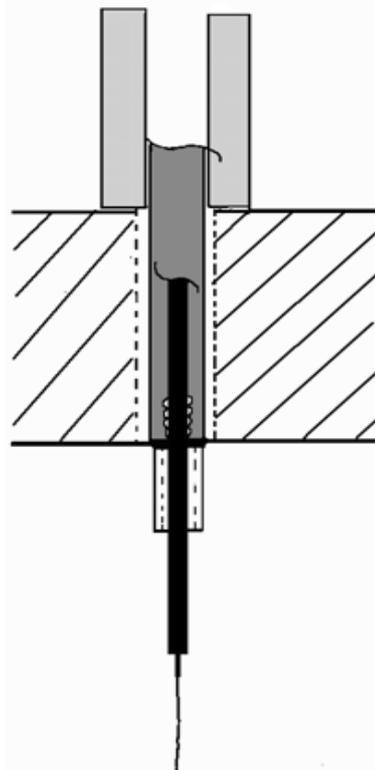
## 2. Installing UNITY 2

### 2.1. Installing the transfer line

UNITY 2 is supplied with a universal transfer line to convey desorbed analytes from UNITY 2 to a gas chromatograph or other analytical system. The sample path utilises a deactivated fused silica line (0.25mm I.D. and 0.35mm O.D.) heated over its entire length by means of a distributed heater and at the GC end by heat conduction from the GC oven. The line is 1 m long, which is sufficient to reach most gas chromatographs even when a mass spectrometer is attached.

**Note:** The parts supplied can be used in other combinations to suit particular instrument configurations.

1. Through built in access to the oven region by means of holes in the side, top or back of the oven, with "knock out" sections in the outer casing.

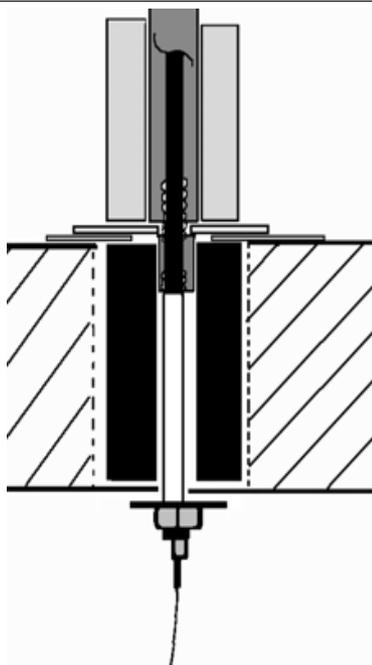


Locate a hole in the inner oven wall with a corresponding hole leading to the outside of the instrument.

It is usually necessary to displace the oven insulation material to enable the flexible metal line to be pushed against the outside of the inner oven wall.

The M6 spacer nut (attached to a 1/4-inch spacer tube on the transfer line) secures the line casing to the oven wall allowing the 1/8-inch aluminium sleeve to protrude into the oven. If the hole in the inner oven wall is larger than the end of the line, fit one of the large metal washers from the shipping kit at this point.

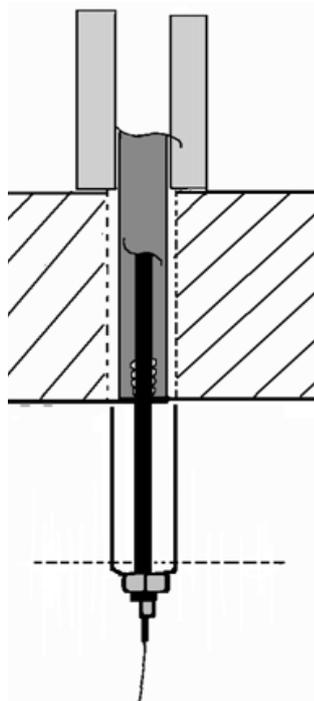
2. If all such access points are already in use it is possible to gain entry via an unused injector or detector port with or without a heated zone.



As the entry hole will generally be larger than the diameter of the metal line sleeve, one or more of the large washers supplied will be needed. If the heated zone block is particularly deep both the M6 spacer nut and spacer tube will be needed as shown.

This part of the line derives its heat from the heated zone block which should be set to run at a temperature 50°C above the line setting but not above 250°C as the silicone foam rubber insulation will be damaged.

3. Entry to the GC oven is through the fan protection grill.



In this situation the 1/4-inch spacer tube attached to the transfer line prior to the spacer nut is used to extend the line

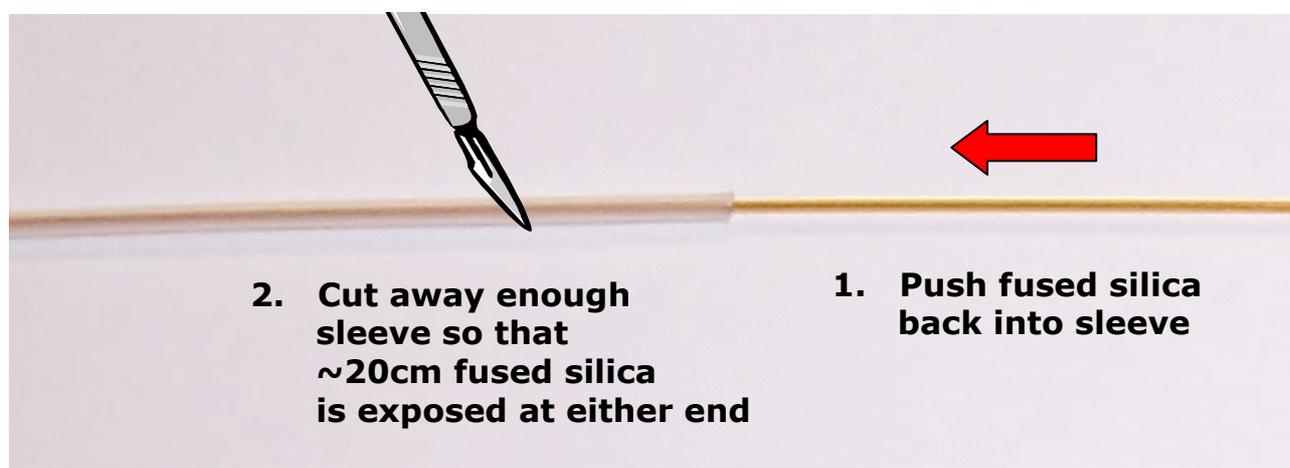
and a special U-shaped metal support bracket is pushed through adjacent holes in the grill to press against the oven inner wall.

**Note:** The line must not be secured with a nut against the fan grill as this could be distorted causing it to hit the fan.

### 2.1.1. Installing the fused silica transfer line insert

Once the heated line has been fitted to the GC, the fused silica plus associated PTFE sleeving (**SERUTD-5093**) (see shipping kit) are pushed from the GC end, along the 1/8-inch aluminium tube until they protrude from the other (UNITY 2) end of the transfer line.

Trim the PTFE sleeve to ensure enough fused silica is exposed.



Connect the fused silica transfer line to the GC column with a pressfit (**C-QSC10**) or alternative connector.

## 2.2. Connecting the transfer line to UNITY 2

Place UNITY 2 on the bench on the most convenient side of your gas chromatograph. Ensure that the transfer line will reach from the top of UNITY 2 to the selected entry point into the GC oven.

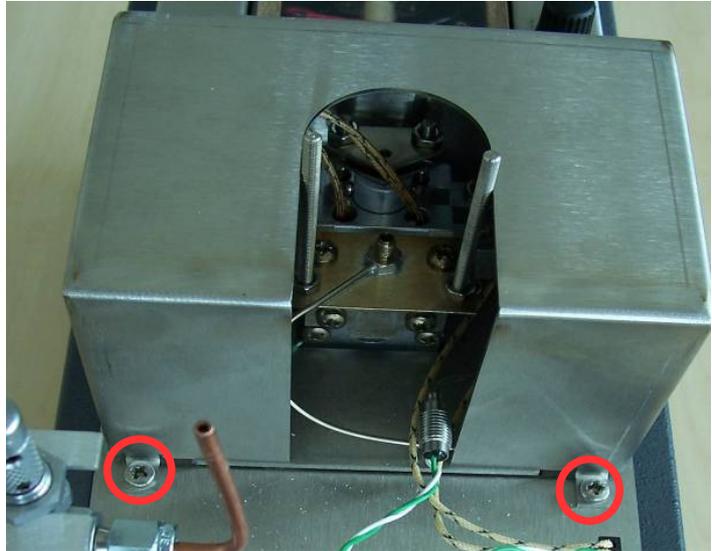
Ensure that UNITY 2 is switched off and cool.

Remove the rear top cover

- 1) Slide the cover backwards
- 2) Lift upwards

Remove the heated valve surround

- 1) Unscrew the 2 screws highlighted
- 2) Lift upwards



Place the 1/16 x 0.4 mm (**U-FV001 (pk 10)**) ferrule onto the union then thread the 1/16-inch stainless steel Swagelok type nut (**SERZ-0157**) on loosely



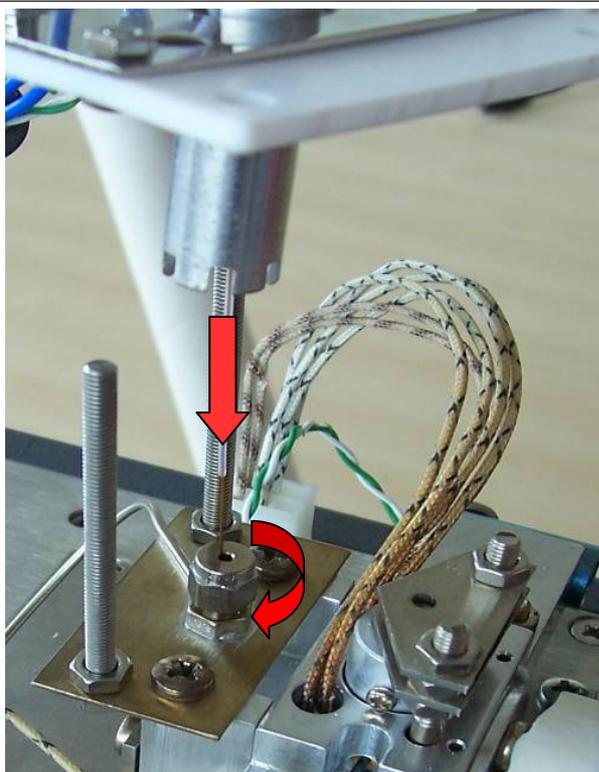
Pull ~ 20 cm of fused silica from the PTFE line casing. Cut off the first few mm of fused silica using an approved capillary cutting tool.

Make a mark **20 mm** from the end of the fused silica using typing white-out fluid or an alternative marker.

Gently feed the fused silica through the 1/16" nut and ferrule until the mark is reached.

Tighten the nut to trap the fused silica and then tighten a further 1/2 turn using one of the 8 mm wrenches (spanners) provided in the shipping kit.

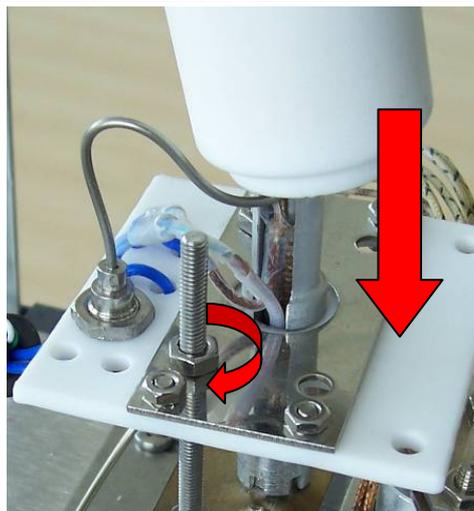
 Do not over tighten or the ferrule will become distorted.



Carefully bring the clamp plate, PTFE plate and shield tube down into the position with the shield tube covering the union nut.

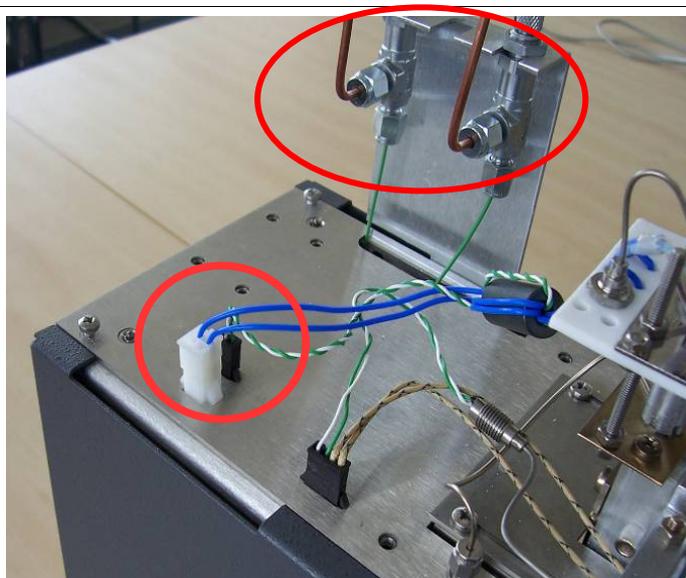
The shield tube should be positioned such that the 1/16th side tubing projects through one of the cutouts.

Push the clamp plate and PTFE plate down on to the 2 exposed threads and secure with 2 x M4 nuts (**SERZNM4FSS**)



Move the 2 copper vents tubes into the upright position.

Plug the 2 connectors highlighted into their respective sockets

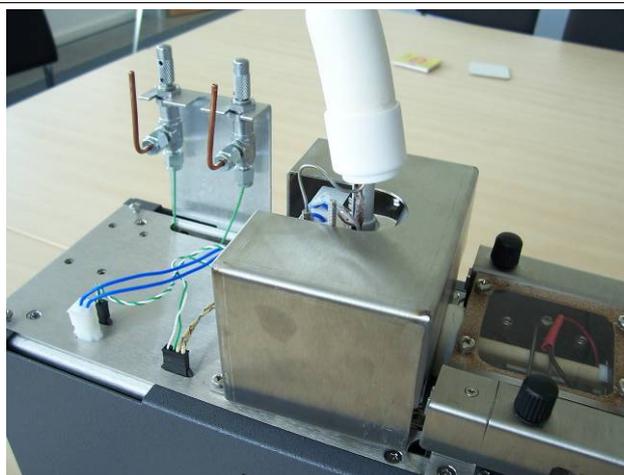


Insert the split filter tube, ensuring that the heated valve assy. does not move.

If it does move check the tube alignment.



Replace the heated valve surround and secure with the 2 screws removed in the first step

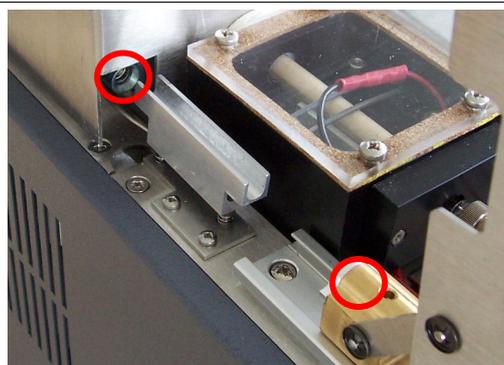


Replace the rear top cover



Check the tube receivers to ensure the white PTFE frits are present in both sample and split tube sides.

If they are missing then replace them with spares, which can be found in the shipping kit.



## 2.3. Installing the cold trap

Ensure the power to UNITY 2 is switched **OFF**.

Remove the front top cover from UNITY 2

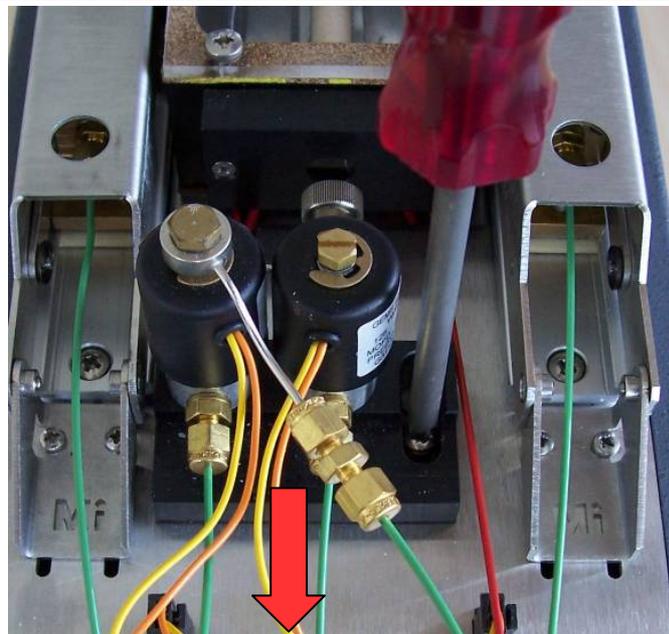
Pull the cover back while lifting



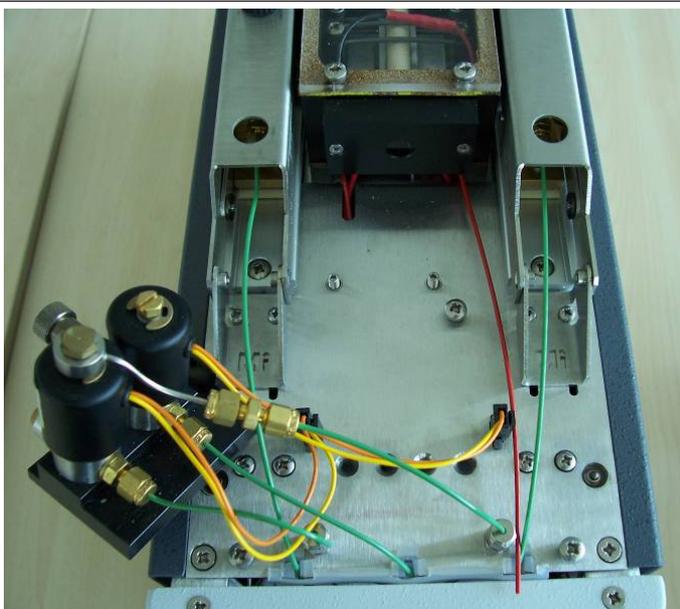
Loosen the screw at the bottom of the desorb pneumatics assembly

Do not remove the screw completely.

Gently pull the desorb pneumatic assembly towards the front of the instrument being careful to keep it in the horizontal plane



Once clear of the screw, pull the pneumatics forward and rotate to the left.



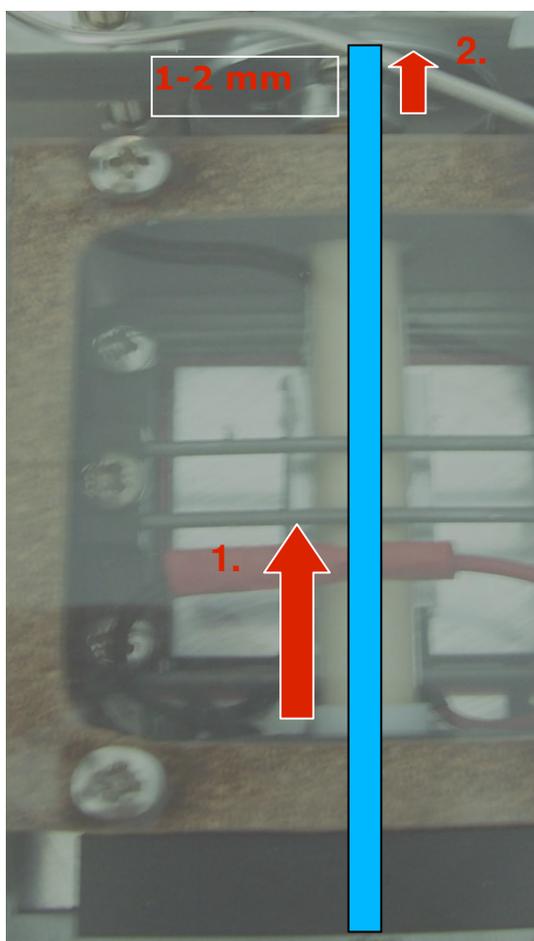
1. Place the trap alignment tool into the cold trap box.
2. The tool should pass smoothly up to the o-ring in the heated valve before further gentle pressure moves the tool another 1-2 mm.

 **If the tool does not move smoothly past the point where it enters the brass connector there may be a misalignment problem.**

See Technical support document Section 3.3 for the realignment procedure.

3. Remove the trap alignment tool

 **NEVER SWITCH UNITY 2 ON WITH THE TRAP ALIGNMENT TOOL INSTALLED**

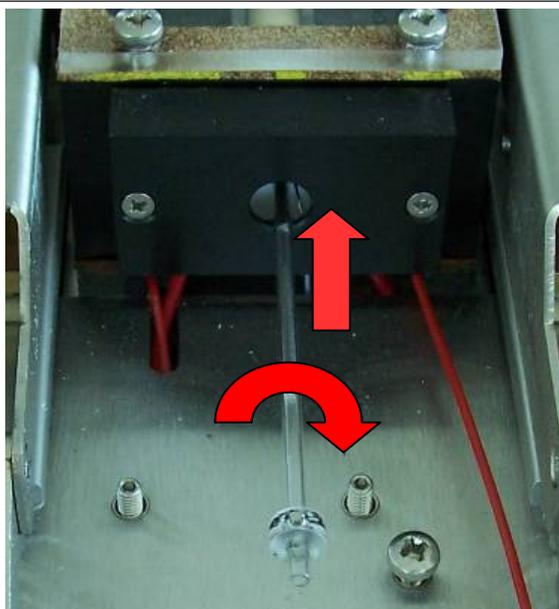


Holding onto the glass flange, gently twist and push the trap tube into the cold trap box.

 **DO NOT APPLY EXCESSIVE FORCE TO THE QUARTZ COLD TRAP TUBE.**

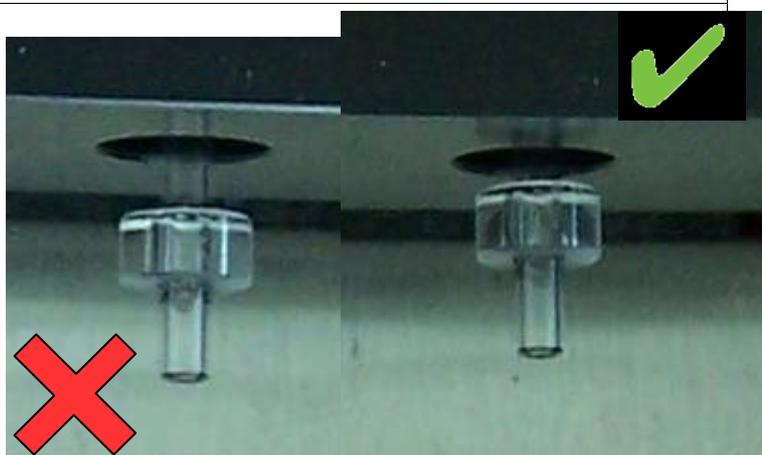
If in doubt practice with the trap alignment tool supplied in the shipping kit.

 **NEVER SWITCH UNITY 2 ON WITH THE TRAP ALIGNMENT TOOL INSTALLED.**



You will feel increased resistance as the cold trap pushes into the seal at the valve end

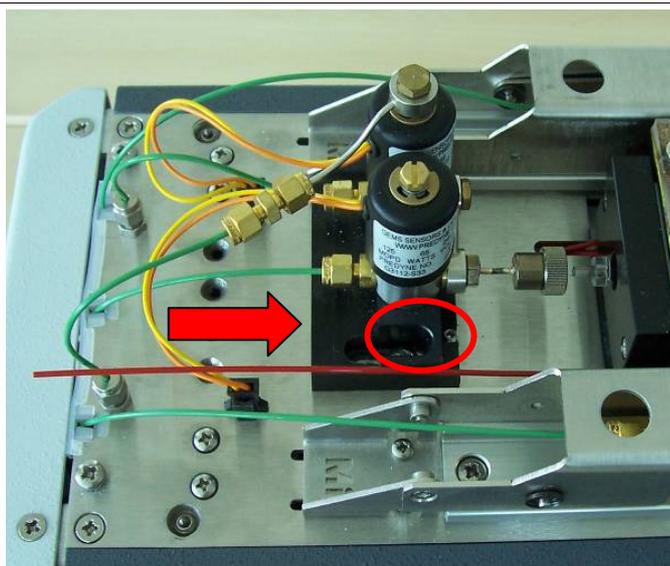
Once the trap is properly inserted the glass flange should be approximately 1 mm from the black plate



Bring the pneumatic assembly back and relocate the screw in the slot.

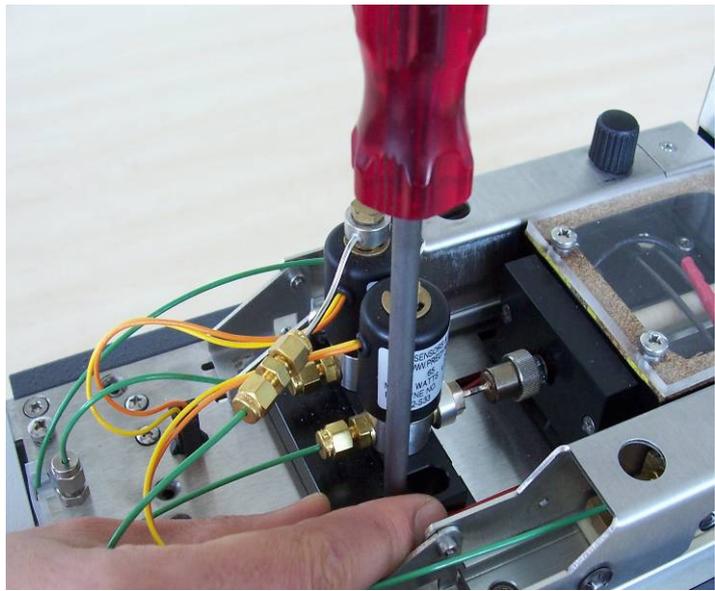
Push the assembly gently back in the horizontal plane guided by the screw, taking care to align the trap and stainless steel connector

 **MISALIGNMENT CAN CAUSE THE END OF THE QUARTZ TRAP TO SNAP**

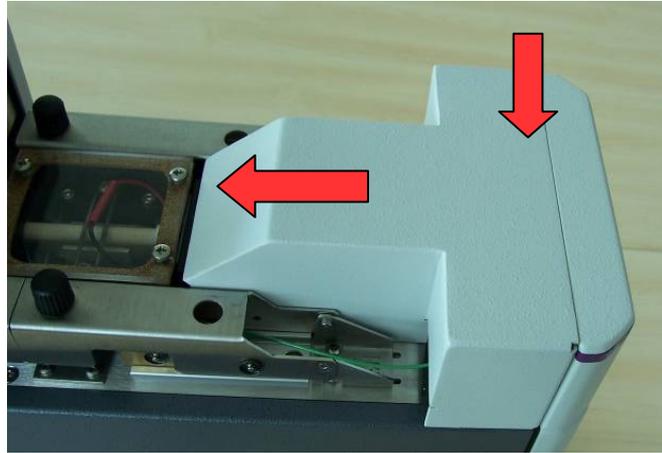


Apply gentle steady pressure to push the trap into the sealing O-ring located inside the steel trap connector.

Retighten the screw firmly



Refit the front cover

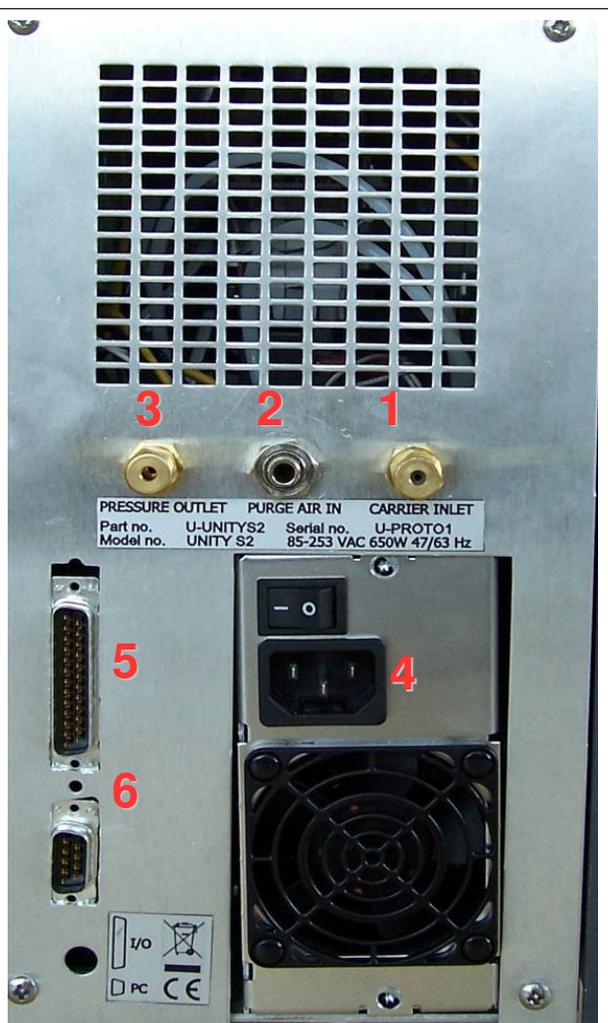


## 2.4. Connections to UNITY 2

Connect the following:

- 1) Carrier gas line to the connector labeled '**Carrier Inlet**'
- 2) Purge gas to the central connector labeled '**Purge Air In**'
- 3) If using Electronic Carrier Control refer to the UNITY 2 ECC manual**
- 4) Power cable
- 5) UNITY 2 to GC cable  
*SERUTD-5098 = AGILENT GC*  
*SERUTD-5108 = THERMO GC*  
*SERUTD-5116 = VARIAN GC*  
*SERUTD-5095 = SHIMADZU / OTHER GC*
- 6) UNITY 2 to PC cable (*SERZ-0189*)

Once carrier gas is supplied check for leaks around the transfer line to UNITY 2 connection with an electronic He leak detector.



## 2.5. Installing the software

Ensure that your PC meets all specifications presented in Section 1.1. and is operating under a 32-bit version of Windows™. It is advised to close down other applications on your PC while loading UNITY 2 software.

Locate the UNITY 2 software CD supplied in the shipping kit. Insert the CD into the appropriate compartment of the PC and follow the instructions on the screen. Alternatively, open Windows Explorer (located under Start > Programs) and access the CD drive. Open the UNITY 2 folder and scroll down the content list to Setup.exe. Selecting this option will initiate installation of the software. Proceed as directed.

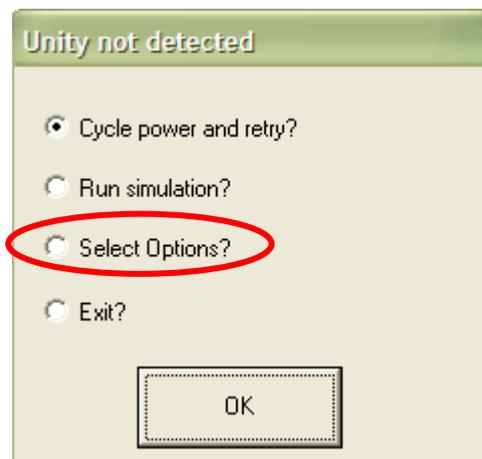
Once the UNITY 2 software has been loaded onto your PC you can access the program either by double clicking the UNITY 2 icon placed on the desktop or from Start > Programs.

## 2.6. Running the software

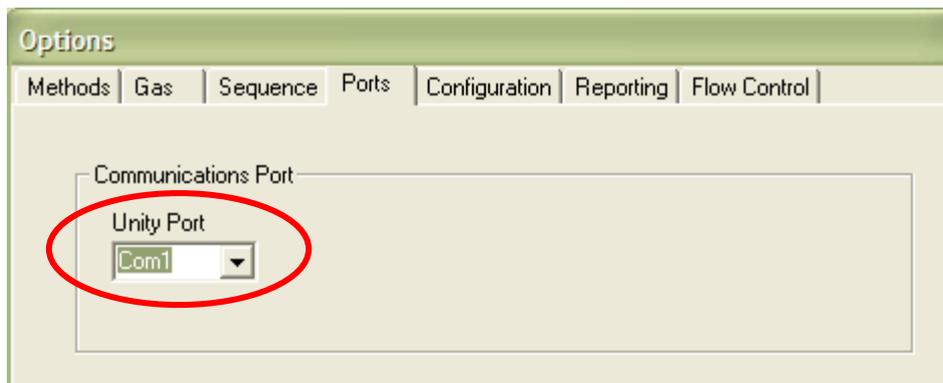
Ensure that the gas supplies to the system - especially the dry air or nitrogen purge gas used for UNITY 2 valve actuation and purging the cold trap box - are on.

Having checked the above, switch UNITY 2 on using the switch located on the back panel of UNITY 2. Start the software as described in Section 2.5.

- If communications between the PC and UNITY 2 are established successfully the software will open.
- If for some reason, communication is not established an 'Instrument not Detected' box appears with a number of options, Cycle Power and retry? Run simulation? Select options? and Exit?.



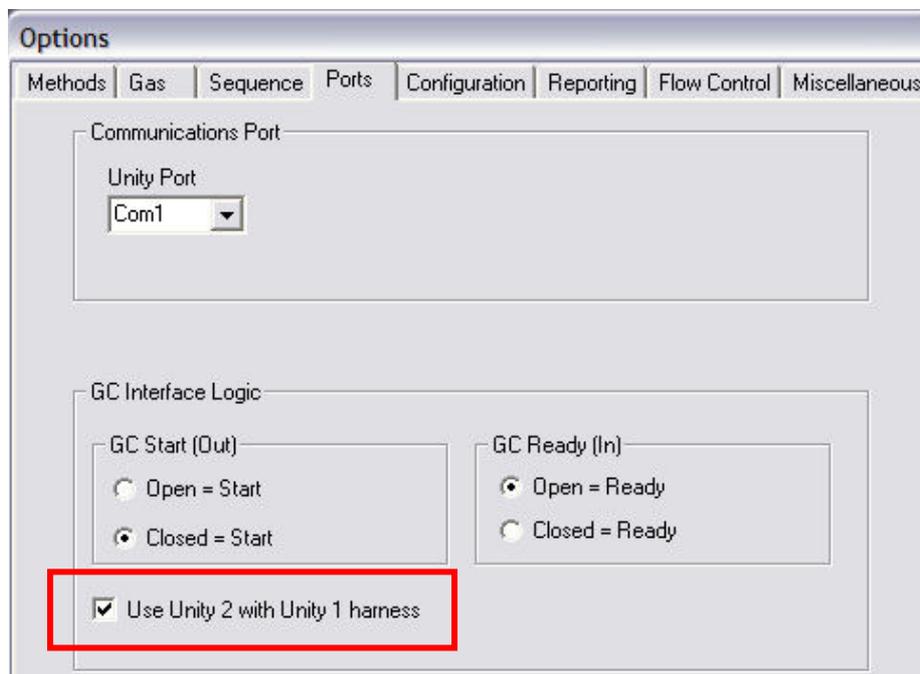
- Choose Select options. This will take you to Ports tab of Options under the View menu. Ensure that the correct PC comms port is selected.



- Change the default comms port if necessary by clicking on the down arrow and then clicking on the correct comms port in the list.
- Close down UNITY 2 software, switch the power to UNITY 2 off, wait ten seconds and then switch UNITY back on again.
- Re-access the UNITY 2 program on the PC as described above.

## 2.7. GC interface logic

The GC interface logic options can be found under the 'Ports' tab. Ensure 'Use Unity 2 with Unity 1 harness' is selected.



Check the correct operation of the GC ready signal. If the signal appears inverted i.e. software reports GC not ready when GC is ready, then change the GC Ready (In) logic.

## **2.8. Installation Checklist**

All ordered items present – if not please contact Markes International

Any shipping damage

All electrical fittings connected

All pneumatic fittings connected and leak checked

Instrument powered up & functioned correctly

Injections performed (blank and standard)