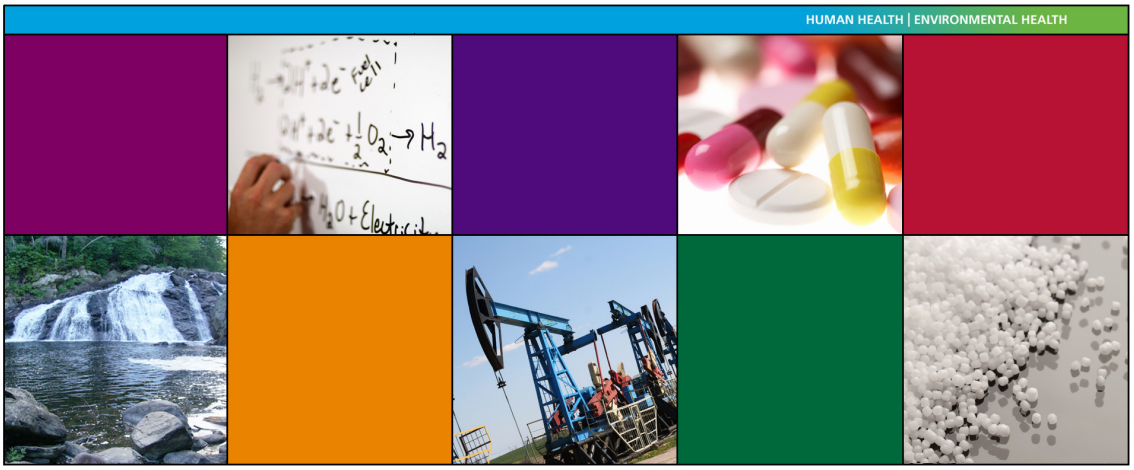
LIQUID SIPPER SAMPLING ACCESSORY



User's Guide

PerkinElmer®

Release History

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Contents

Conventions Used in this Manual

Normal text is used to provide information and instructions.

Bold text refers to text that is displayed on the screen.

UPPERCASE text, for example ENTER or ALT, refers to keys on the PC keyboard. '+' is used to show that you have to press two keys at the same time, for example, ALT+F.

All eight digit numbers are PerkinElmer part numbers unless stated otherwise.

Definitions

Operator: Person operating equipment for its intended use.

Responsible Body: Individual or group responsible for the use and maintenance of equipment, and for ensuring that operators are adequately trained.

Notes, cautions and warnings

Three terms, in the following standard formats, are also used to highlight special circumstances and warnings.

NOTE: A note indicates additional, significant information that is provided with some procedures.

CAUTION	*We use the term CAUTION to inform you about situations that could result in **serious damage to the instrument** or other equipment. Details about these circumstances are in a box like this one.*
D	***Caution (Achtung)*** *Bedeutet, daß die genannte Anleitung genau befolgt werden muß, um einen **Geräteschaden** zu vermeiden.*
DK	***Caution (Bemærk)*** *Dette betyder, at den nævnte vejledning skal overholdes nøje for at undgå en **beskadigelse af apparatet**.*
E	***Caution (Advertencia)*** *Utilizamos el término **CAUTION** (ADVERTENCIA) para advertir sobre situaciones que pueden provocar **averías graves en este equipo** o en otros. En recuadros éste se proporciona información sobre este tipo de circunstancias.*
F	***Caution (Attention)*** *Nous utilisons le terme **CAUTION** (ATTENTION) pour signaler les situations susceptibles de provoquer de **graves détériorations de l'instrument** ou d'autre matériel. Les détails sur ces circonstances figurent dans un encadré semblable à celui-ci.*
I	***Caution (Attenzione)*** *Con il termine **CAUTION** (ATTENZIONE) vengono segnalate situazioni che potrebbero arrecare **gravi danni allo strumento** o ad altra apparecchiatura. Troverete informazioni su tali circostanze in un riquadro come questo.*
NL	***Caution (Opgelet)*** *Betekent dat de genoemde handleiding nauwkeurig moet worden opgevolgd, om **beschadiging van het instrument** te voorkomen.*
P	***Caution (Atenção)*** *Significa que a instrução referida tem de ser respeitada para evitar a **danificação do aparelho**.*
CN	***Caution (小心)*** *我们使用“小心”这一术语来通知您有关可能会对本仪器或其它设备造成严重损害的情况。有关这些情况的详细信息可在此类方框中找到。*
JP	***Caution (注意)*** *分光器や他の機材等に深刻なダメージを与える恐れがある場合は、この様なボックスの中に表示しています。*

WARNING

*We use the term WARNING to inform you about situations that could result in **personal injury** to yourself or other persons. Details about these circumstances are in a box like this one.*

D

Warning (Warnung)

*Bedeutet, daß es bei Nichtbeachten der genannten Anweisung zu einer **Verletzung** des Benutzers kommen kann.*

DK

Warning (Advarsel)

*Betyder, at brugeren kan blive **kvæstet,** hvis anvisningen ikke overholdes.*

E

Warning (Peligro)

*Utilizamos el término **WARNING** (PELIGRO) para informarle sobre situaciones que pueden provocar **daños personales** a usted o a otras personas. En los recuadros como éste se proporciona información sobre este tipo de circunstancias.*

F

Warning (Danger)

*Nous utilisons la formule **WARNING** (DANGER) pour avertir des situations pouvant occasionner des **dommages corporels** à l'utilisateur ou à d'autres personnes. Les détails sur ces circonstances sont données dans un encadré semblable à celui-ci.*

I

Warning (Pericolo)

*Con il termine **WARNING** (PERICOLO) vengono segnalate situazioni che potrebbero provocare **incidenti alle persone.** Troverete informazioni su tali circostanze in un riquadro come questo.*

NL

Warning (Waarschuwing)

*Betekent dat, wanneer de genoemde aanwijzing niet in acht wordt genomen, dit kan leiden tot **verwondingen** van de gebruiker.*

P

Warning (Aviso)

*Significa que a não observância da instrução referida poderá causar um **ferimento** ao usuário.*

CN

Warning (警告)

我们使用“警告”这一术语来通知您有关可能会对您自己或他人造成人身伤害的情况。
有关这些情况的详细信息可在此类方框中找到。

JP

Warning (警告)

使用者及びその他周辺に危害が及ぶ恐れがある場合は、
この様なボックスの中に注意事項が表示されています。

Introduction

The Liquid Sipper Sampling Accessory can be used with the Frontier IR Systems, Spectrum 100 Series and Spectrum 400 Series spectrometers. This User's Guide contains details for using the Liquid Sipper Sampling Accessory (non-temperature-stabilized version) with both FT-IR and FT-NIR instruments.

Figure 1 The Liquid Sipper Sampling Accessory installed in an instrument

What is the Liquid Sipper used for?

The Liquid Sipper Sampling Accessory is used for analyzing liquid samples using automated sampling and flushing techniques. The accessory can deal with a wide variety of liquids from aqueous or organic solutions to more viscous liquids including light oils.

However, very viscous liquids are not suitable as the peristaltic pump will have difficulty drawing them through the system.

How it works

The liquid from which the spectrum is to be collected is drawn up a probe into a flow cell by a peristaltic pump. The peristaltic action is created by the cam of the pump squeezing flexible tubing that is routed around the pump, inside the pump housing. The beam passes through the flow cell and out to the detector.

The Liquid Sipper Sampling Accessory

The Liquid Sipper Sampling Accessory, as shown in Figure 1, has the following features:

- A stainless steel probe, which can be raised and lowered into the liquid to be sampled.
- A shelf on the front of the accessory where the sample is placed on a stainless steel drip tray.
- Two buttons on the top of the accessory, used for selecting the Sample and Flush cycles.
- A programmable, variable speed, peristaltic pump located at the front of the accessory, and accessible through a hinged door.

- An access cover to the flow cell compartment.
- A removable flow cell.
- A waste disposal port on the front of the accessory, underneath the shelf.

Options

The following options are available:

- A range of flow cells to accommodate different liquids.
  The standard mid-infrared flow cell is a 100 micron KBr cell.
  If, for example, you are sampling aqueous solutions you might choose a BaF_2 cell, rather than the standard KBr, which would be damaged by water.
  The standard near-infrared cell is a 1 mm CaF_2 cell.
  Refer to *Replacing flow cell windows* on page 25 for more information.
- A range of spacers allowing you to produce different pathlengths.
  Refer to *Replacing the spacer in the flow cell* on page 23 for more information.
- A range of tubing to accommodate different samples.
  Refer to *Selecting and replacing peristaltic pump tubing* on page 26 for more information.
- A filter installed on the end of the probe when sampling liquids that contain suspended solid particles.
  Refer to *Appendix: The Optional Filter (L1201989)* on page 33 for more information.

Installing the Accessory

Before installing for the first time

Before you install the accessory in your instrument for the first time, you will need to perform the following pre-installation tasks:

- Place the drip tray on the shelf
- Install the flow cell
- Fit the waste tube.

Placing the drip tray on the shelf

➢ Place the drip tray on the accessory shelf under the probe ensuring the lip of the drip tray is uppermost.

Figure 2 shows the correct orientation of the drip tray.

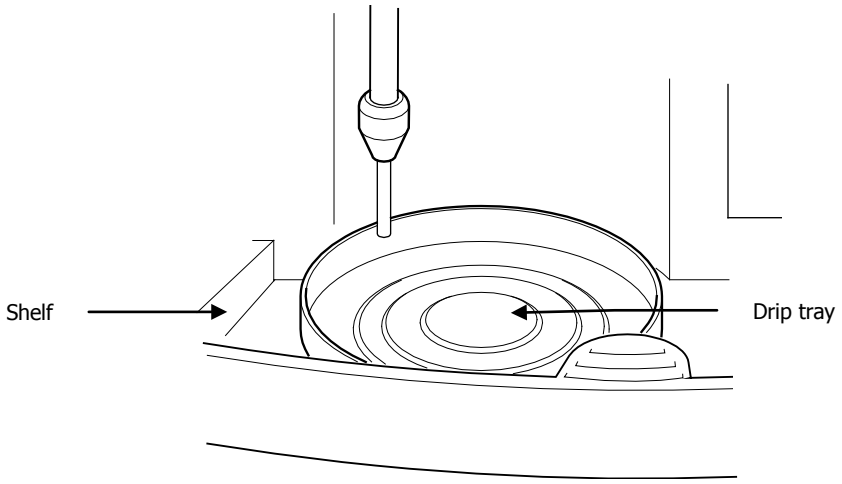


Figure 2 Drip tray orientation

Installing the flow cell

1. Remove the flow cell access cover located on the top of the accessory.

2. Ensuring correct orientation (Figure 3), hold the flow cell just above the flow cell compartment.

3. Fit the tubing from the probe to the lower connection on the flow cell and the tubing from the pump to the upper connection on the flow cell, tightening the two nuts finger tight, as shown in Figure 3.

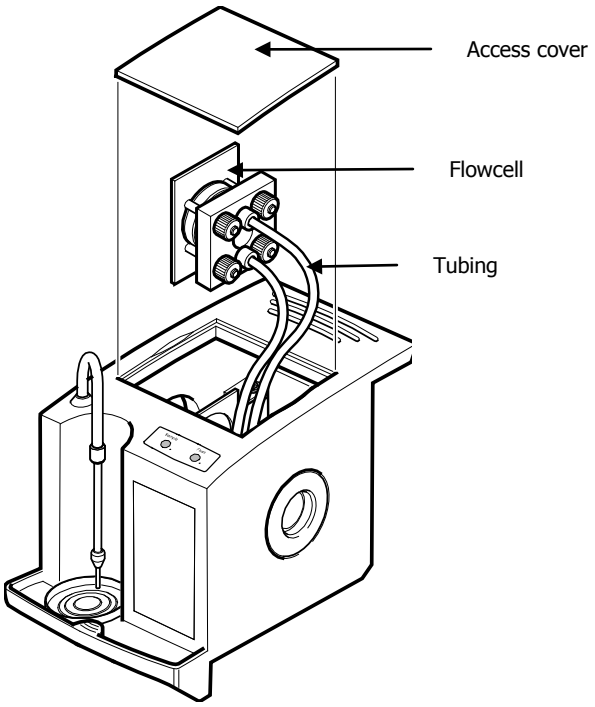


Figure 3 Flow cell orientation and tubing connected

4. Slide the flow cell into its holder ensuring the tubing is not twisted or trapped, and does not block the beam.

5. Refit the flow cell access cover.

Fitting the waste tube

1. Push one end of the waste tubing onto the waste connector port below the accessory shelf, as shown in Figure 4.

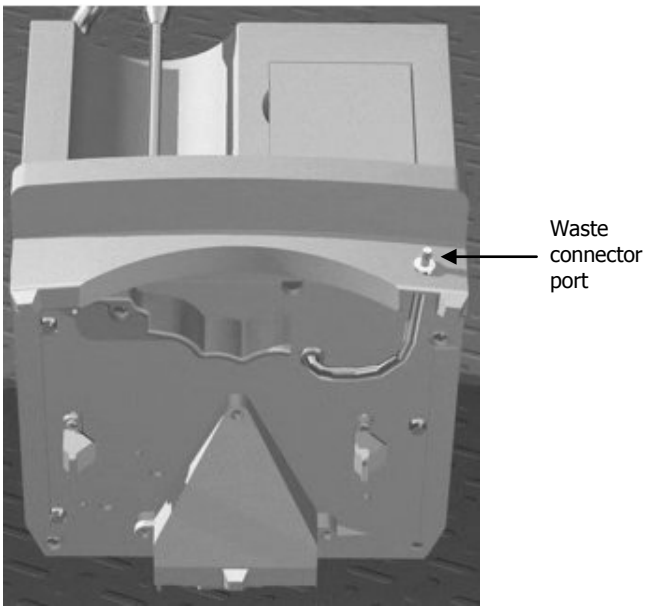


Figure 4 Waste connector port

2. Put the free end of the tube into a waste container which should be positioned at least 90 cm below the waste connector port.

Disposal of waste

CAUTION	*Ensure all local and national regulations covering waste disposal are complied with when disposing of liquids from the Liquid Sipper Sampling Accessory.*

Fitting the accessory

NOTE: To use your accessory, you must first have added your instrument to the list of available instruments. If you have Spectrum software (version 10.3 or later) and do not have an instrument installed, see the *Spectrum Administrator's Guide* (L1050095) for details of the Instrument Install Wizard.

To install the accessory in the sample compartment:

1. Remove the sample area cover if fitted by opening the cover, pressing the clip and pulling the cover vertically to remove (Figure 5).
   Store it in a safe place for future re-use.

Figure 5 Removing the sample area cover

2. Remove the current sampling accessory by pulling the release handle (under the baseplate of the accessory) towards you and then sliding the accessory towards you (Figure 6).

Figure 6 Removing a sampling accessory

3. Install the Liquid Sipper Sampling Accessory (Figure 7) by sliding it onto the ledge and pushing it into the sample compartment until it engages with the connector.

Figure 7 Installing the Liquid Sipper Sampling Accessory

Spectrum software detects the presence of the accessory, and a toolbar of accessory-specific controls is displayed (Figure 8).

Figure 8 Liquid Sipper Accessory toolbar

The Setup Instrument Basic (Figure 9) and Setup Instrument BeamPath (Figure 10) tabs are updated to show that the Liquid Sipper Accessory is in position.

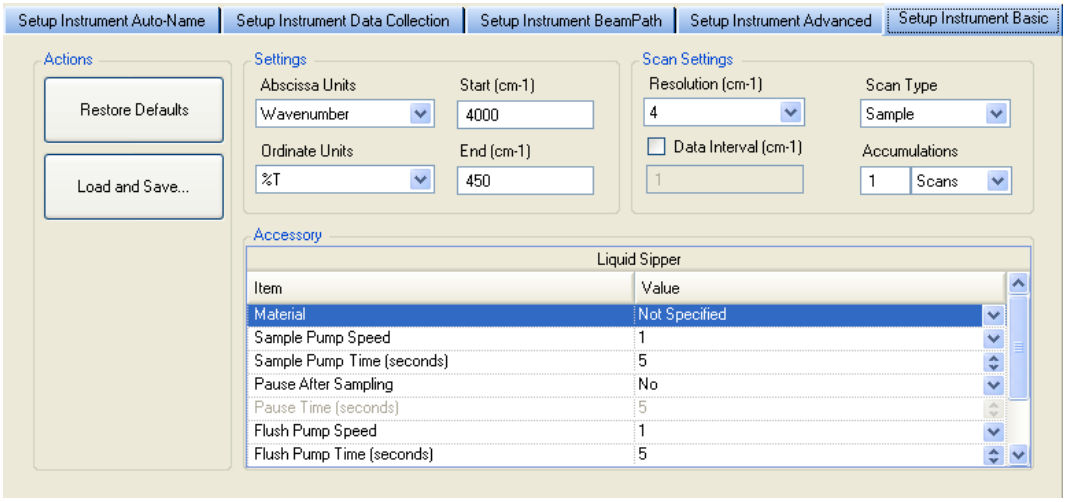


Figure 9 Setup Instrument Basic tab with Liquid Sipper controls

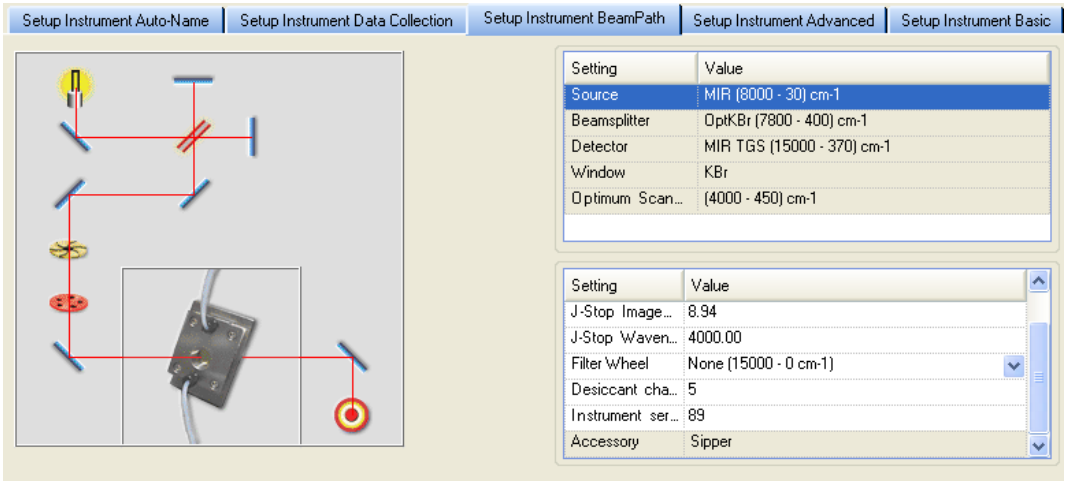


Figure 10 Setup Instrument BeamPath tab with flow cell icon

Your accessory is now ready for use.

Using the Accessory

WARNING

Do not attempt to run the pump with the cover removed. Do not put your fingers in the rotor while it is moving.

WARNING

If the equipment is used in a manner not specified herein, the protection provided by the equipment may be impaired.

You can use the accessory in the following ways:

- Using the **Start**  and **Stop**  buttons on the accessory toolbar to manually control the pumping and flushing times. You can then collect data as normal using the scan buttons on the Measurement toolbar.
- Using the **Sample**  button on the accessory toolbar to sample and then collect a spectrum using the settings entered in the Accessory section of the Setup Instrument Basic tab.
- Using the **Flush**  button on the accessory toolbar to flush the cell using the settings entered in the Accessory section on the Setup Instrument Basic tab.

Determining the flow cell pathlength

Before collecting data, you can use the Setup Pathlength tool in Spectrum software to calculate the pathlength of the flow cell. You can then set up the software so that the pathlength value is saved to the header of all spectra collected and can be used as a variable in Equations. Refer to *Setup Pathlength tab* in the Spectrum on-screen Help for details.

Preparing to pump a sample

1. Raise the probe by pulling vertically upwards.
2. Place the container with the sample in it on the drip tray.
3. Push down on the probe to lower it into the sample, as shown in Figure 11.

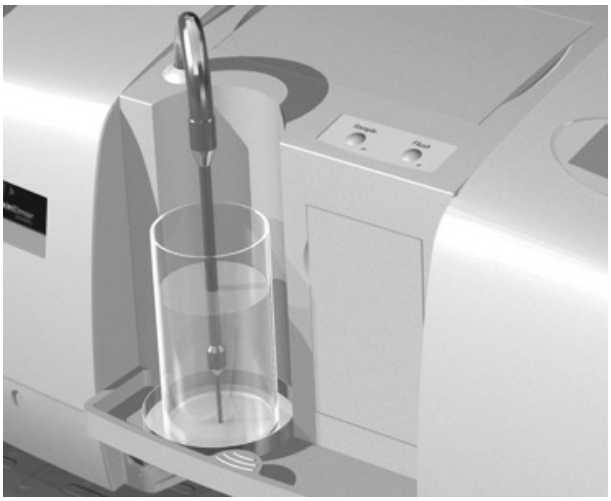


Figure 11 Sample container in place, probe lowered into sample

Manually pumping and flushing

You can manually start or stop the pump. This is particularly useful when monitoring, where you can view the changes in the spectrum or energy as the pumping progresses.

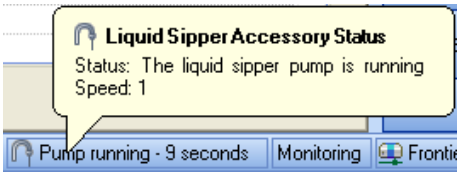
You can use this method to determine appropriate pump times and flush times for collecting data and flushing using the **Sample** and **Flush** options.

The pump speed is defined by **Manual pump speed** on the Setup Instrument Basic tab. The options are 1, 2, 3 and 4, where 1 is the slowest speed.

1. Prepare to collect your sample.
   Refer to *Preparing to pump a sample* above.
2. Click to collect a background scan.
   The flow cell is automatically moved out of the beampath while the background scan is collected.
3. Click to monitor your sample.
   The flow cell is automatically moved into the beampath while monitoring.
   The Live tab is displayed. This shows a preview of your sample spectrum. No data will be collected.

4. Click **Start**  to start the pump.

   The icon then changes to **Stop**  , which you can click to stop the pump.
   A message on the Status bar will display the time (in seconds) the pump has been running.

5. When the preview indicates that that the sample has been pumped into the cell, make a note of the time the pump has been running (if required), and then click **Stop**  .

6. Click  to stop monitoring the spectrum.

7. If you want to collect the sample spectrum, click  .

8. Prepare the probe to flush the sample with a suitable solvent.

9. Click  to monitor the spectrum.

10. Click **Start**  to start the pump.

    The icon then changes to **Stop**  , which you can then click to stop the pump.
    A message on the Status bar will display the time (in seconds) the pump has been running.

11. When the preview indicates that the sample has been flushed from the cell, make a note of the time the pump has been running (if required), and then click **Stop**  .

12. Click  to stop monitoring the spectrum.

Setting up automated sampling

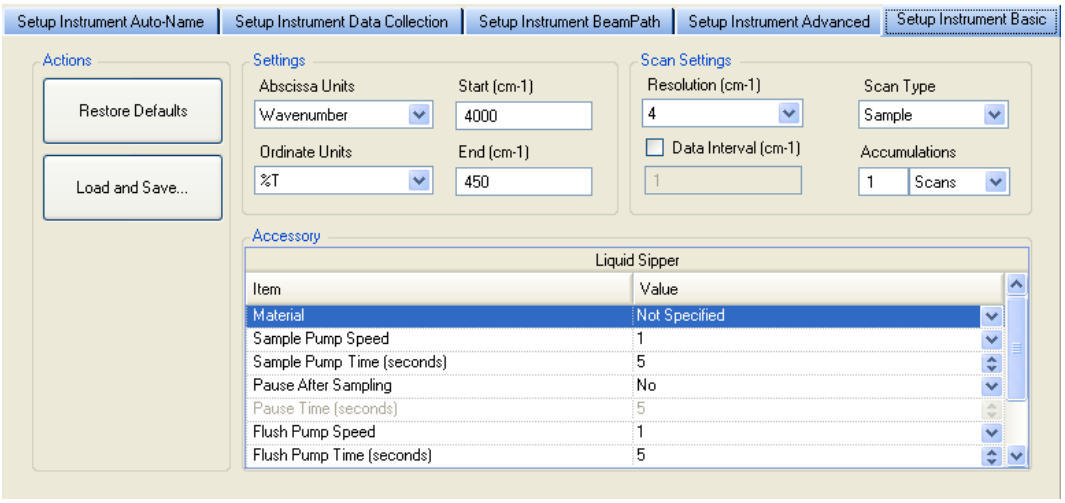
The settings used when you click **Sample**  or **Flush**  are defined on the Setup Instrument Basic tab.

When you click **Sample**, the sipper will pump at the **Sample Pump Speed** for the **Sample Pump Time** and then the software will scan the sample using the current scan settings. You can include an optional **Pause Time** before scanning.

1. Determine the appropriate sample pump speed and sampling times for your samples.
   Refer to *Manually pumping and flushing* on page 16.

2. From the Setup menu select **Instrument**.
   The Setup Instrument tabs are displayed.

3. Select the Setup Instrument Basic tab.



4. Select the flow cell window **Material** from the drop-down list.
   The default mid-infrared cell provided with the Liquid Sipper is a 100 μm KBr cell. The default near-infrared cell is a 1 mm CaF_2 cell.
   The option selected will be saved to the header of the spectrum.

5. Select the **Sample Pump Speed** required from the drop-down list.
   The options are 1, 2, 3 and 4, where 1 is the slowest speed.

6. Set the **Sample Pump Time**, in seconds.

7. Select **Yes** from the **Pause After Sampling** drop-down if you want a pause between sampling and scanning.
   The default is **No**.

8. Enter the **Pause Time (seconds)**.

9. Select the **Flush Pump Speed** required from the drop-down list.
   The options are 1, 2, 3 and 4, where 1 is the slowest speed.

10. Set the **Flush Pump Time**, in seconds.

NOTE: You can save the settings defined on the Setup Instrument Basic tab, including the Liquid Sipper settings to an instrument setup file (*.set) that can be reloaded, or exported for use on other systems. Select **Load and Save** on the tab to display the Instrument Setup dialog.

For more information, refer to the Spectrum on-screen Help.

Scanning a sample

The Sample option uses the settings on the Setup Instrument Basic tab.

1. Enter an appropriate **Sample ID** and **Description** on the Instrument Settings toolbar.

2. Click  to collect a background scan.
   The flow cell is automatically moved out of the beampath while the background scan is collected.

3. Click **Sample**  to start sampling.

   The Sample icon then changes to **Stop**  , which you can then click to stop the pump.

   OR

   Push the **Sample** button located on top of the Liquid Sipper (see Figure 12).
   If you push the button again during the sampling cycle, it will stop pumping.

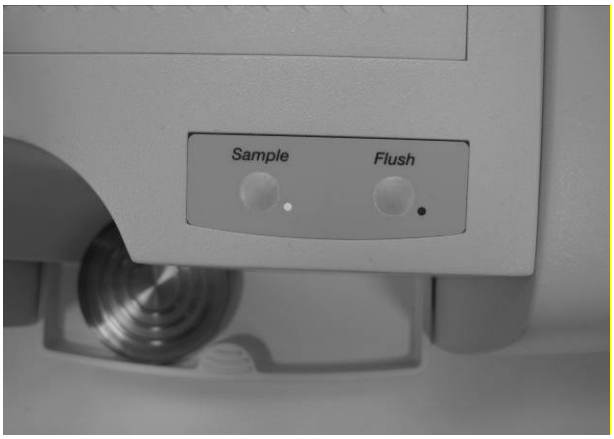


Figure 12 Sample and Flush buttons on the liquid sipper

The sample will be pumped into the cell for the time specified. Then, if enabled, Spectrum will count down the Pause Time before collecting a sample scan. The flow cell is automatically moved into the beampath while the sample scan is collected.

NOTE: If Spectrum detects that a new background is required, this will be collected before the sample scan (after any Pause Time specified). The flow cell is automatically moved out of the beampath while the background scan is collected.

Flushing

Flush uses the setting defined for Flush Pump Speed and Flush Pump Speed on the Setup Instrument Basic tab.

CAUTION	*Do not use solvents that will damage the flow cell or the tubing.* *For example, do not use water to flush the KBr flow cell.*

- Click **Flush**  to start flushing.

  The Flush icon then changes to **Stop**  , which you can then click to stop the pump.

  OR

  Push the **Flush** button on the top of the accessory.

  If you push the button again during the flush cycle, it will stop pumping.

Flushing with the next sample

If you are routinely using similar sample types, you may not need to flush the Liquid Sipper with solvent, but simply flush through one sample with the next. This can be done by flushing, or by using a sufficiently long **Sample Pump Time** when sampling to ensure that the previous sample has been pushed through.

Moving the flow cell

The flow cell can be moved in and out of the beampath using the **Move** flow cell button on the Accessory toolbar.

- Click  to move the flow cell into the beampath.
- Click  to move the flow cell out of the beampath.

Maintenance

NOTE: Maintenance must be performed by a responsible body.

Preventative Maintenance

You should check for wear and leaks in the tubing especially around the pump rotor each day before using the Liquid Sipper Sampling Accessory, and if you encounter problems during routine operation.

Cleaning the Liquid Sipper Sampling Accessory

You can clean the outside of the Liquid Sipper Sampling Accessory, including the shelf, using a damp cloth. Mild detergent may be used, if necessary. Always perform a patch test on an inconspicuous area before you clean the entire Sampling Accessory.

The drip tray can be removed from the Sampling Accessory and cleaned using a strong detergent.

Avoid spilling liquid into the accessory. Clean all external spills immediately. If anything that is spilled enters the accessory, remove the accessory from the spectrometer if currently installed, and contact a PerkinElmer Service Engineer.

WARNING

Do not run the pump while the cover is removed. Do not put your fingers in the rotor while it is moving.

Adjusting the probe

Under normal conditions the probe is manually raised and lowered to enable the container to be placed in the drip tray. Should the probe become loose, the following instructions detail how to tighten it.

1. Reach under the accessory and pull the blue release handle towards you, to release the accessory from the instrument.

2. Slide the accessory out of the instrument sufficiently to gain access to the probe friction adjustment screw access hole on the side of the accessory, as shown in Figure 13.

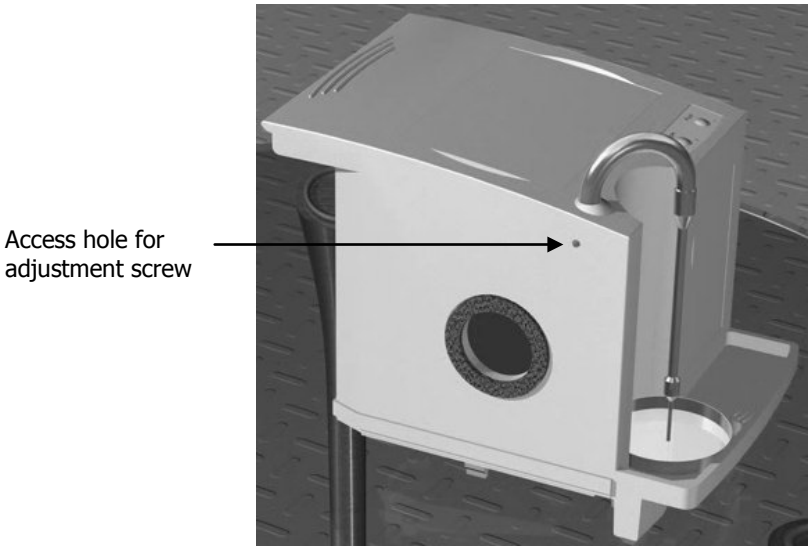


Figure 13 Probe friction adjustment screw access hole

3. Using a suitable flat blade screwdriver inserted in the access hole, tighten the screw sufficiently to ensure the probe is not loose, but can still be raised and lowered without undue force.

4. Slide the accessory back into the instrument until it locks firmly into the connector at the rear of the sample area.

5. Ensure the free end of the waste tube still feeds into the waste container.

Replacing the flow cell

The following instructions detail how to remove and install a complete flow cell. Later in the manual are instructions for *Replacing the spacer in the flow cell* (page 23) and *Replacing flow cell windows* (page 25).

WARNING

If you have been analyzing hazardous liquids, pump a suitable solvent such as heptane or ethanol through the Liquid Sipper before performing any maintenance.

1. Remove the flow cell access cover located on top of the accessory.

2. Noting its installed orientation, carefully lift the flow cell vertically out of its holder, ensuring none of the tubing is caught.

3. Holding the flow cell just above the accessory, as shown in Figure 14, disconnect the tubing from the flow cell by undoing the two connectors.

NOTE: Be careful not to spill any fluid that may remain in the tubing or the flow cell, and wipe up any residue.

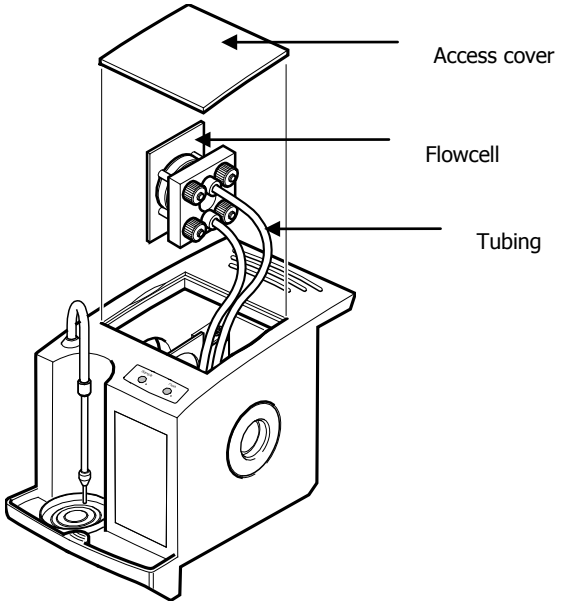


Figure 14 Flow cell removed from accessory

4. Ensuring the replacement flow cell is orientated correctly, position it just above the flow cell compartment.

5. Fit the tubing from the probe to the lower connection on the flow cell and the tubing from the pump to the upper connection on the flow cell, tightening the two nuts finger tight.

6. Slide the flow cell vertically downwards into its holder, ensuring the tubing is not twisted or trapped.

7. Refit the flow cell access cover.

Replacing the spacer in the flow cell

The following cell spacers are available:

Cell spacer	**Part number**
100 μm	L1201905
50 μm	L1201904
0.5 mm	L1202053
1 mm	L1200254

WARNING

If you have been analyzing hazardous liquids, pump a suitable solvent such as heptane or ethanol through the Liquid Sipper before performing any maintenance.

The spacer determines the pathlength of the flow cell, and can be replaced to produce shorter or longer pathlengths. The following instructions detail how to change the spacer.

WARNING

Always wear disposable gloves when handling windows.

CAUTION

Always handle windows by their edges.
Do not touch the flat surfaces of a window.

1. Referring to *Replacing flow cell windows* on page 22, remove the flow cell from the accessory.

2. Undo the four nuts securing the flow cell and slide the parts off as required until you have removed the spacer, as shown in Figure 15.

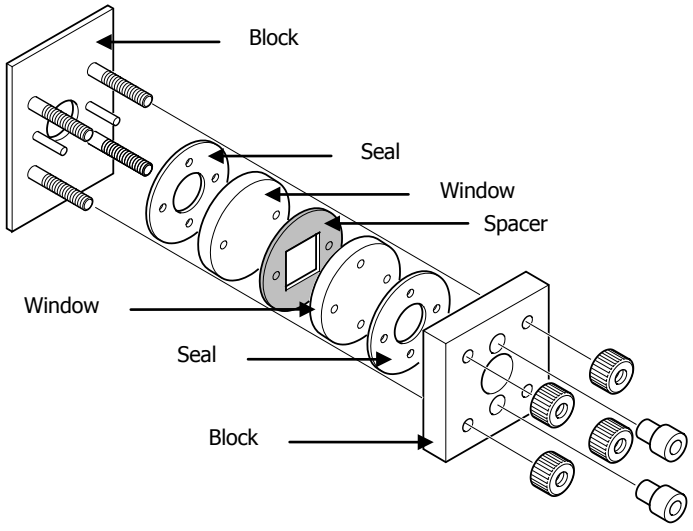


Figure 15 Flow cell; spacer highlighted

3. Fit the new spacer.

4. Refit the flow cell parts, ensuring that the window with four holes is oriented so that the grooves point towards the spacer.

5. Refit the nuts, ensuring they are not overtightened.

6. Re-install the flow cell.

Replacing flow cell windows

The following flow cell windows are available:

Flow cell window	**Part number**
KBr	L1200308
CaF_2	L1200309
BaF_2	L1200310
NaCl	L1200307

WARNING

If you have been analyzing hazardous liquids, pump a suitable solvent such as heptane or ethanol through the Liquid Sipper before performing any maintenance.

The standard mid-infrared flow cell supplied has KBr windows whilst the standard near-infrared flow cell has CaF_2 windows. Different flow cell window materials are appropriate for different types of sample. The following instructions detail how to replace the flow cell windows.

WARNING

Read the Safety information provided with the windows before removing them from the packaging.

Always wear disposable gloves when handling windows.

CAUTION

Always handle windows by their edges, do not touch the flat surfaces of a window.

1. Referring to *Replacing the flow cell* on page 22, remove the flow cell from the accessory.

2. Undo the four nuts securing the flow cell and slide the parts off as required until the flow cell windows are accessible.

3. Replace the windows, as shown in Figure 16.

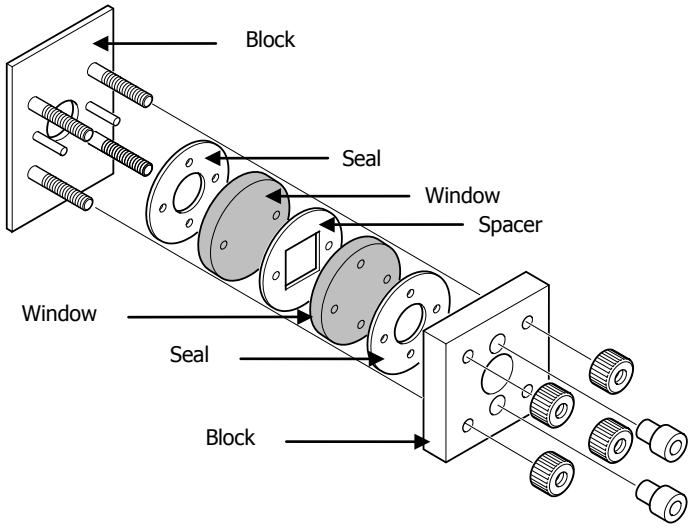


Figure 16 The Flow cell with the windows highlighted

4. Refit the flow cell parts, ensuring that the window with four holes is oriented so that the grooves point towards the spacer.

5. Refit the nuts, ensuring they are not overtightened.

6. Re-install the flow cell.

Selecting and replacing peristaltic pump tubing

WARNING

If you have been analyzing hazardous liquids, pump a suitable solvent such as heptane or ethanol through the Liquid Sipper before performing any maintenance.

Different types of tubing are appropriate for different sample types and conditions, so you may need to change the standard Viton tubing for a more appropriate material:

Material	Details	Part number
Viton	A black synthetic rubber with resistance to concentrated acids, solvents (excluding acetone), ozone, radiation, and temperatures up to about 300 °C.	L1202006
Silicone	A translucent medical/food grade tubing which is odorless, non-toxic, and has FDA and USP Class VI approvals. It is also autoclavable and resistant to temperatures up to 250 °C	L1202036

Material	Details	Part number
Autoprene	An opaque thermo-plastic rubber which is FDA food grade and USP Class VI medical grade material. It is by far the most resistant to wear.	L1202035
Tygon	A clear, non-toxic tubing, with excellent chemical resistance, handling virtually any inorganic chemical.	L1202037

It should also be noted that peristaltic pump tubing, because of its use, will wear over time and will need to be replaced. The following instructions detail how to replace peristaltic pump tubing.

WARNING

Make sure that the instrument is switched off at the power switch, or remove the accessory from the instrument before performing this procedure.

1. Ensure the instrument is switched off, or the accessory is removed from the instrument.
2. Open the pump access door.
3. Lever off the plastic cover over the pump.
   Use the indentation in the door frame as a leverage point.
4. Disconnect the inlet and outlet connections of the pump tubing (black Viton as standard) by removing the white connectors from the sample transfer tubing (yellow Tygon as standard).
5. Carefully remove the pump tubing.
   Manually turning the pump rotor will assist you.
6. Fit the replacement tubing by inserting the two connections into the sample transfer tubing free ends.
7. Route the tubing around the pump rotor, ensuring that there are no twists or kinks in the tubing.
   Manually rotating the pump rotor will assist you.
8. Close the pump access door.

Replacing the tubing inside the probe

WARNING

If you have been analyzing hazardous liquids, pump a suitable solvent such as heptane or ethanol through the Liquid Sipper before performing any maintenance.

Due to wear and tear, or contamination, it may be necessary to replace the Teflon tubing (part number 02508063) inside the probe arm that goes to the flow cell. The following instructions detail how to replace this tubing.

NOTE: 900 mm of tubing is required.

1. Referring to *Replacing the flow cell* on page 22, remove the flow cell from the accessory and disconnect the probe tubing from the flow cell.
2. Fully raise the probe arm by pulling it vertically.
3. Remove the end fitting from the probe and pull on the metal tube until the connection with the plastic tube is visible, as shown in Figure 17.

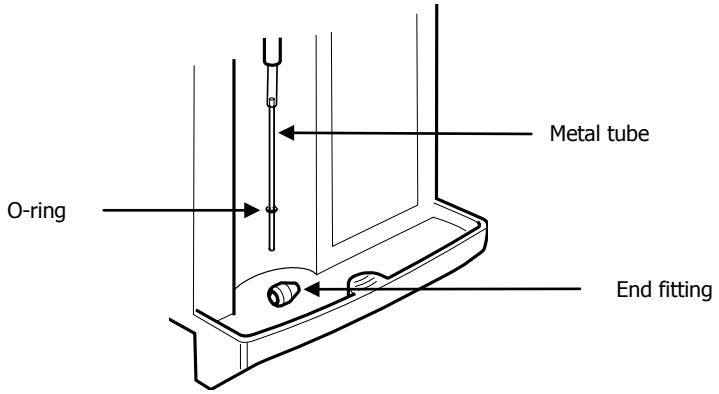


Figure 17 Removing the tubing from the probe

4. Remove the metal tube from the plastic tubing.
5. Pull the plastic tubing from the flow cell end until it is completely drawn out of the probe.
6. Fit the replacement tubing by inserting from the probe end, pushing it through until about 25 mm remains protruding from the probe.
7. Refit the metal tube, pushing it about 10 mm into the plastic tubing.
8. Push the tube and tubing up into the probe until 40–50 mm of the metal tube remains protruding.
9. Refit the end fitting.
10. Fit a nut and ferrule onto the other end of the tubing, as shown in Figure 18.

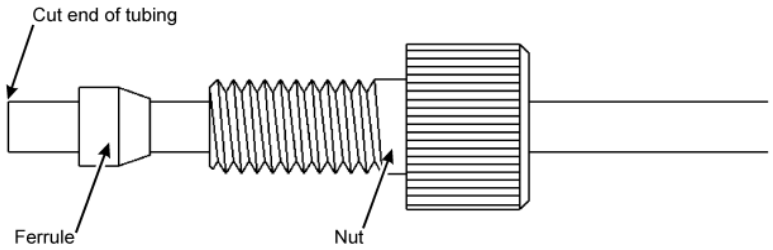


Figure 18 Fitting a nut and ferrule onto the tubing

11. Connect the tubing to the flow cell by screwing the nut in until it is finger-tight.

NOTE: Make sure that the tubing is pushed against the bottom of the hole while you are screwing the nut into the hole. Tighten the nut sufficiently to compress the ferrule onto the tubing.

12. Refit the flow cell.

Spares and Consumables

Item	**Part number**
Tygon tubing (sample transfer tubing and waste tubing)	L9001004
Teflon tubing	02508063
Tefzel ferrule	09920535
Knurled nut for ferrule	09920536
Sipper cell kit (no windows)	L1200306
KBr cell windows	L1200308
CaF_2 cell windows	L1200309
BaF_2 cell windows	L1200310
NaCl cell windows	L1200307
Filter	L1201989
100 μm cell spacer	L1201905
50 μm cell spacer	L1201904
0.5 mm cell spacer	L1202053
1 mm cell spacer	L1202054
Viton peristaltic pump tubing	L1202006
Autoprene peristaltic pump tubing	L1202035
Silicone peristaltic pump tubing	L1202036
Tygon peristaltic pump tubing	L1202037

Troubleshooting

If your solution is too concentrated or is highly absorbing, you will need a shorter path length (Figure 19).

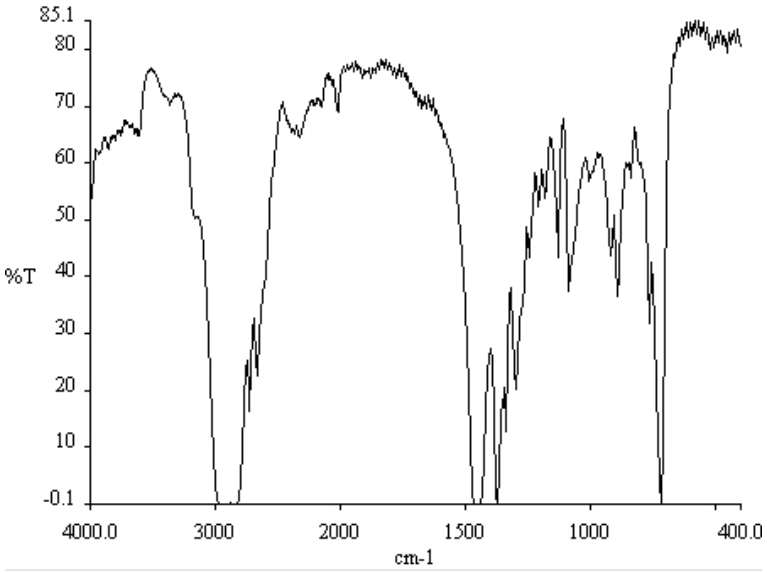


Figure 19 Spectrum of a concentrated solution

If your solution is too dilute or is weakly absorbing, you will need a longer path length (Figure 20).

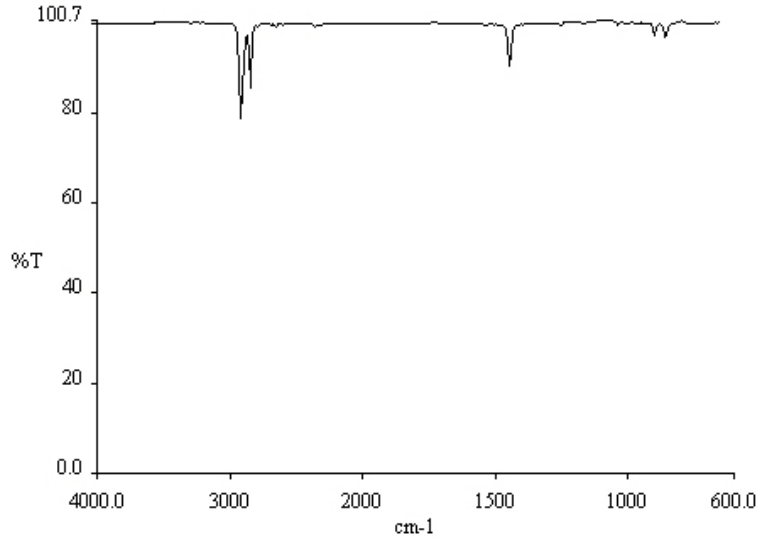


Figure 20 Spectrum of a dilute solution

If you flow cell is not in the path of the beam, you will see a spectrum similar to that shown in Figure 21.

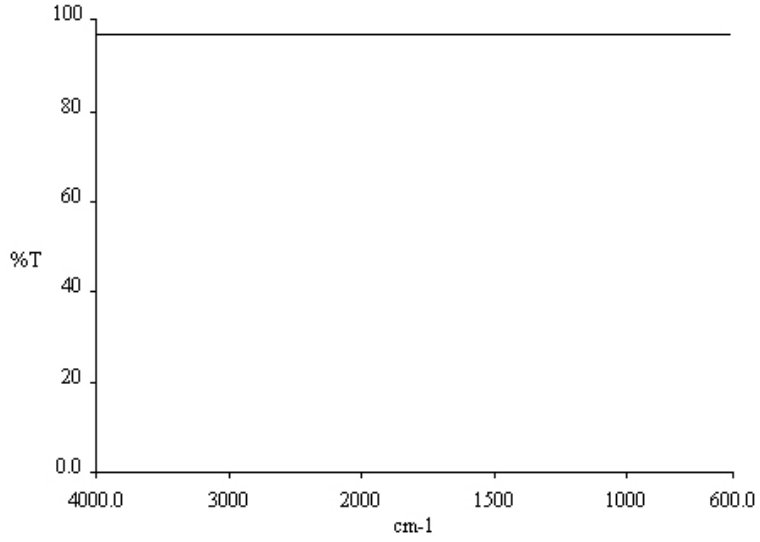


Figure 21 Spectrum without flow cell

If your flow cell is in the beam path, but has been pumped dry or has a leak, you will see spectra similar to those shown in Figure 22, depending on your flow cell material.

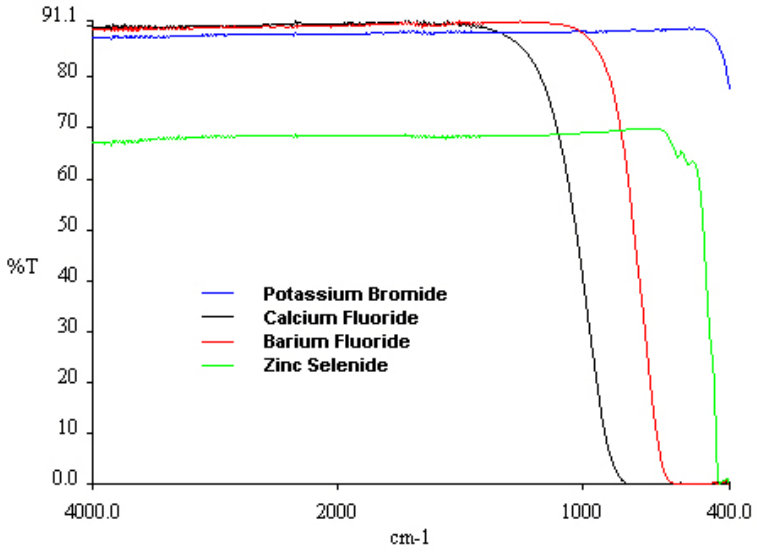


Figure 22 Spectra of flow cell materials

Appendix: The Optional Filter (L1201989)

To allow for samples that have suspended solid particles an optional filter can be fitted to the end of the sipper probe. The filter contains an 80 μm mesh.

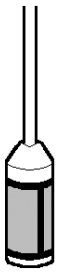


Figure 23 The optional filter

1. Fully raise the probe arm.
2. Remove the end fitting from the probe and pull on the metal tube until the connection with the plastic tube is visible, as shown in Figure 24.

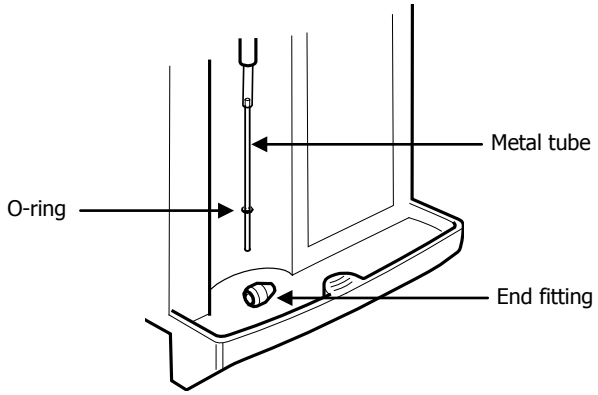


Figure 24 Removing the standard fittings

3. Remove the metal tube from the plastic tubing.
4. Remove the O-ring from the metal tube.
5. Slide the end fitting onto the filter tube.
6. Fit the O-ring onto the filter tube about 40–50 mm from the filter.
7. Push the filter tube into the plastic tube about 10 mm.
8. Push the tubing back into the probe and fit the end fitting to the end of the probe so that the end of the probe looks like Figure 25.

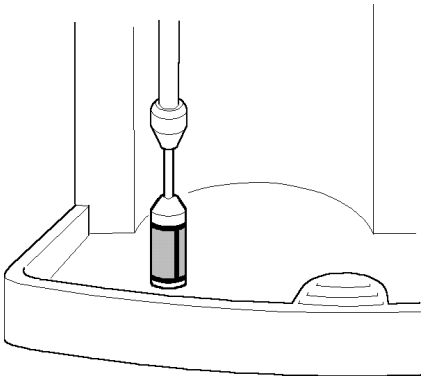


Figure 25 The filter in place

NOTE: If the filter becomes blocked, remove it from the probe and either flush solvent through it or clean it ultrasonically.