Spotlight Liquid Nitrogen Reservoir

The Liquid Nitrogen Reservoir (L1860345) fits on the top of Spotlight 300, 350 or 400 series imaging systems. The reservoir is a supplementary Dewar that replenishes the instrument detector cooling Dewar as nitrogen gas evolves. This additional capacity allows you to perform extended experiments such as automated multiple imaging. From stabilized and full, the reservoir can cool the detector for 24 hours.

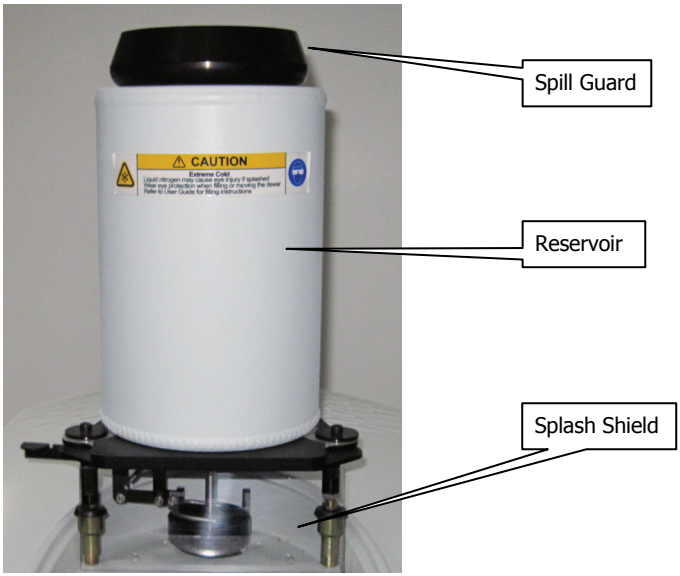


Figure 1 Spotlight Liquid Nitrogen Reservoir

NOTE: For more information refer to *Multiple Images* in the SpectrumImage software Help System.

PerkinElmer Ltd, Chalfont Road, Seer Green,
Beaconsfield, BUCKS, HP9 2FX, United Kingdom.

Produced in the UK.

Safety Information

The reservoir requires you to handle liquid nitrogen in quantities in excess of 1 L (2 US pints). Before use, ensure that an appropriate risk assessment has been carried out.

Liquid nitrogen can cause severe cryogenic burns. Skin can adhere to cooled surfaces, and tear when removed. When handling liquid nitrogen, follow all the applicable personal protection protocols defined for your site, especially for eye protection. Minimize the possibility of skin contact.

Never use liquid nitrogen in a poorly ventilated area. 1 L of liquid nitrogen evolves to 700 L (approximately 25 cubic feet) of nitrogen gas, which can cause oxygen depletion in an enclosed space. The cold vapor can pool at floor level. Oxygen depletion does not trigger a gasping reflex, and errors of judgment, confusion or unconsciousness can occur in seconds and without warning.

Consider proper actions in the event of accidental spillage. This could include immediate evacuation of the area, and not attempting to pick up any cold or dropped equipment until the liquid and evolved gas has cleared.

Make sure that a suitable container, such as an empty 1 L Dewar, is available into which you can, if necessary, safely drain the reservoir.

Installation and Fitting

The reservoir is fitted by a PerkinElmer Service Engineer, who will check the position of the imager detector and ensure that the reservoir is properly aligned and at the correct height. Do not attempt to remove the fittings that are attached to the imager body or to the detector Dewar.

If you want to transfer the reservoir to another instrument, consult a PerkinElmer Service Engineer.

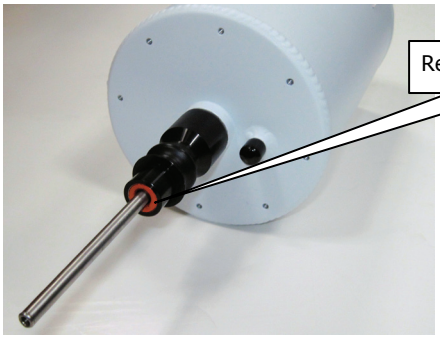
Inserting the Reservoir

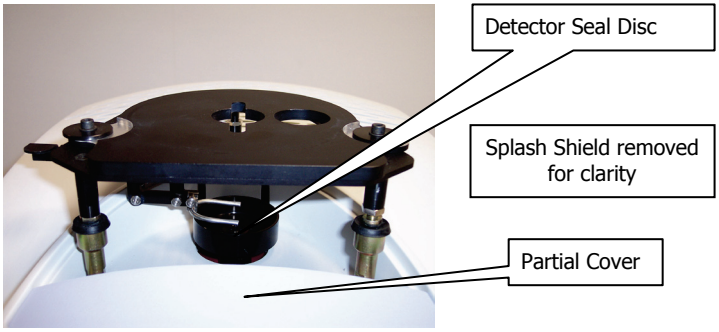
WARNING

Do not attempt to fill the reservoir before inserting it into the imager.

Liquid nitrogen will drain from the reservoir, resulting in a spillage.

1. Make sure that the reservoir seal O-ring and the detector seal disc are clean and dry.





   If the O-ring or seal disc is wet, icing may allow leakage.

2. Make sure the loose stopper for the top of the reservoir is in place.

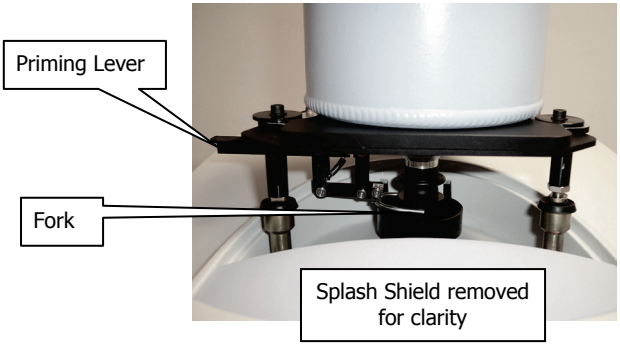
   This is a precaution against any splashing by liquid carried with the vapor evolved as you lower the reservoir tube into any liquid nitrogen in the detector Dewar.

3. Hold the reservoir upright, with the valve on its lower face to your right.

   Never attempt to open this valve. It was used during manufacture to evacuate the reservoir.

4. Gently lower the reservoir tube through the top plate and into the Dewar, being careful to avoid catching or damaging the gaitered spring or seal, until the reservoir rests on the detector seal disc.

5. Press the priming lever to check its action.



The priming lever actuates a fork that lifts the reservoir seal, compressing the gaitered spring.

Removing the Reservoir

WARNING

In normal circumstances, do not attempt to remove the reservoir before it is empty.

If you must remove the reservoir before it is empty, bear in mind that some spillage of liquid nitrogen from the reservoir tube is unavoidable. Your personal protection is paramount, especially of your face, feet and hands.

Make sure that a suitable container, such as an empty 1 L Dewar, is available into which you can safely drain the reservoir. Do not use a plastic container (which is likely to shatter) or a metal bin (the gas will boil off very quickly and liquid nitrogen may splash).

1. Using the supplied dipstick, make sure that the reservoir is empty.

2. Lift the reservoir vertically until it is clear of the top plate.
   Take care that the gaiter does not catch on the top plate.

3. Allow any icing to evaporate and dry before storage or re-use.

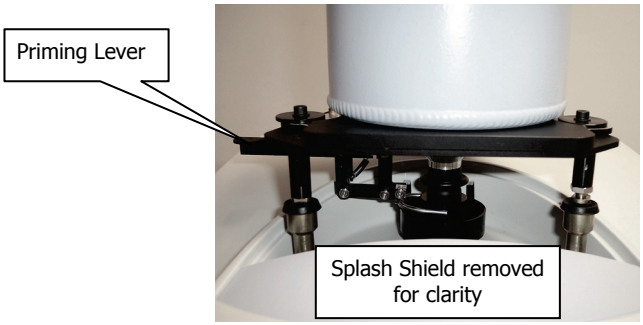
Filling the Reservoir from Room Temperature

WARNING

Treat liquid nitrogen with care and respect. At a minimum, wear appropriate eye protection. Your site may mandate more extensive personal protection.

1. Insert the reservoir into the detector Dewar, as described in *Inserting the Reservoir* on page 3.
2. Remove the loose stopper from the top of the reservoir.
3. Carefully fill the reservoir with 1 L (2 US pints) of liquid nitrogen.
4. Wait 5 minutes for boiling to subside.

   The amount of liquid nitrogen that boils off depends on the ambient temperature.
5. Put the loose stopper back into the top of the reservoir.
6. Prime the detector Dewar by pressing down the priming lever, holding for 45 to 60 seconds, and then gently releasing the lever.



NOTE: If you see liquid nitrogen or frost around the seal, release the priming lever immediately.

7. Wait 5 minutes.

   You may see some condensation on the outside of the reservoir, and on the spring gaiter, that disappears as the system stabilizes.

8. Using the SpectrumImage software, display the Energy Monitor, and wait for the detector energy to stabilize.

   To display the Energy Monitor in Image mode, click  in the Stage Control Window, or select **Monitor** from the Scan menu.

9. If the monitored energy is low and not increasing, press the priming lever for 10 seconds.

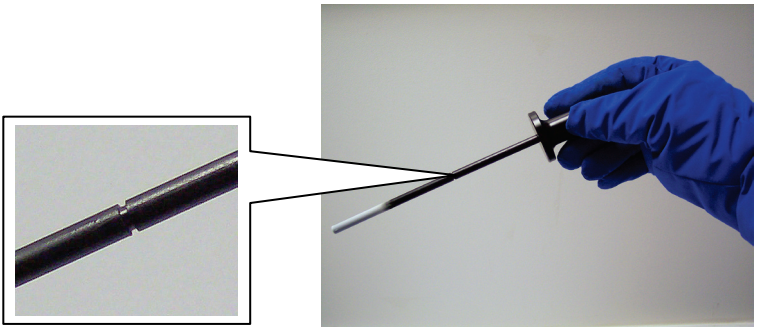
   NOTE: If you see liquid nitrogen or frost around the seal, release the priming lever immediately.

10. Check for seal leakage.

    If you see liquid nitrogen escaping from the seal, refer to *Troubleshooting* on page 7.

11. Use the dipstick supplied to measure the depth of liquid nitrogen in the reservoir, and top up as required.

    Leave the dipstick in the reservoir for about 5 seconds. A few seconds after removal, frost forms on the dipstick, indicating the level.



    Do not fill the reservoir past the groove in the dipstick, that is, to a depth of more than 100 mm (4 inches), which is the height of the reservoir's main chamber.

The system is now ready for use.

Routine Maintenance

Icing

Water vapor can condense on seals and allow leakage. Once a month, remove the reservoir, allow the system to warm up and let any ice evaporate.

Troubleshooting

Seal Leakage

WARNING

Liquid nitrogen escaping past the seal into the sealing disc cup is not normal behavior.

Do not refill the reservoir until you understand the problem and have addressed it.

Seal leakage may worsen as the seal is over-cooled by escaping liquid. Liquid nitrogen overflowing from the sealing disc will damage the instrument.

A small amount of liquid nitrogen escaping past the seal is not harmful while it is contained by the sealing disc. However, the detector may not be cooled for long enough to complete your experiment.

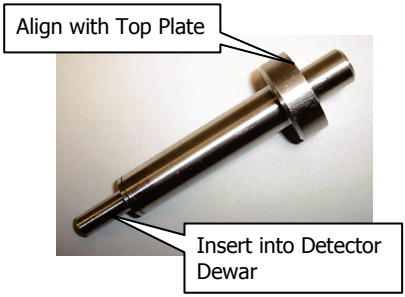
- The most likely cause of slight seal leakage is holding down the priming lever too long so that the sealing ring hardens by over-cooling in escaping liquid. This is a temporary condition. Remove the empty reservoir, allow it to warm, check that the sealing ring is dry, and begin your experiment again.
- To stop a small but persistent leak increase the pressure applied to the seal by rotating the sealing disc anti-clockwise by a quarter of a turn.
- If performance of the seal is poor, check the alignment of the reservoir.

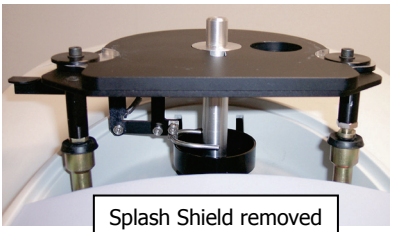
Reservoir Alignment

The reservoir is aligned with the detector Dewar during installation and should not need adjustment unless the instrument is moved.

To check and adjust the reservoir alignment:

1. Remove the reservoir and insert the narrow end of the alignment tool through the top plate and into the detector Dewar.





2. Check that the upper face of the tool's alignment spool is in the same plane as, and at the same height as, the upper face of the top plate.

   If necessary, lay the edge of a ruler across both faces. A spirit level is not helpful.

3. If the reservoir height requires adjustment, rotate the detector seal disk.

   Turn the seal disc anti-clockwise to move up, or clockwise to move down.

4. If the top plate requires adjustment,

   Use the rear post to adjust the pitch (slope, front to back).

   Use the right post to adjust the yaw (slope, left to right).

   In both cases, slacken the lock nut, rotate the post to adjust its height and then retighten the lock nut. Do not over-tighten.

5. Remove the alignment tool.