

## Cryo filling procedure for Hitachi and JEOL SEMs in lab 1L32

Both SEMs in lab 1L32 have liquid nitrogen (LN<sub>2</sub>) traps, which are used to reduce specimen contamination caused by electron-beam irradiation. A LN<sub>2</sub> trap is useful when you take time to select the field-of-view or when you want to obtain high-resolution scanning images at a short working distance.

### A) Filling the 4-liter liquid nitrogen dewar

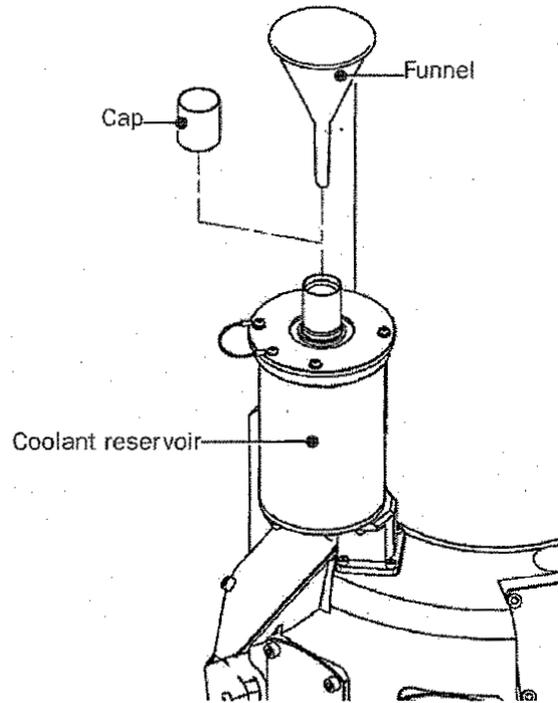
Lab 1L32 has a 4-liter (4L) dewar for bringing LN<sub>2</sub> into the lab. To fill it with cryogen, follow these steps:

- Make sure you are wearing long sleeves, otherwise, you can put the general use coat located in the lab. Also, you should wear pants and closed shoes. Put on safety glasses with side shields, face shield and cryogenic gloves. In general, in case of an accident, your skin and body should be protected from direct contact with cryogen liquid.
- Take the 4L dewar to the loading dock where you will find a large LN<sub>2</sub> dewar with cryogen transfer line. Place the 4L dewar on the floor and insert in its neck the end of the transfer line. Try to adjust the 4L dewar position such that the transfer line stays in place without you needing to hold it.
- Temporarily hold the line in place with one hand (make sure you are wearing cryogenic gloves) and slowly open the liquid valve in the large dewar. Gradually and slowly increase the liquid flow until the valve is open about one full turn. By this time the transfer line should have become rigid and you can let it stand alone.
- Wait until the 4L dewar is full. Close the liquid valve. Remove the transfer line and put on the 4L dewar loose cap. Wait until the line warms up so you can bend it and hang it on the large dewar.
- Carefully bring the 4L dewar to lab 1L32.

### B) Filling the SEM's liquid nitrogen reservoir

The following instructions are taken from the JEOL 7600F instruction manual. The procedure is almost identical for the Hitachi S-400. Please refer to Fig. 1 to identify the parts of the JEOL 7600F LN<sub>2</sub> trap.

- Remove the cap from the filling port on the reservoir and confirm that no water droplets or frost remains inside the reservoir, otherwise, wipe off the water droplets using a dry cloth or evaporate them using a hair dryer.
- **CAUTION:** Make sure you are wearing long sleeves, otherwise, you can put the general use coat located in the lab. Also, you should wear pants and closed shoes. Put on safety glasses with side shields, face shield and cryogenic gloves. In general, in case of an accident, your skin and body should be protected from direct contact with cryogen liquid.
- Insert the funnel into the filling port and pour liquid nitrogen up to the halfway point in the reservoir (about 150 ml). **CAUTION:** If you rush to pour liquid nitrogen, boiling over could occur, causing you to get frostbite. Pour it in several small quantities.
- Put the cap on the filling port. The effective cooling time is about 4 hours. If you want to use this device for more than 4 hours, replenish the liquid nitrogen.



**Liquid Nitrogen Trap**

① **Coolant reservoir**

A volume of 330ml liquid nitrogen lasts in the reservoir for about four hours of continuous operation. If you want to operate this device over a longer period of time, replenish liquid nitrogen in the reservoir every three to four hours.

② **Cap**

Always keep the cap on the filling port except when replenishing liquid nitrogen in the coolant reservoir.

③ **Funnel**

Use the funnel when pouring liquid nitrogen into the coolant reservoir.

Fig. 1 Liquid nitrogen trap for JEOL 7600F.