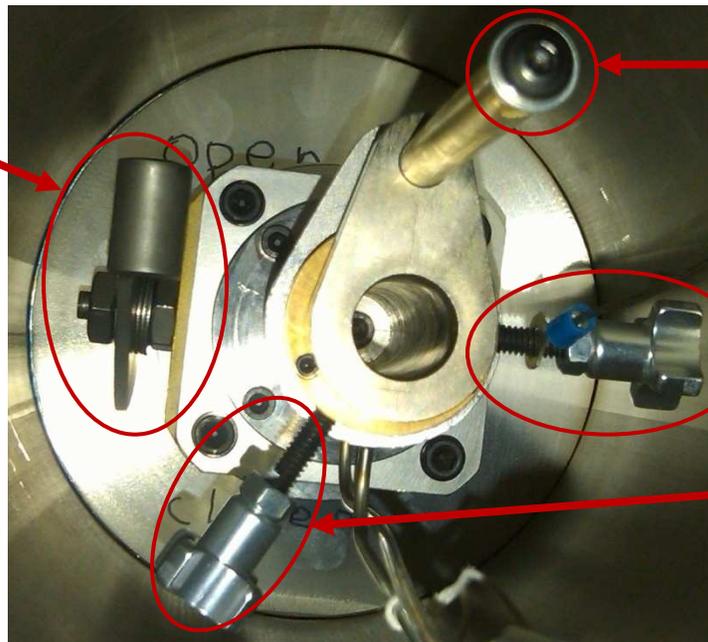


Removing and Inserting Targets While Maintaining Vacuum

Daniel Coupland
July 16, 2009

The S2 scattering chamber target mechanism is entirely manual. Neither the target motion, nor the valves associated with venting or pumping the airlock or closing it off from the scattering chamber, are remotely monitored or controlled. The system was designed by Ben Arend, and the design drawings, along with his instructions, are available on the e09042 experimental webpage.

Ball valve handle:
The ball valve separates the airlock from the scattering chamber. In this picture, it is fully open to allow the target rod to pass into the scattering chamber. In the closed position, the handle would point towards the bottom of the picture.



Guide bolt and spacers: During normal use, these keep the target within its normal range. These must be removed to remove or insert the target.

Set screws: These can be tightened on the target rod to prevent it from moving.

Looking up into the target mechanism when the target is fully inserted



From left: The roughing valve (near the roughing pump,) the vent valve (underneath the scattering chamber,) and the cable limit bracket (on a lanyard hanging from the target assembly.)

Removing the Target

- 1) Start by powering down electronics in the scattering chamber and closing the turbo gate valve. This prevents catastrophic damage in case an error is made during target removal and a significant amount of air leaks into the chamber.
- 2) Check that the airlock roughing valve and vent valve (pictured above) are closed.
- 3) Remove the guide bolt and spacers to allow the target rod handle to slide off the guide rod.
- 4) Pull the target rod down off the guide rod.
- 5) The target rod is made of two shorter rods held together by a long bolt. While you can still look into the bottom of the rod and see the bolt, fit the Allen wrench into the bolt (it's difficult if you wait until you can't see it) but do not unscrew.
- 6) Continue pulling the target rod until *at least* two inches of the upper rod (above the joint) is visible. I suggest pulling the rod out even further than this, until the end of the lower rod almost touches the ground, because this gives you more leverage when pulling only on the upper rod.
- 7) Tighten one of the set screws, to ensure the rod can't move.
- 8) Unbolt the lower rod. Carefully set aside the rod and o-ring.
- 9) Attach the cable limit bracket (pictured above) to the bottom of the upper rod.
- 10) Loosen the set screw.
- 11) Pull the rod down until the lanyard cable is tight. This means that the top of the target ladder has cleared the ball valve, but the rod is still within the o-rings at the bottom of the airlock, as it must be to keep vacuum.
- 12) Close the ball valve by turning the handle (pictured above.) The handle doesn't turn easily, and it may take a long rod or piece of thick plastic to lever it into moving.
- 13) Open the airlock vent valve.
- 14) Remove the target rod.
- 15) Close the airlock vent valve (so you don't forget later.)
- 16) If the target rod will be out for a significant amount of time, open the turbo gate valve to resume pumping the scattering chamber.

Inserting the Target

- 1) Again, start by powering down electronics in the scattering chamber and closing the turbo gate valve, and checking to make sure the airlock roughing valve and vent valve are closed.
- 2) Insert the upper half of the target rod into the airlock, until the cable limit bracket can just barely fit over the bottom (you don't need to attach it.)
- 3) Pump down the airlock by opening the roughing valve.
- 4) When the Pirani gauge attached to the roughing line reads below 10 mTorr, close the roughing valve.
- 5) Open the ball valve. This should have very little effect on the scattering chamber pressure.
- 6) Push the target rod up until the lower rod will fit underneath it.
- 7) Tighten a set screw.

- 8) Bolt the lower rod onto the upper rod. Be sure it's firmly attached, since this determines how much play there is in the position of the target.
- 9) Loosen the set screw.
- 10) Push the target rod up until you can fit the base over the guide rod. It will become a lot more difficult to push when the top of the rod passes through the o-ring at the top of the airlock. This is normal, but if it is too difficult, it may mean that the top of the rod or part of the target has gotten stuck, and should not be forced.
- 11) Push the target rod up into the desired target position.
- 12) Attach the guide bolt and spacers.
- 13) Open the turbo pump gate valve, and turn on electronics.