

Target How To

- **Question:** How much should the **JT Valve** be open for my shift?

Answer: The more coolant flow you take from the CHL/ESR, the more power you can dissipate on the target, so you need to know **two things** before setting the JT Valve:

- 1. How much beam current is going to be on target during my shift? and
- 2. Is there any limit on the flow rate of coolant I can take from the refrigerator?.

How much current you are going to take determines how much you have to open the JT Valve. For quick reference, each microamp of beam deposits about 5 W of power into the H_2, D_2 targets. Therefore, the JT Valve has to be at least open enough to dissipate whatever power you expect the beam to put on the target. Remember, though, that if there's a limit on the flow rate from the refrigerator, or any conditions imposed on the speed of changing the valves, you must follow these limits.

- **Question:** I want 50 μA of beam on my target today. How do I know when to stop opening the JT Valve?

Answer: From the previous question, you saw that 50 μ would deposit about 250 W of power on the target, so you need to open the JT Valve so it will dissipate at least 250 W. How do I know how much power the coolant will dissipate? That's simply the power that the high power heater is putting out with no beam. Your procedure for setting up that loop is then:

- Find out the max current you'll take during the shift
- Calculate the deposited power (e.g. 1 $\mu A \sim 5$ W).
- With no beam on the target, open the JT Valve until the high power heater reads the amount of power you calculated above.
- Open the JT Valve a little more to get approximately 50 extra Watts of power on the target loop. **Why?** Because the temperature of the coolant you're taking from the refrigerator can fluctuate, making the coolant cool less efficiently, so you want to be able to ignore coolant temperature fluctuations by opening the valve a little more than absolutely needed.

- **Question:** I'm new on shift. Which target variable(s) should I be watching? **Answer:** The target temperature, shown on the camera.. If that temperature is ok, the target is close to working right. Other things to watch: JT Valve position, fan speed. These things are also shown on cameras. The camera is the best way to know if the target

is working, because sometimes the GUIs freeze up and you don't realize it until later. Watch the pressure in the loop that we're using. If it changes by more than 3-4 psia, there's a problem. Call the target-on-call. Always know what target is in the beam. Watch what the refrigerator is doing. If the flow rate is oscillating more than ± 2 g/s, then there's a problem. Call the target-on-call.

- **Question:** What should the target vacuum be?
Answer: It's normally in the 10^{-7} range. It sometimes fluctuates with beam on target and with coolant changes. I would start to worry when it gets to the 10^{-5} level. Call the target-on-call at that point, or when the trend looks like it will pass this point.
- **Question:** What should the fan speed be set at?
Answer: When the liquid hydrogen or deuterium targets are in beam, the fan is usually set to 60 Hz. You get this by setting 25% in the "percent frequency" box on the fan.ad GUI. If the target will be out of beam for long periods (i.e. 1 day or more), it's common to lower the fan to 24 Hz (i.e. 10%). Remember to increase the speed again when the target goes back in beam.
- **Question** The alarms are going off. What should I do?
Answer Click on the all window. Is the alarm for one of the other loops that we're not using at this time? If so, it's ok to ignore that alarm. You can change the alarm limits yourself so the alarm stops beeping, or you can send the target-on-call an e-mail and they will change the limit for you. If the alarm is for the loop that we're using, see if you can track down the problem. For instance, if the loop temperature is above the setpoint, is the heater working correctly? Do you have the auxiliary heater turned on mistakenly? Is the coolant from the refrigerator flowing at the same rate and temperature? If you can't solve the problem by yourself after 5 minutes, or if the target is in danger of warming up, call the target-on-call.
- **Question:** Can I do anything to the target that will mess it up?
Answer: Yes, but not easily. The main things you can mess up are:
 - Opening the JT Valve too far or too fast, which could bring down the refrigerator.
 - Trying to move the target with beam on, which will FSD the machine.
 - Changing the setpoints of the high power heater so that the temperature isn't regulating correctly.
 - Opening/closing valves without knowing what they do (although only a limited number of valves can be controlled through the GUI at this time).

This isn't an exhaustive list, but these are mostly the worst things you could do. Anything else you want to do to the target, try it! You are sitting a target shift to learn what happens to the target when you do certain things, so as long as you don't do the above things which could mess up the accelerator/experiment/other halls, feel free to play with things! If something is not working on the target, let the target-on-call know, through an e-mail if it's not an emergency. Putting it in the logbook is not good enough, because we don't always have time to go through the logbook to see if there are any problems reported. If you want to learn more about some aspect of the target, mail or call the target-on-call and we'll be glad to go into depth with you.