Routine Machine Room Maintenance

Systems in the machine room provide control, power and environmental control for the lasers located in the clean room and for some systems across the hall in the surface science laboratory. Most of the parameters for these systems change slowly on a day-to-day basis but should routinely be monitored to prevent damage to the system caused by running out of specifications. **A routine check has normally been made on a workday daily schedule. A check should also be made whenever work in the clean room or machine room has been made which might change fluid levels or power systems**. The room should be closed and locked when not being used by qualified personnel in order to reduce chances of injury due to the hazardous nature of much of the equipment if used improperly.

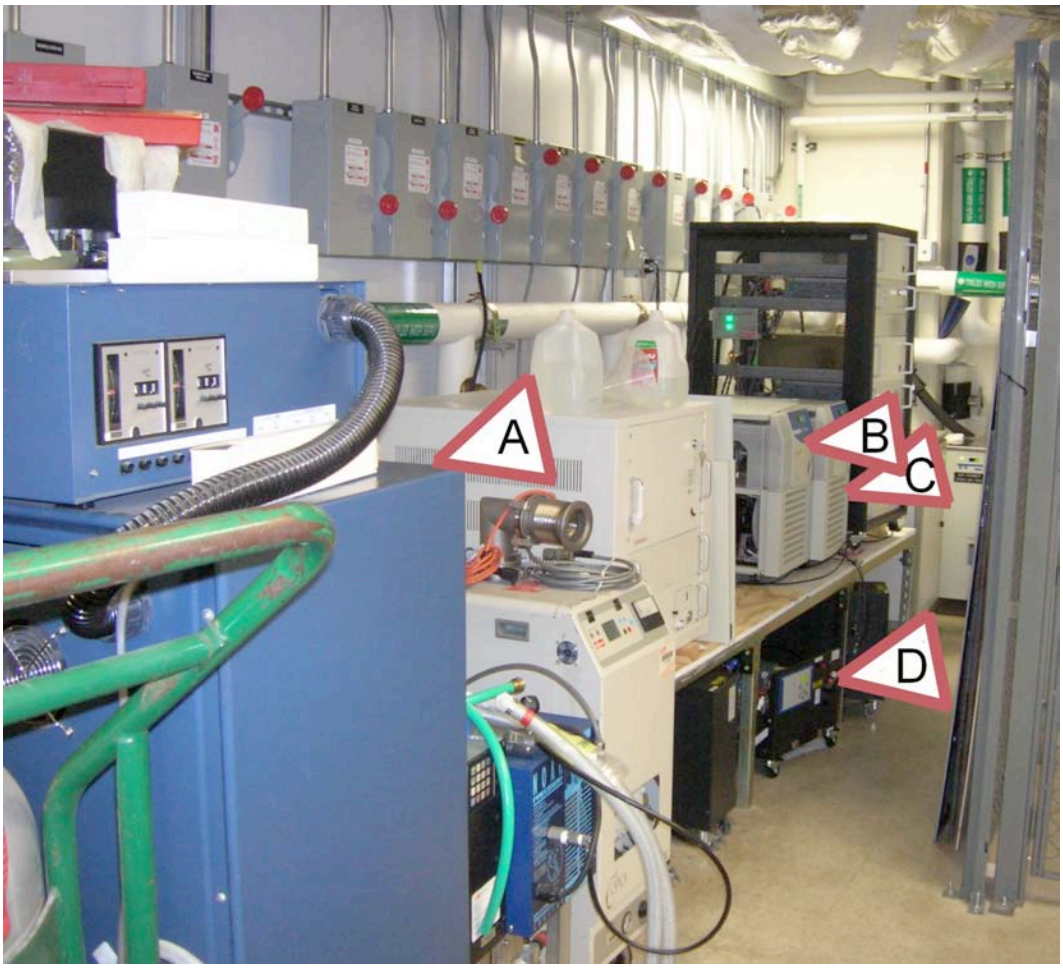

Figure 1

When entering the machine room one will find most of the support equipment placed to the left of the room along the wall adjacent to the clean room. Figure one, above, is the view from near the hall entrance doorway. The arrows, “A, B, C and, D” are used to indicate items to be referred to in this document. Arrow “A” in Figure 1 indicates the area near the left wall where the filter and flow meter are located.

Figure 2 is a second view (in the direction indicated by the arrow "A" in Figure 1) in which the flow meter (arrow "E") and the filter (arrow "F") are photographed near the clean room wall. The flow meter (close up as Figure 3) is used to measures the flow through the filter. Flow indicated in Figure 3 is 10.22 gallons per minute through the filter. The replaceable element filter is used to remove debris and algae from the secondary cooling loop circulated by the Neslab chiller. The filter element is a Pentek PD-1-934 1 um Polypropylene (purchased from Pentair Water) and may be replaced using a strap wrench after the source and drain valves for the filter hoses (see Figure 4 "G" and "H") are closed. **Filter change is indicated when cooling water flow through the filter is less than 5 gallons per minute** (See Figure 2 "E" and Figure 3). A fresh filter will flow in excess of 10 gallons per minute. Lifetime for this filter element has been roughly two months.

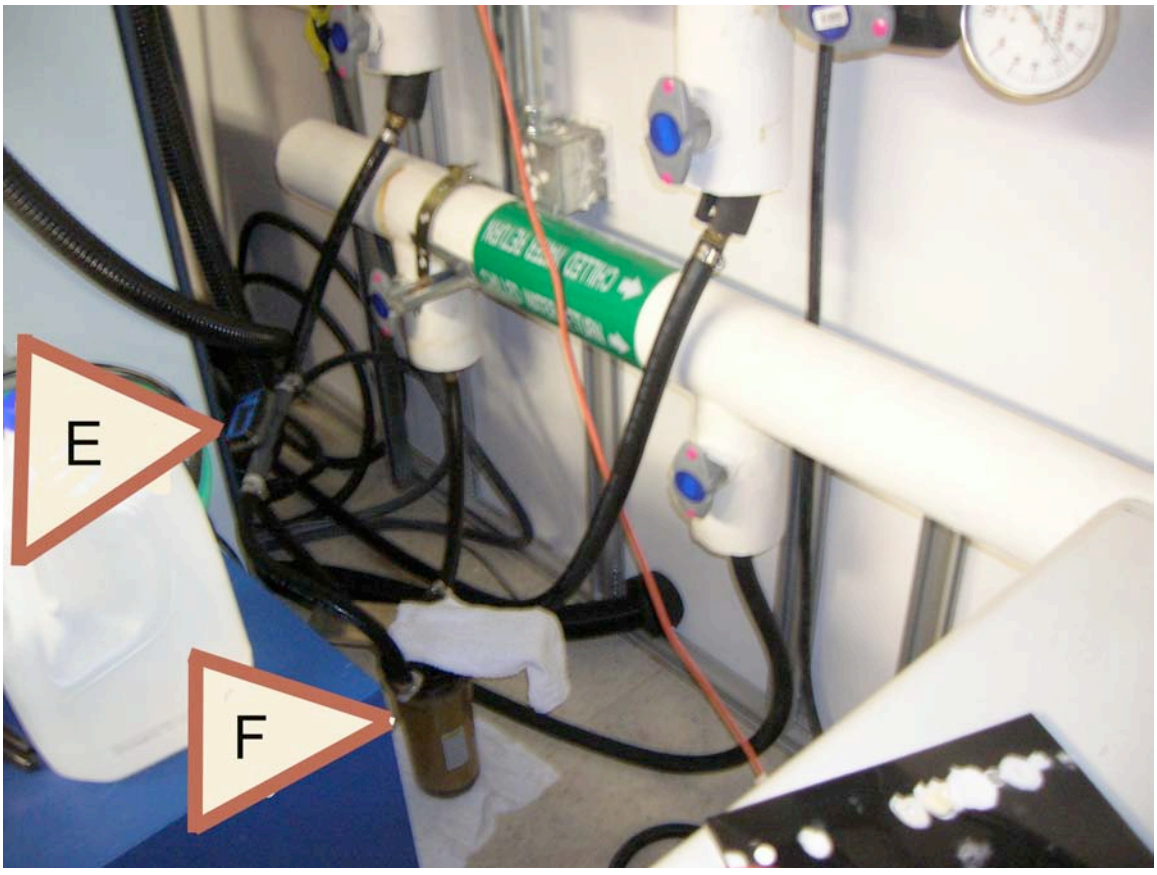

Figure 2

Figure 3

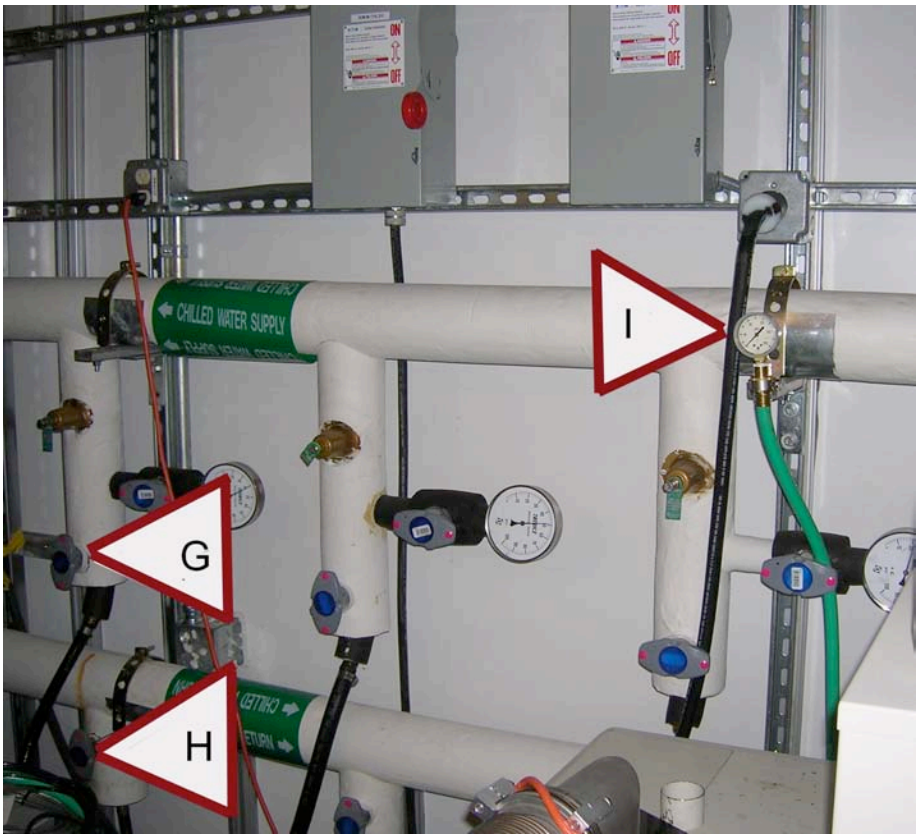

Figure 4

In Figure 1, arrows “B”, “C”, and, ”D” are chillers used to cool components of the terawatt laser located in the clean room. Chillers “B” and “C” are located on top of a low table while chiller “D” sets on the floor. “B” and “C” cool the Femtopower laser, the booster amplifier and, the power amplifiers. Chiller “D” cools the Jade pump laser. Chillers “B” and “C” are normally left running at all times while the chiller “D” is only run when the Jade pump laser is in use. **Water levels should be checked on a daily basis for all three of these chillers**. Chillers “B” and “C” are easily checked for water level by using a flashlight pointed into the reservoir. Chiller “D” needs to be checked while the circulation pump in the unit is running. **Distilled water should be used to refill the reservoir from any loss of level. A further check for the water conductivity on chiller “D” needs to be made**. Conductance of between .1 and 1 micro siemens should be maintained. Press the button until conductance is indicated (Figure 5 “J”). Opening or closing the plastic needle valve (Figure 5 “K”) will lower or raise the conductivity. One must keep in mind that the time constant for the conductance settling is of the order of hours. Changes to the valve take a long time to settle to a final conductance and also the conductance will not be at the final value when the unit is cold started.

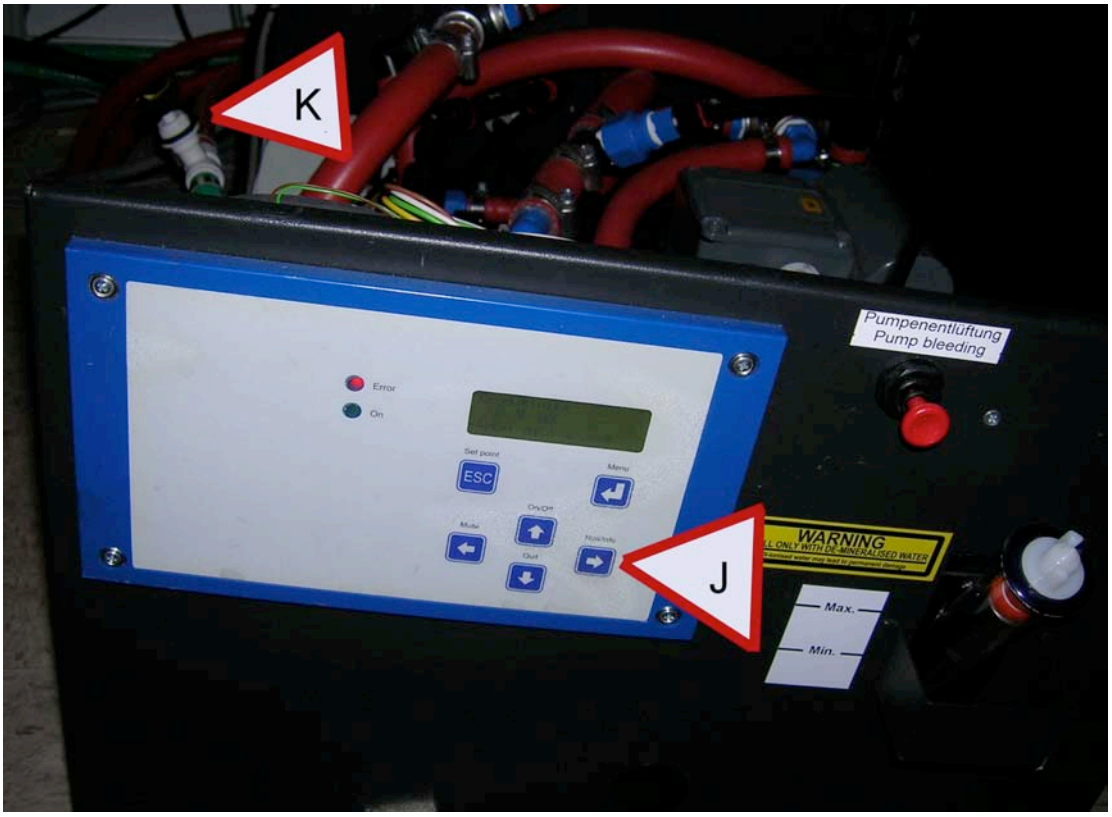

Figure 5

Back pressure for the Neslab chiller loop is measured with the pressure gauge indicated in Figure 4 as “I”. **This pressure should be controlled so that the needle is just off the pin.** Control of the pressure is adjusted using the Neslab loop bypass valve as seen in Figure 6 indicated with arrow “L”.

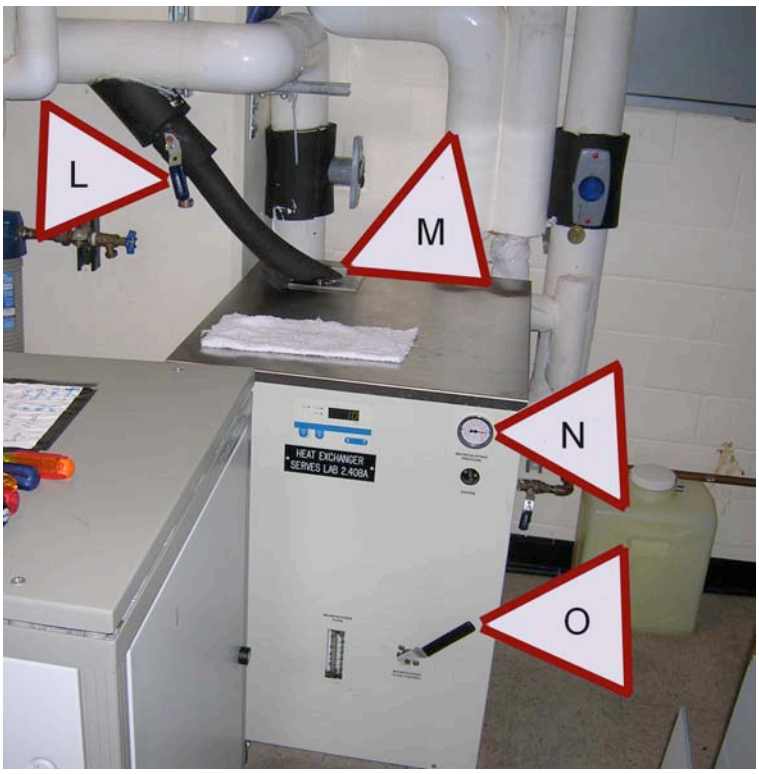

Figure 6

Water level for the Neslab chiller loop is monitored and maintained using the plastic window on the top of the unit (Figure 6 “M”). The lower end of a white rod is used as an indicator for the proper level of water in the reservoir. **Distilled water should be used to refill the reservoir from any loss of level.** The thumb screws on the window can be removed and the window rotated to give access for adding water. Source line pressure for the Neslab chiller is indicated by the pressure gauge (Figure 6 “N”) and is regulated using the circulation pump bypass valve (Figure 6 “O”). **Source line pressure should be adjusted to roughly 84 PSI** (needle horizontal). It should be noted that the source line pressure for the Neslab chiller is effected by the back pressure for the Neslab chiller loop and when one of these is adjusted, the other will need to be adjusted. Usually only a few iterations of adjustment will allow both pressures to be set correctly.

During the routine checks of equipment in the machine room, one should also inspect for other problems. Look for water on the floor. The typical place for these water problems is between the equipment and the clean room wall where many hoses are routed and connected. Other places to check are under the chillers and the water filter. If water is found, assess risk of electrical danger before touching anything.

Watson Henderson 6/14/2013