

Water Cooling System

The electronic FEBs need to be cooled during operation. The cooling process will be done by circulating water in cooling pipes shown in Figure 1. Left attached to cooling plate shown in Figure 1. Middle. The FEBs are sitting on bottom of the cooling plates and attached to cooling pipes by L shape connector shown in Figure 1. right.

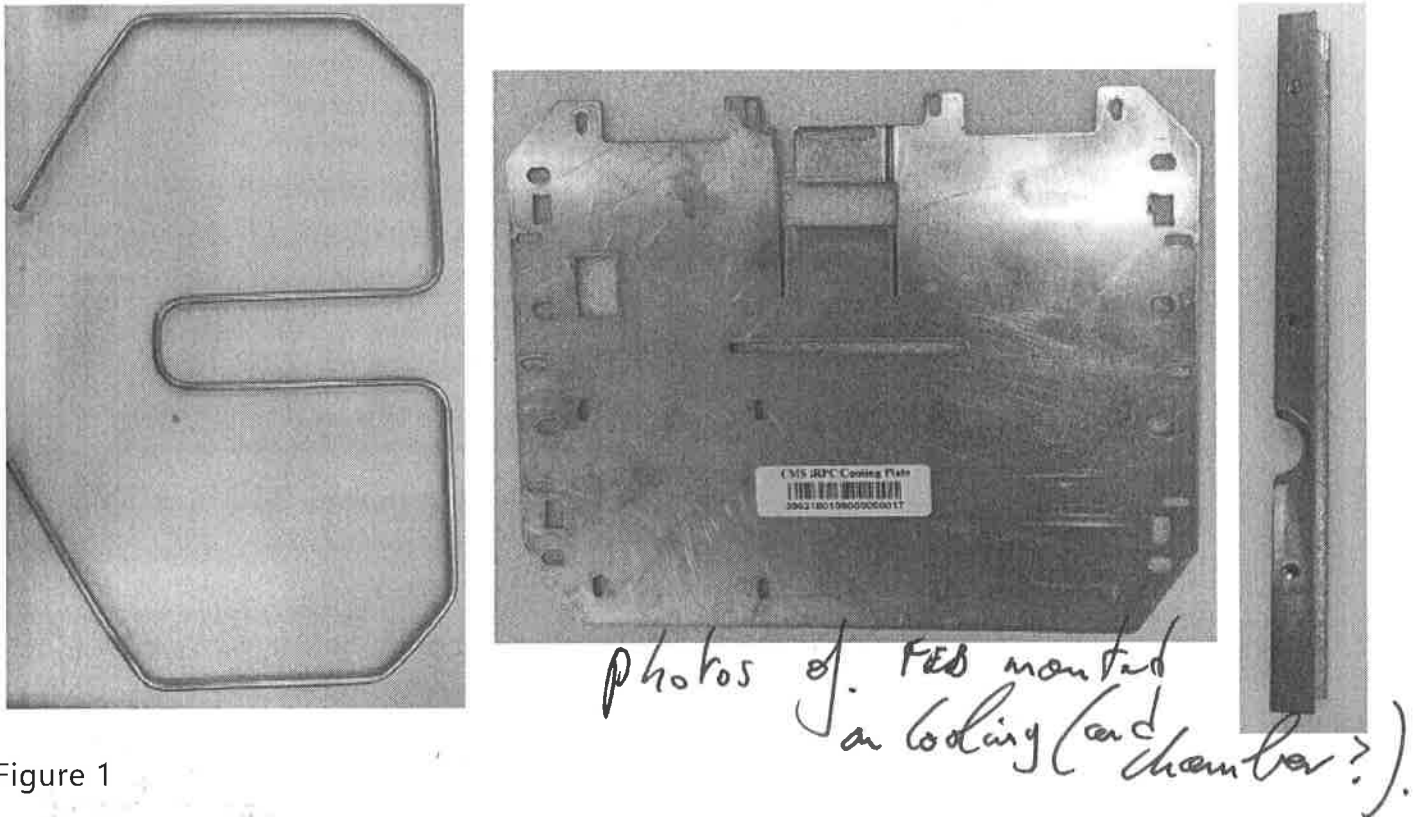


Figure 1

In this system we can circulate water or air. For cooling purpose we circulate water. But in case we need to disconnect pipes and change the chamber under test as example, we need to circulate air to remove the water from the pipes and safely disconnect the pipes.

Let's first describe the cooling system parts, then you can find the procedure to use the cooling system.

The cooling system has different components:

1. The chiller

This unit is responsible of cooling the water, shown in Figure 2. Left.

- To switch on/off the chiller, there is 1/0 button (shown by number 1 in top right figure 2), then you need to press the power button (shown by number 2 in top right figure 2) for 5 sec to switch on the chiller.
- You can adjust the temperature of the water from 2 arrows up/down (shown by number 3 in top right figure 2), Normally we set the temperature at 17°C.

- You ~~can~~ ^{must} check the water level in the water tank inside the chiller from the glass window shown in Figure 2 right bottom ,
- Important: You need to check the water level before switch on the chiller and should be between and

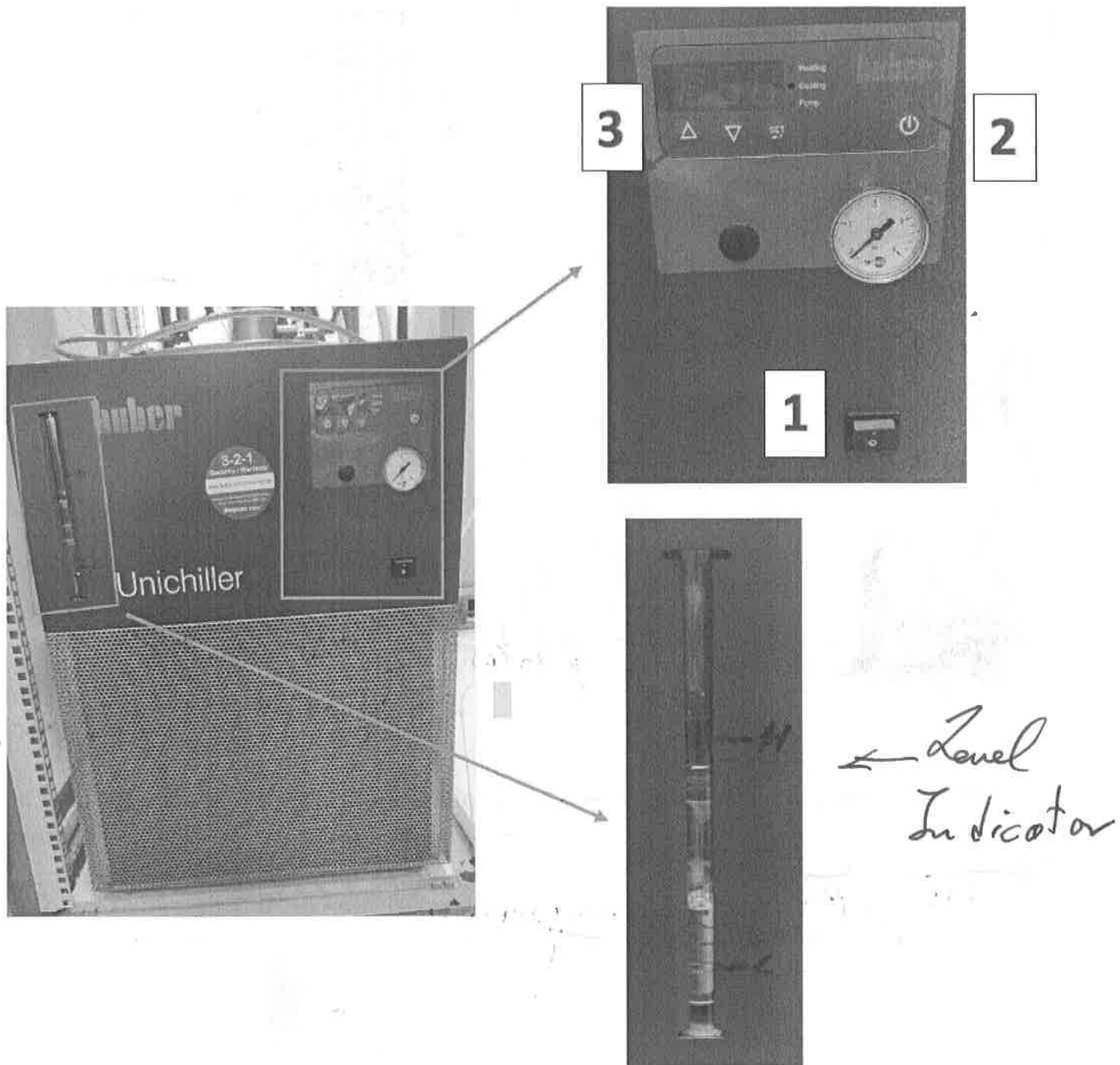


Figure 2

3. The panel

This unit is responsible for distributing the water in 4 supply channels to the chambers and collect the return water through 4 return channels to chiller again, shown in Figure 3

- Four channels means that we can circulate water in 4 chambers at the same time.

allows the circulation

(S1, S2, S3 & S4)

(R1, R2, R3 & R4)
Water Cooling System - CodimD

photo of PP.

- We have 4 supply and 4 return lines as shown in Figure 3. As example; gas pipe from line 1 supply is connected to the chamber and the return line is connected to return line 1 and it is the same for the rest 3 channels. *this repeated for the 3 other channels.*
- You can find the channel names for supply and return lines on figure 3

Air Pressure Regulator

Water/Air valve

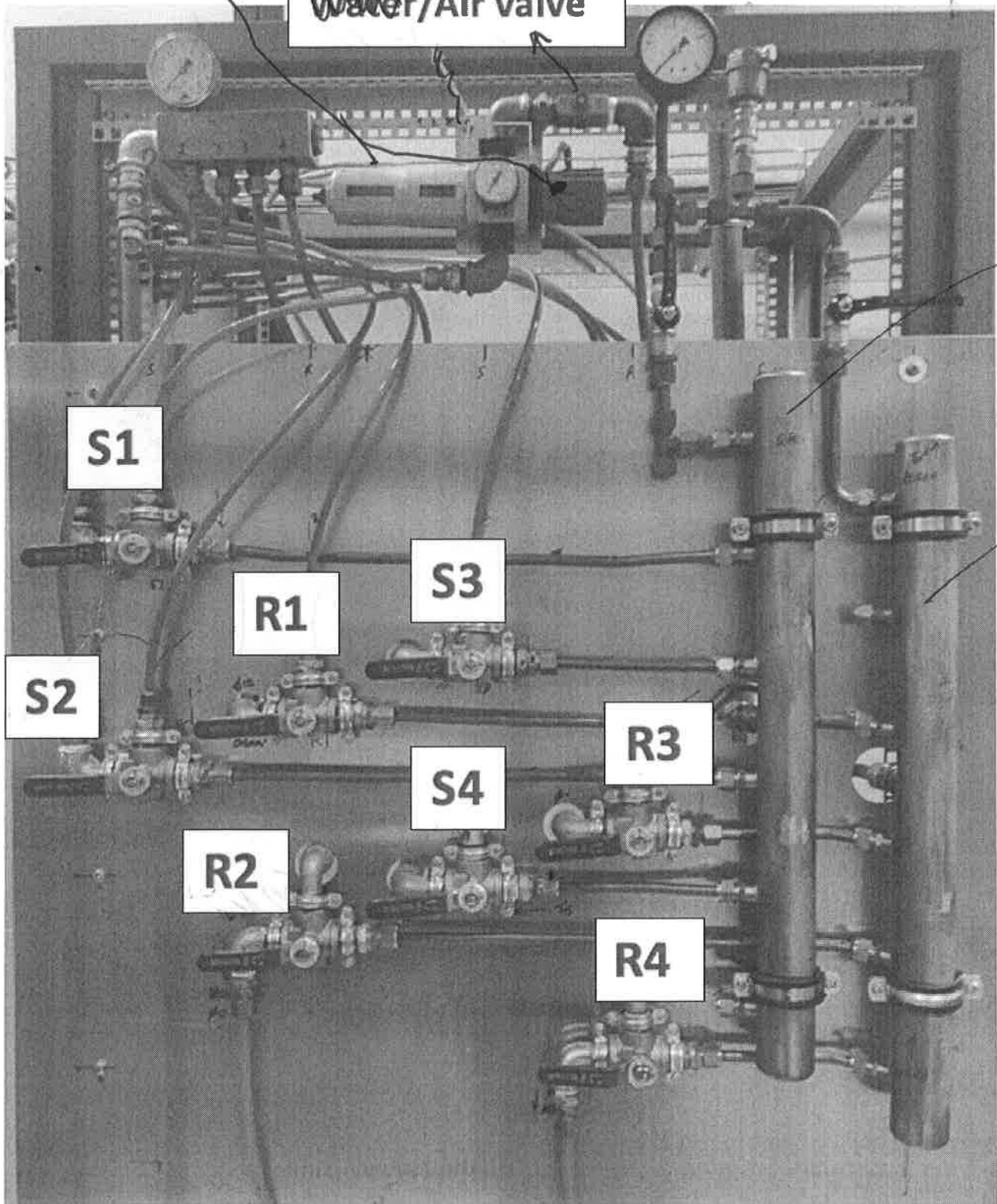


Figure 3

3. The ~~bubbler~~ *Rotameter*

(with bubbler) 2 phase)

You can see the water start to flow or bubble in the bubbler when you switch on the chiller, shown in Figure 4 Left. *We will have an indication of*

4. The ~~fans~~ *Rotary flow indicators (RFI)*

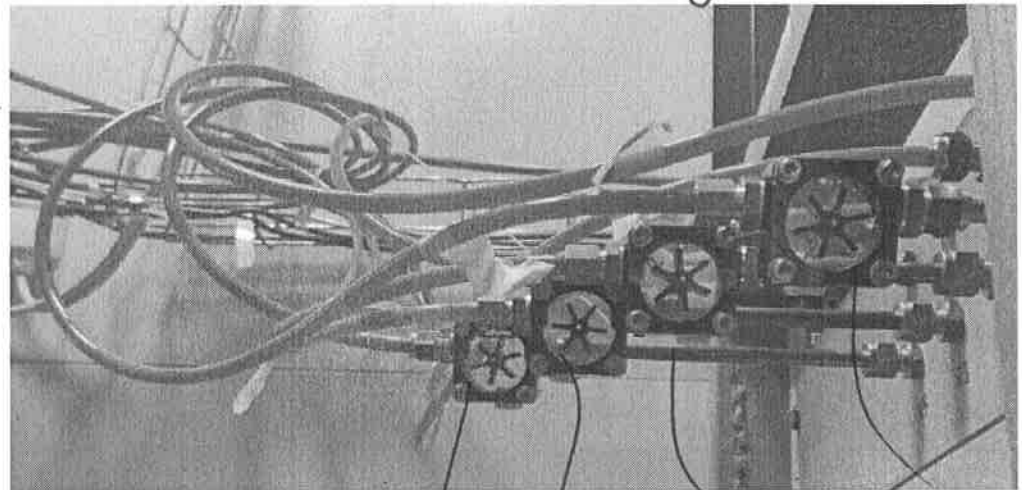
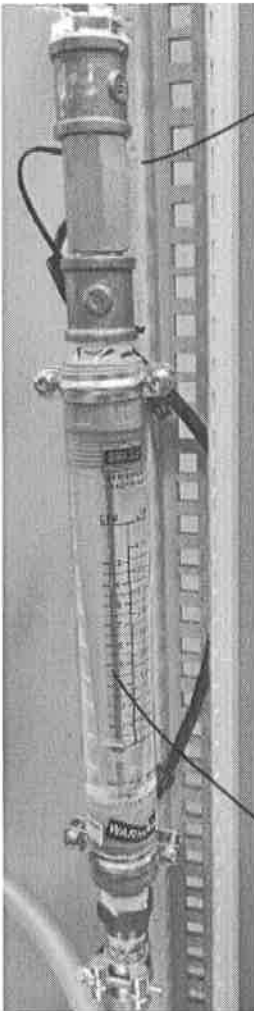
the total flow from the Hall effect flow meter

The fans are rotating when water pass through. The fans are connected to return lines to indicate the circulation of water in the chamber returning to return lines, shown in Figure

4 Right

*Hall Effect flow meter
1-25 $\text{L} \cdot \text{min}^{-1}$*

x 4 - Rotary Flow Indicators



R₁ R₂ R₃ R₄

Rotameter

0-4 (5?) $\text{L} \cdot \text{min}^{-1}$

Figure 4

Procedure To connect chambers and start cooling

In order to circulate water in the chambers do the following steps:

1. Connect the four chambers with the *Blue* *The Unions* pipes using ... connector shown in Figure 5. When you are tightening the connector use key number 17 and tight gently (Don't tight so much, just one turn) *Union*

(x2 always!)

To be established!

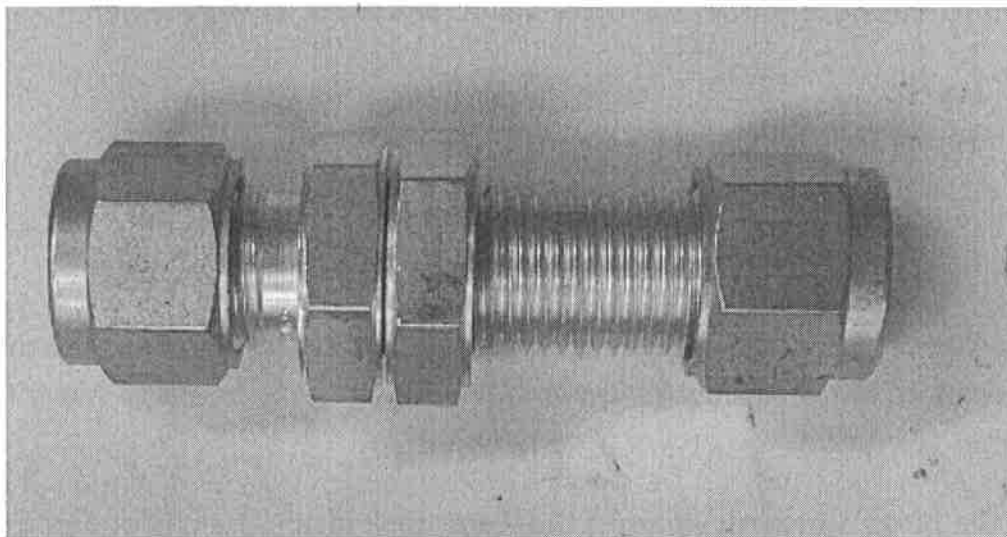


Figure 5

2. As example: first supply goes to the first chamber and the return goes to return line 1 and the same for the other 4 chambers.

3. Make sure ~~from~~ all the pipes connections (otherwise there will be water leak in the chamber with HV connectors and all the electronic FEBs)

4. Make sure from the water level in the water tank in the chiller to be between and

5. All the ~~switches~~ ^{valves} in the panel should be in the direction shown in Figure 3, this direction means that the water will flow. ^{is 2} ^{oriented horizontally} ^{after the chiller} ^{as shown}

6. Make sure that the black valve (Water/Air Valve) in horizontal direction, which mean ^{vertical position} ^{ensuring} ^{no air is pumped into the circuit}

7. Switch on the chiller from on/off bottom as show in Figure 2 and then press on button for 2-3 seconds

8. You will see the water is bubbling in the bubbler and the four fans connected to the return lines are rotating (this make sure that the water is circulating now in cooling pipes on the chambers)

9. Check the temperature on the chiller to be around 17 oC and if not just you can adjust by increase/decrease the temperature from the arrows shown in Figure 2 to reach 17 oC

Procedure To disconnect chambers

In order to disconnect the chambers we need to follow this procedure carefully.

As we mentioned earlier that we can circulate air in the system to remove water from pipes before we disconnect the pipes otherwise there could be water leak in HV connectors and FEBs.

The air line is connected to the system from the black valve (Water/Air valve) shown in Figure 3.

In order to circulate air ^{make} to the following steps

1. Rotate the black valve (Water/Air valve) shown in Figure 3 to be in vertical position shown in Figure ³ *corresponding to be purged*
2. Move the two valve ^{connected} to the chamber (supply line and return line) at the same time to vertical position to allow air flow as shown in Figure ^X *It is important to move the two switches together at one go.*
3. The air will flow ⁱⁿ the pipes and push water ^{to} the water tank inside the chiller and the air will flow out of the tank to exhaust. *2 phase separator to the exhaust*
4. You can see the fans are running with the air flow but with different speed.

?