**Chapter no 6-: System operation**

In this chapter we will see the operation of the system. This chapter will highlight the work for the system operator and will consist of the measure and procedure to be taken while using the system

**6.1 Guides for calibrating the system before use.**

Basically while system does not need the calibration but a few sensors need to be calibrate according to the use of the electrolyte solution you are using, and what material you are electroplating.

**6.1.1 Temperature and MQ series sensors**

This sensor s doesent need to be calibrated. They need to set the threshold value by using the pot given on the sensor itself. According to it you need to put the threshold value in the program which wiil in turn accutuate the buzzer indicating the the measured value reached beyond the threshold limits.

**6.1.2 PH sensor**

* **PH limit setting**

There is another pot that acts like a limit switch. Basically, the D0 pin on the sensor board will supply 3.3V to the pin until a preset PH value (that you set with the limit pot) is reached, at this point a red LED will light up and the pin will go down to about 0V.  I did not play with this much but suppose it can be handy if you want to activate a buzzer or something if a certain PH is reached, it will work great on an Arduino digital port – that will go high from about 2V up. This will work if the PH value goes higher than the set value. If you want it to trigger something when the PH goes lower, you need to monitor the digital pin to trigger when the digital pin goes low. You will unfortunately not be able to set this limit between two values, either if the pH goes up to high or if the PH drop to low. Programmatically you of cause can do an upper and lower limit.

* **Connecting and calibrating the PH probe.**

The hard part is over and this offset does not have to be set again, even if you change PH probes. We have PH probes available here: PH probe Electrode BNC connector

Here is a couple of things to know about PH probes:

* The probes readings change over time and need to be calibrated every now and again to make sure the value is still the same and be adjusted if it did change.
* You need at least one PH buffer solution to calibration your PH probe. They are available at many different PH values, A buffer solution of 6.86 and 4.01 is most common as it covers the range of most applications. If you are only going to use one buffer solution make sure its value is near the value range you will use in your normal tests – if it is pool water a buffer solution of 6.86 is usually near enough.
* Buffers come in pre-made solutions or as a powder. I prefer the powder because it is cheaper and does not have an expiration date. The powder is easy to make up as well, I suppose it depends on the power you will use, the one I use you add the powder to 250ml distilled water and stir until all powder is dissolved. It will last about a month once you added water to it.
* A PH probe**takes some time** to get to the right value, allow it to be in the liquid you want to measure for at least two minutes or longer, it does not mean it will be stable at one ph value, it will jump around a bit between 3 or 4 values but on the last digit, for example,  between 6.84 – 6.88
* PH values differ in different temperatures, although that might sound cumbersome, in the temperature range between 10 – 30 degrees Celcius the PH does not differ and from 30 degrees Celcius it goes up with about a pH of 0.01 to 50 degrees Celcius that is about 0.06. In most uses, it will be below 30 degrees Celcius and temperature do not have to be calculated in.

**6.2 Precautionary measures to take using the system**

* Do not expose this sensor to water and frost.
* Applying a voltage higher than 5V or applying the voltage to the wrong pins may damage the sensor.
* Exposing the sensor to a high concentration of gases for a long time may have a negative effect on its performance.
* Shaking or vibrating the sensor may decrease its accuracy.
* Do not let the measuring terminal box (containing the arduino) to be in direct contact with the electrolyte solution present in the bath
* Do not power up the arduino until you hav made the proper conection
* Make the use of proper standard ideal solution while calibrating the ph sensor
* Make sure that BNC connecter is properly shorted to eash other while setting offset of ph sensor[details given in chapter no 3]
* According to the requirement only set the set the threshold value of the mq2 and mq7 sensor otherwise you may get wrong indication.
* Make sure that code has been properly uploaded in the arduino
* And very important keep at least 200m distance between transmitter and receiver module for proper data transfer

**6.3 Steps for operating the system**

**Step1-:** before operating the system ensure that you have followed all the calibration and precautionary measures.

**Step 2** **-:** Put all the sensors at their actual site (mq2and mq7 at the bath site and temperature and ph sensor in the electrolyte solution)

**Step 3-**: Upload the program in the arduino and power on it

**Step4-:** Wait for some delay and see the lcd display if it showing the readings and if not then follow the calibration and precautionary steps again and implement it .

**Step5-:**  Now the system is in its work mode. While implementation the system to another bath you need to follow the steps given above