The contentious issue of water's resistance value.

PREAMBLE:

There is much about the measuring of water that is technically and scientifically incorrect, such as any of the following:

1. The measuring of water's conductivity and using terminology as if comparable to a solid metallic conductor, i.e. Resistivity and Current in amperes/hour.

2. Instead of using direct current and voltage potential, alternating current is used at various differing frequencies at predictable varying impedances.

3. Conductivity measured in Siemens or parts thereof, is claimed to be the direct reciprocal of resistivity, further flawed as resistivity relates to a solid metal conductor in a linear shaped object, such as a square solid cube and measuring the current flow between two opposing surfaces of such a solid. Considering that two metallic foils 10x10mm and *separated* 10mm apart does equate to the same thing, should not be considered.

4. The consistency of water as a dielectric and thus an insulator should NOT under any circumstances be compared to a solid metal conductor through which current flows in a predictable way.

5. Metals conduct electrons as electrical current flow. It is subject to any opposing resistances and the voltage potential applied without there being any direct limit. Water in comparison will break up its molecular identity into Hydrogen and Oxygen when the applied voltage potential exceeds 1.23 Volt DC.

6. The largest enigma of all is the claim for a maximum resistance of water as being 18.24 million Ohm at a conductance level of around 0.0548 micro Siemens at a temperature of 25 degrees Celcius at a pH of 7 on the one hand and a maximum of 100 million Ohm by Horiba on the other. Another claim that 1 micro Siemens equals a reciprocal value of resistivity of 1 million Ohm is also wanting and most likely never been tested for accuracy.

Conclusion to the aforementioned:

It is obvious from these facts listed, that something different and more scientifically orientated should be introduced. Unfortunately two aspects of water make this a very difficult assignment due to (a) ultra-pure water on its own would have theoretically an infinite opposition to any current flow and (b) any electrons on their own released into the water (hydrated or solvated electrons) would be quickly be surrounded and captivated by the electrical charges of the water molecules themselves. Only ionic flow is able to be measured and even that is questionable, when we do not know how much is flowing one way or the other. In fact we may just be measuring the difference between the anions and cations.

A possible solution to these problems:

Thinking about these problems, I reminded myself that within Ohm's Law there are two well-known factors, i.e. Parallel Resistance and Current Hugging, explained as follows:

The parallel resistance factor:

Place two equal value resistors in parallel and join them electrically at both ends. Their value would halve, i.e. two 1,000 ohm resistors would have a combined value of just 500 Ohm. Joining two such resistors in series (end to end) would provide a combined resistance of 2,000 Ohm.

Current hugging:

However, if we parallel connect two resistors of different values such as 300 and 400 Ohm, it must be obvious that the resistor measuring 300 Ohms would allow more current to flow than the resistor of 400 Ohm. Accordingly the 300 Ohm resistor would take away current from the 400Ohm resistor and get hotter in the process. This phenomena is called 'current hugging".

Working on these models, I conceived an instrument that would compare the ionic current in the water and simultaneously that same current flowing through an unknown resistance factor. Which-ever would have the lowest hypothetical current level, irrespective if it were ionic or charge carrier flow in the water or electron flow through solid metal conductors and a resistance out of the water, would present hugging of the current. Both systems would have a current measuring device in series, e.g. an analogue panel meter to do so.

To ensure a measure of accuracy, the voltage potential and the current flow through the water will be 330 volts DC at a limiting and consistent current of 50 micro ampere. Equally a 50 micro ampere at 330 volts DC would flow through a variable resistor (a value unknown at this stage) and adjusted until such time as both panel meters would show the same level of current and no current hugging form on one circuit or the other.

There could be an unexpectant outcome when ionic flow through water will not allow itself to be compared with electron flow through a real resistor, a bit like comparing oranges and apples. Anyhow, the dual channel measuring instrument is complete and ready to go. The actual power supply will feature a 300 volts DC at 50 micro ampere and a second power supply at 30 and 60 volts DC also at 50 micro ampere. This is to prove that low voltage have trouble passing current at low voltage potentials, albeit more at the higher voltage level. If it does work however, we will finally be able to test the properties of different types of water as well as water quantities such a s 1 litre ant 2 litre volumes.

A sketch of the concept is included hereunder.

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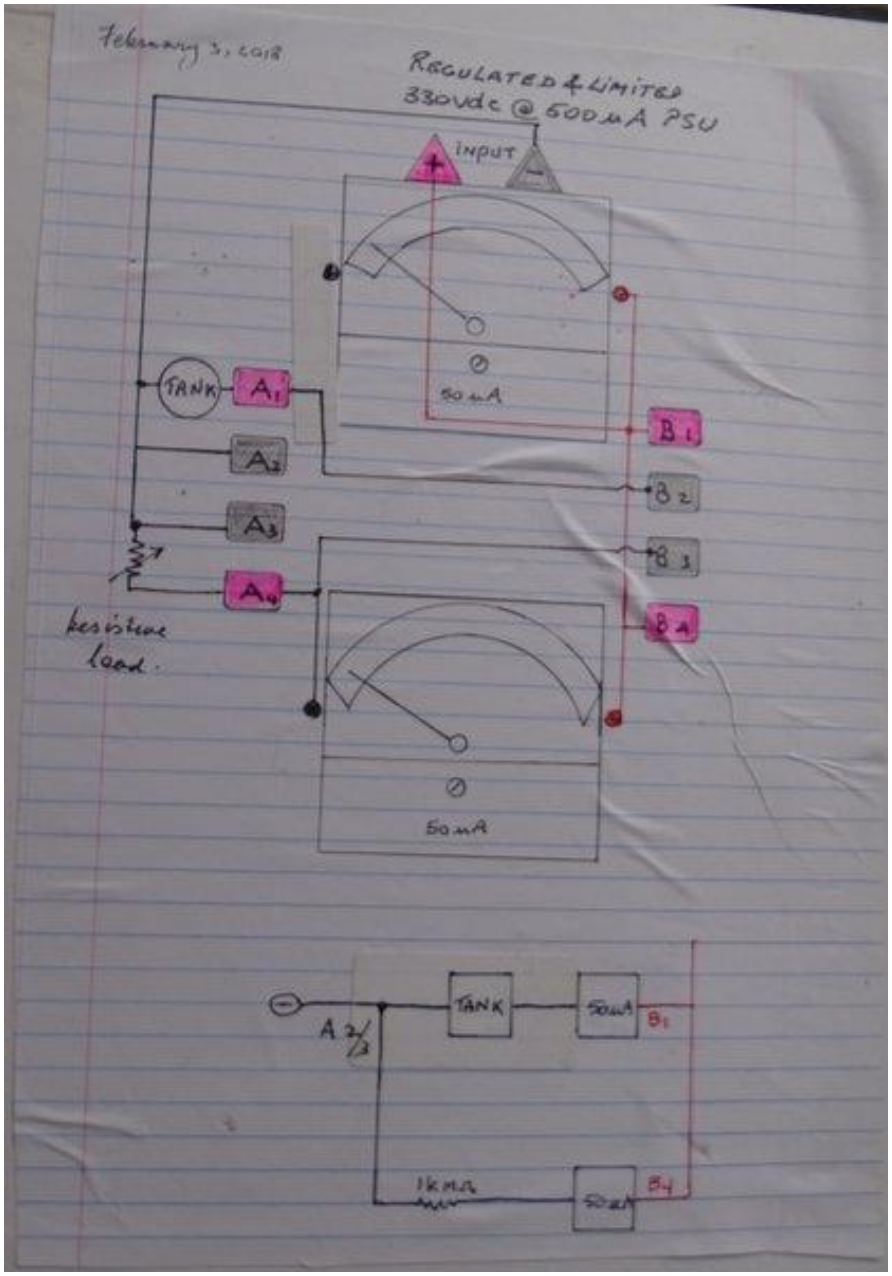

Resistance values around 1,000 million Ohm will be tried first. Either it needs to be higher or lower, perhaps 300 million Ohm as measured some years ago.