

## A Word or Two about Calibration Checking

M. C. Miller's criterion requiring that the potential difference between two RE-5, or RE-5C electrodes be less than  $\pm 5\text{mV}$  in order for a service electrode to be declared "calibrated" with respect to a non-service electrode, does not apply in the case of an IonX electrode.

IonX electrodes are pre-constructed and are supplied with a Certificate of Calibration. The electrode potential is quoted on the Certificate versus the Standard Hydrogen Electrode (SHE) potential. The electrode potential of an IonX electrode will be in the range,  $316\text{mV} \pm 10\text{mV}$ , which is the manufacturer's tolerance range for this type of electrode.

IonX electrodes are designed for field (service) use, however, if an IonX electrode is used to check the calibration of a regular RE-5, or RE-5C electrode, an understanding of what a potential difference reading means in such a case, is required.

### Example:

Let's say that an IonX electrode has an electrode potential, as indicated on its Certificate of Calibration, of  $321\text{mV}$  versus SHE, which is a potential within the manufacturer's specified range. Now, let's say that a potential difference reading of  $8\text{mV}$  is recorded in tap water between the IonX electrode and a service RE-5, or RE-5C electrode. This means, in this example, that the potential of the service electrode is  $313\text{mV}$  ( $321\text{mV} - 8\text{mV}$ ) versus SHE, assuming that the IonX electrode was connected to the positive side of the voltmeter and the service electrode was connected to the negative side of the voltmeter.

Since the accepted electrode potential of a copper/saturated copper sulfate electrode is  $316\text{mV}$  versus SHE, the service electrode potential, in this example is within  $3\text{mV}$  of the "Standard" value, which would be very acceptable ( $313\text{mV}$  compared to  $316\text{mV}$ ).

Consequently, the service electrode should be considered to be "calibrated" in this example. However, since the potential difference between the IonX and the service electrode was measured as  $8\text{mV}$ , the service electrode would not have been declared calibrated by application of the  $\pm 5\text{mV}$  criterion.

So, if an IonX electrode is to be used to check the calibration of a service electrode, the first step is to check the potential value quoted on the Certificate of Calibration, and, based on the potential difference reading, determine the potential of the service electrode and compare that value to the "Standard"  $316\text{mV}$  value.