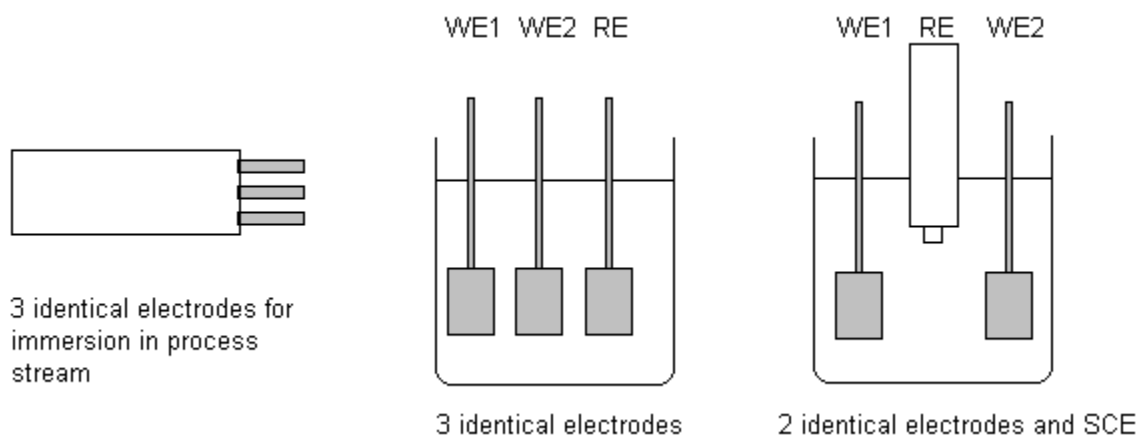
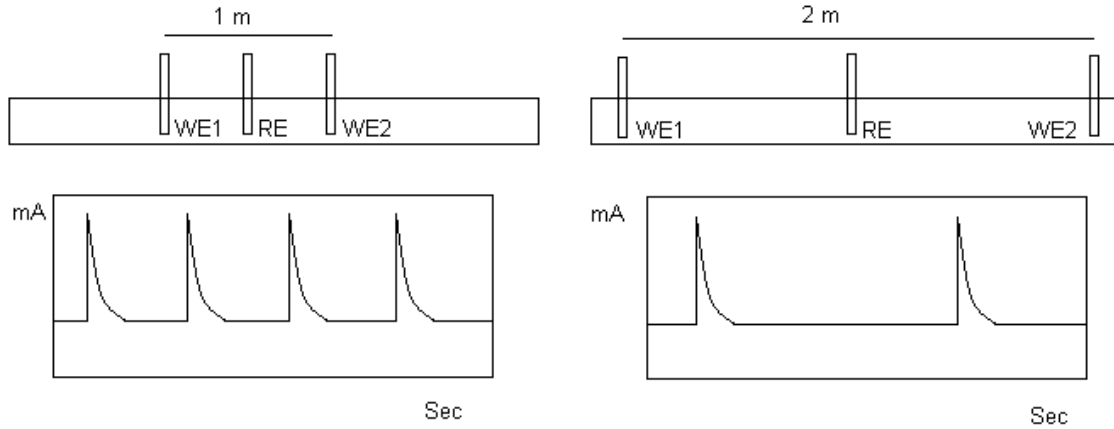

Current and Voltage Noise

This is one of the simplest tests. Usually three identical electrodes are immersed in an electrolyte and two of them are coupled by a zero resistance ammeter whilst the third is connected to a voltmeter to monitor the potential between the couple and this third electrode. The ZRA ensures both electrodes in the couple are at exactly the same potential. The Gill AC 8 and 12 and the Field Machine along with the dedicated Galvo Gill 12 all incorporate ZRAs. In practice a test of a set length is set up say 1000 points recorded every 1 second and the resulting data analysed.



Electrochemical noise is appealing because it can be conducted at open circuit without perturbing the corroding system. Currently no real consensus exists as to the test details. Each experimenter usually develops their own procedure for testing known products and builds up an experience base for comparative purposes. Attempts have been made to find a relationship between uniform corrosion rate and measured electrochemical noise but this universal equation has not yet been found and consequently no ASTM standard exists for noise testing. When used for long term field monitoring in aqueous systems an analysis of fluctuations in the current record has proved useful. One system was installed at 13 points in a plant and known conditions reproduced. Calibrating the current pulses against known corrosion rates allowed the system to monitor the plant. One of the original uses for electrochemical noise in the late sixties was for monitoring localised corrosion. The transient development of bare metal at newly

formed pit or cracking sites as a result of temporary propagation and repassivation can result in potential noise current noise or both. Cell geometry is often overlooked during noise tests but is just as important as for standard polarisation tests. Consider the experiment below performed using a Gill AC.



Three identical tool steel electrodes were immersed in tap water. Test 1 had WE spacing of 1m and test 2 had WE spacing of 2m. A regular large pulse was observed in the current trace with a frequency inversely proportional to the electrode spacing.