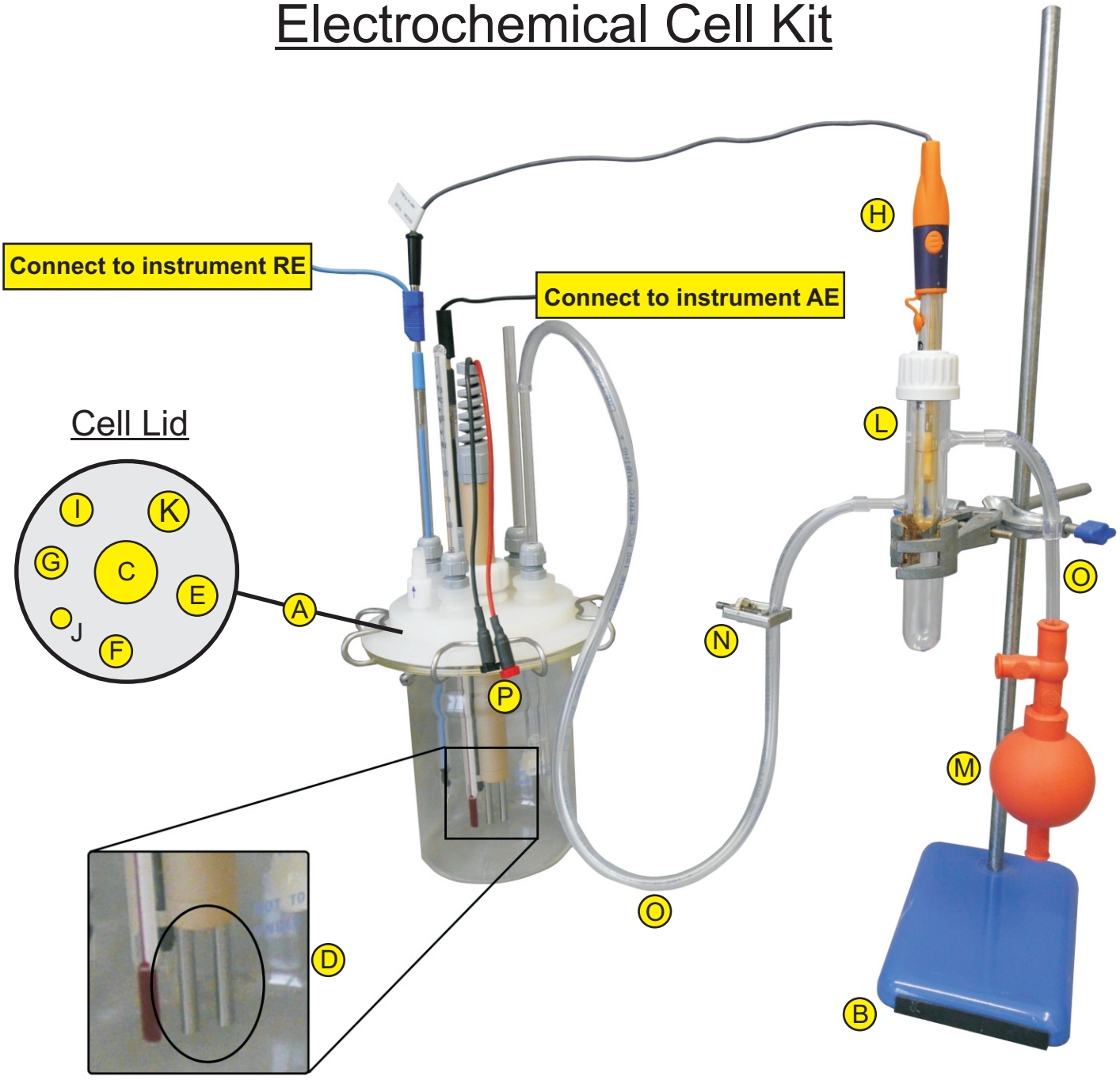
ACM Instruments
Corrosion Monitoring Instrumentation

Electrochemical Cell Kit



A **1L Cell Vessel, Lid & Clamp**
Cell lids are supplied pre-drilled. The spring clamp secures the lid to the cell top.

B **Retort Stand, Base, Rod, Clamp & Arm**

C **2 Electrode Probe**

D **Electrodes** (2 x Mild Steel)

E **Luggin Probe**
Used in a salt bridge connection. Glass construction with a fine tip that points towards the test electrodes.

(F) Thermometer

(G) Noise Reducing Probe (blue lead) Platinum pin type tip, adapter and sealing plug.
The Noise Reduction Probe is particularly useful at reducing mains signal polarisation caused by mains pick-up in the Electrochemical Cell. Typically these electrodes should be used with a salt bridge or a typical commercial reference electrode. Further details can be found at our web site under Application Notes / Noise Induction.

(H) Refererence Electrode (Saturated Calomel)

(I) Auxiliary Electrode (black lead) with 1cm^2 Band of Platinum, adapter and sealing plug
When inserting the Platinum Electrode into its adapter we recommend that the adapter is first dismantled so as not to damage the Platinum band as it passes through the adapter. Typically the Auxiliary Electrode is used to supply current to the cell during a polarisation.

(J) Vent
An exhaust valve through which gas can flow in one direction only.

(K) Gas Distribution Tube
Sintered end for creation of small bubbles. Used for sparging with gas such as CO_2, H_2S or Nitrogen.

(L) Remote Reservoir, (M) Pipette Filler, (N) Hoffman Clip & (O) Tubing

In some cases it is deemed necessary to effectively isolate the reference electrode from the cell via a salt bridge. Typical reasons for this are: pollution caused by the Reference Electrode, extreme heat in the test cell and the desire to reduce solution resistance by placing the Luggin probe as close as possible to the test electrode. Although such experimental set-ups look professional, if possible they should be avoided as they can be the source of problems. Air leaks around the remote reference electrode are a typical problem causing a gradual dropping of the fluid level and eventual draining of the salt bridge.

Typical location of air leaks: Cap, Hoffman clip & tubing joints. Bubbles in the salt bridge are also another typical problem. Indeed the typical result of the reference electrode becoming isolated from the cell is that the test electrode is effectively dissolved by excessive polarisation. Another perhaps less well known effect is cause by the problem of noise induction. Noise induction is caused by the differential mains pick-up at the cell and reference electrode. This effect is more noticeable when a typical commercial reference electrode is used and made worse with a salt bridge. Although usually ignored, the level of this signal can be as much as 1V. This signal feeds into the potentiostat as if it is an external input which is then used to polarise the test specimen. For instance two identical tests placed on different positions on the same bench will be polarised by different levels of mains signal polarisation. The effect of this polarisation on the test results may be profound. The level of this polarisation can be reduced with the use of a Noise Reduction Probe as provided with the cell kit.

(P) For polarisation techniques, such as LPR, Potentiostatic, EIS and Galvanostatic, connect RED to Instrument WE1 and leave BLACK disconnected.

For galvanic techniques connect RED to Instrument WE1 and BLACK to WE2

Typical Cell Configurations

Fig 1 : Simple three electrode set-up using a metallic reference electrode. This type of cell may be adequate, particularly when test types are performed over a short period of time such that any drift in the reference electrodes potential during the test is likely to be small. The set-up may also have benefits in situations where mains interference is a problem.

Fig 1.

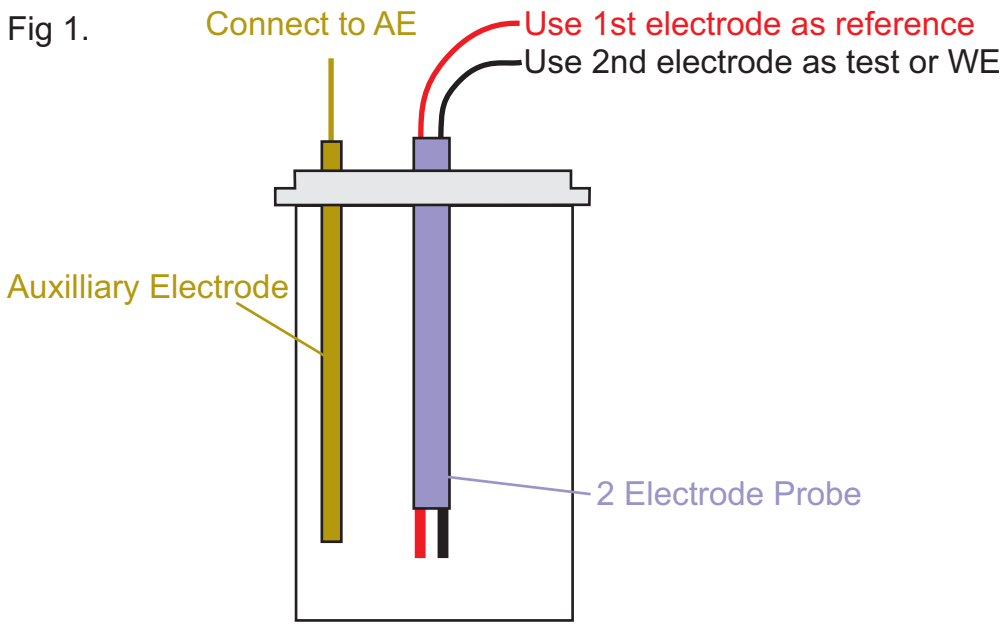


Fig 2 : This cell arrangement is similar to figure 1 except that a typical commercial reference electrode (normally Saturated Calomel Electrode in ACM cell kits) is used instead of a metallic reference. In some cases it may be wise to use the Noise Reduction Probe to cut down mains signal polarisation of the test electrode. For further details please view our web site under Application Notes / Noise Induction.

ACM automated instruments have an internal ZRA, this enables them to perform electrochemical tests on either an individual electrode (WE1) or a galvanic couple of electrodes (WE1 and WE2). In this later case, provided the Weld test option is not selected then the couple of electrodes behaves as if it is a single electrode. However current measurements are only taken from WE1. In most cases operators will only use a single electrode. It is important that if only a single electrode is used then this is connected to WE1 and not WE2.

Fig 2.

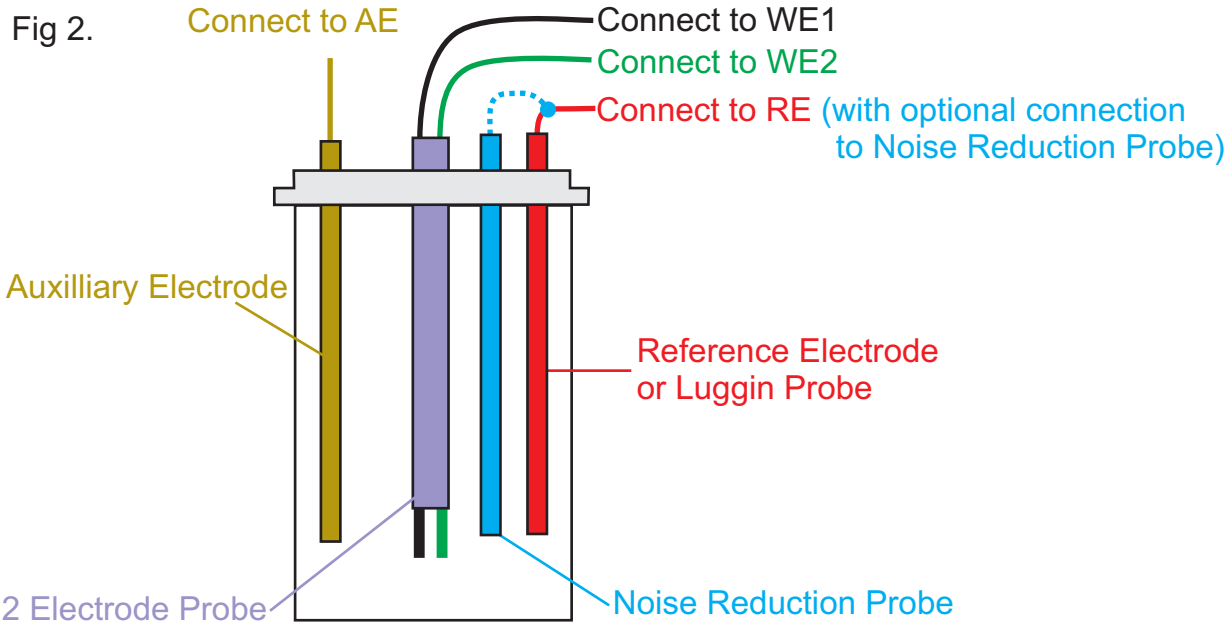


Fig 3 : This configuration is typically used for two electrode LPR type tests. In this configuration just the centre two electrode probe is used. The Auxiliary Electrode and Reference Electrode leads are connected to one of the leads whilst WE1 is connected to the other lead. In this situation the polarisation current must pass through two charge transfer layers. It is suggested that if the two electrodes are of the same material then an area of half the electrode area is used to compensate for this effect. If the common Auxiliary / Reference Electrode is either much bigger than or much more active than the test electrode, then it may be reasonable not to alter the electrode area.

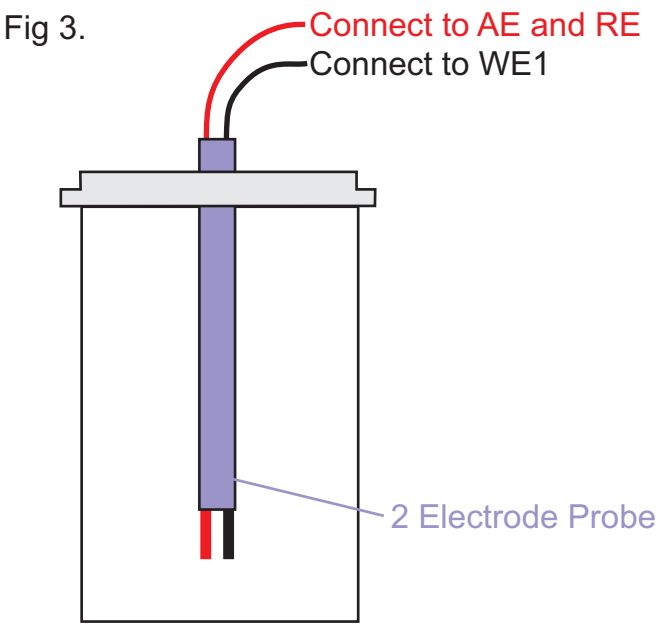


Fig 4 : Typical configuration of the cell for Current & Voltage Noise tests or for galvanic and potential monitoring. For improved potential measurements or in situations where mains interference is a problem we recommend the use of the Noise Reduction Probe.

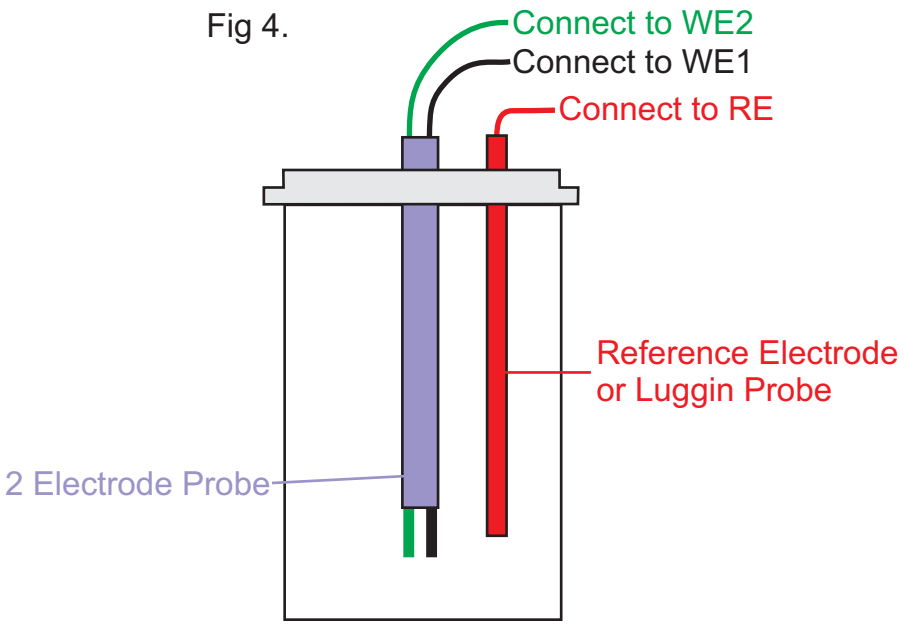


Fig 5 : Customisation of the cell. The cell is provided with a range of plugs which can be used to block off unwanted holes in the cell lid. These blanking plugs can be drilled for customisation purposes. Alternatively the adapters can be used to mount your own 7mm diameter electrodes.

Fig 5 shows a typical cell with a rotating cylinder electrode system.

Fig 5.