POLATRAK®

CORROSION TESTING PROBE

DC-II™ DROP CELL / DIP CELL OPERATION MANUAL

Twin reference electrodes provide online calibration	Slim, weighted body prevents entanglements	Use with hand-held multimeter for topside readout

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Notes:

1. Specifications subject to change without notice

2. Platforms and risers must be inspected via drop cell yearly in the Gulf of Mexico per API RP 2A-WSD as part of Level I inspections

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1. Overview

The DC-II™ drop-cell is a dual element silver/silver chloride (Ag/AgCl) reference electrode for measuring cathodic protection potentials in seawater; readings are taken with a multi-meter. The reference electrode cable has two leads, one to each element. The bare ends of the wires should never be immersed in water.

Reference electrode elements in housing

Standard 250’ reel
DC20004

Optional 500’ reel
DC20022

The DC-II™ is lowered into the seawater off the side of a platform or vessel. The slender, weighted body reduces the chance that the DC-II™ could become entangled in the structure or surrounding objects. The DC-II™ is lowered to the determined water depth(s) and the structure potential is recorded from a hand-held multi-meter.

2.0 Scope

The purpose of this document is to instruct users on how to properly operate the DC-II™, including general assembly, recording and interpreting potential readings.

3.0 Equipment requirements

One of each of the following is needed. Please note that it's wise to have a spare of each.

3.1 DC II™ + spooled cable

3.2 Multi-meter (preferably intrinsically safe)

3.3 Test leads, alligator-type (usually attached to multi-meter)

3.4 Metal file or rasp

3.5 Zinc calibration coupon with lead wire (calibration only)

3.6 Pencil or pen

3.7 Clipboard or notepad for recording potential readings and depths

3.8 Grounding cable with large alligator clip (optional)

3.9 Gas meter (optional)

3.10 Non-metallic bucket (calibration only)

3.11 Valid certificate of calibration for the multi-meter (usually attached to the multi-meter)

4.0 Calibration instructions (See Figure 1)

CAUTION

Always inspect test leads, connectors and drop cell cable for cracks or breaks in the insulation before each use. If any defects are found, replace item immediately. Ensure that the test leads do not get wet.

4.1 Check test leads on multi-meter:

4.1.1 Connect both test leads to the multi-meter: One to the "V-Ω" terminal and the other to the "COM" terminal.

4.1.2 Set the multi-meter to the smallest resistance scale (typically 200 Ohms).

4.1.3 Ground the probe end of the test leads together and record the value. If this value is 0.5 Ohms or less, proceed. If this value is greater than 0.5 Ohms, check test leads for damage and retest; otherwise, replace the test leads.

4.2 Fill a non-metallic bucket or container with enough seawater or simulated seawater solution to fully immerse the DC-II™, verifying that the water is free of oil.

4.3 Insert the DC-II™ into the seawater and agitate the DC-II™ to remove all air bubbles. This ensures that the Ag/AgCl reference electrodes are in contact with seawater.

4.4 Clean the zinc calibration coupon with a file or sandpaper. Remove most of the oxide layer and insert the coupon into bucket, leaving the lead wire above water.

4.5 Allow the DC-II™ to soak for approximately one hour to allow the electrodes to reach equilibrium (usually not necessary if probe has been used recently).

4.6 Set the multi-meter to the 200mV DC scale.

4.7 Take a reading between the two Ag/AgCl reference elements (The two bare wires from the DC-II™). The reading on the meter should have a value of +/- 10.0mV or less. If so, the survey may proceed. If the reading is greater than +/- 10.0mV, soak the electrodes for another hour to reach equilibrium and check again. If reading is still not within +/- 10.0mV, the DC-II™ should be replaced.

4.8 Set the multi-meter to the 2.0V DC scale. **(See Figure 2)**

4.9 Take a reading between the zinc calibration coupon's lead wire and each Ag/AgCl reference element (a total of two readings) as shown in Figure 2.

4.10 The value on the meter for each reading should be between (-) 1.030 V and (-) 1.070 V (depending on the purity of the zinc coupon).

5.0 Measurement

CAUTION

A hot work permit may be required If the multi-meter being used is not intrinsically safe, as a multi-meter is considered a spark hazard.

5.1 Deploy the DC-II™ housing into the seawater to the first depth specified (usually 3 meters [10 feet]).

5.2 Connect the multi-meter test lead from the "COM" terminal to either of the two Ag/AgCl electrode leads.

5.3 Using a steel file or rasp, remove coating and corrosion product from a very small area of the structure down to bare metal. The area to be used must be electrically continuous with the main structure. Some sections of grating may only be fastened to the deck by bolting and should not be used.

5.4 Connect the multi-meter test lead from the "V-Ω" terminal to the uncoated portion of the structure (from the previous step).

5.5 Set the multi-meter to the 2 volt DC scale.

5.6 Record the potential reading from the multi-meter and water depth into a notebook or form.

5.7 Record the multi-meter reading at each depth increment of 5m, or as required.

5.8 After the last reading, disconnect the multi-meter and coil the cable evenly onto the reel.

5.9 Soak the elements in a non-metallic bucket of fresh water for at least one hour before storing.

Table 1 - Normal cathodic protection ranges for bare carbon steel in seawater

Range (mV)	Interpretation	Action
-500 or more positive	Error (unless unprotected)	Remake contact & verify Measure two other points around the component
-501 to -649	Isolated from cathodic protection	Remake contact & verify Record data
-650 to -799	Not cathodically protected	
-800 to -849	Marginal cathodic protection	
-850 to -1049	Cathodically protected	Record data
-1050 to -1149	Anode potential	
-1150 or more negative	Error	Remake contact & verify Measure two other points around the component

Note: For brackish or fresh water, please consult Peterson's Nomogram.

Table 2 - Troubleshooting the DC-II™

Symptom	Cause	Action
The drop cell reads 0V	Severed cable above water-line, or gas bubble trapped in drop cell chamber (rare)	Visually inspect cable. Perform cable immersion bucket test to find location of cut (Fig. 3)
The drop cell values are erratic	Nicked cable with exposed wire, or bad ground on structure	Visually inspect cable. Perform cable immersion bucket test to find nicked location.
	Bad ground on structure	Recheck the ground on structure
The drop cell reads out of tolerance on both channels	The reference elements are contaminated	Return the drop cell to Deepwater for service
	The cable is nicked on both channels.	Perform cable immersion test
The drop cell will not resurface	The DC-II™ has become entangled	Tie off the DC-II™ to an appropriate anchor point. Check on it every three hours. Often, the cell will free itself.

Notes:

1. Never allow the leads to contact the structure directly.

2. Only connect through a high-impedence multimeter.

3. To avoid entanglement, always deploy on the down stream / downwind.

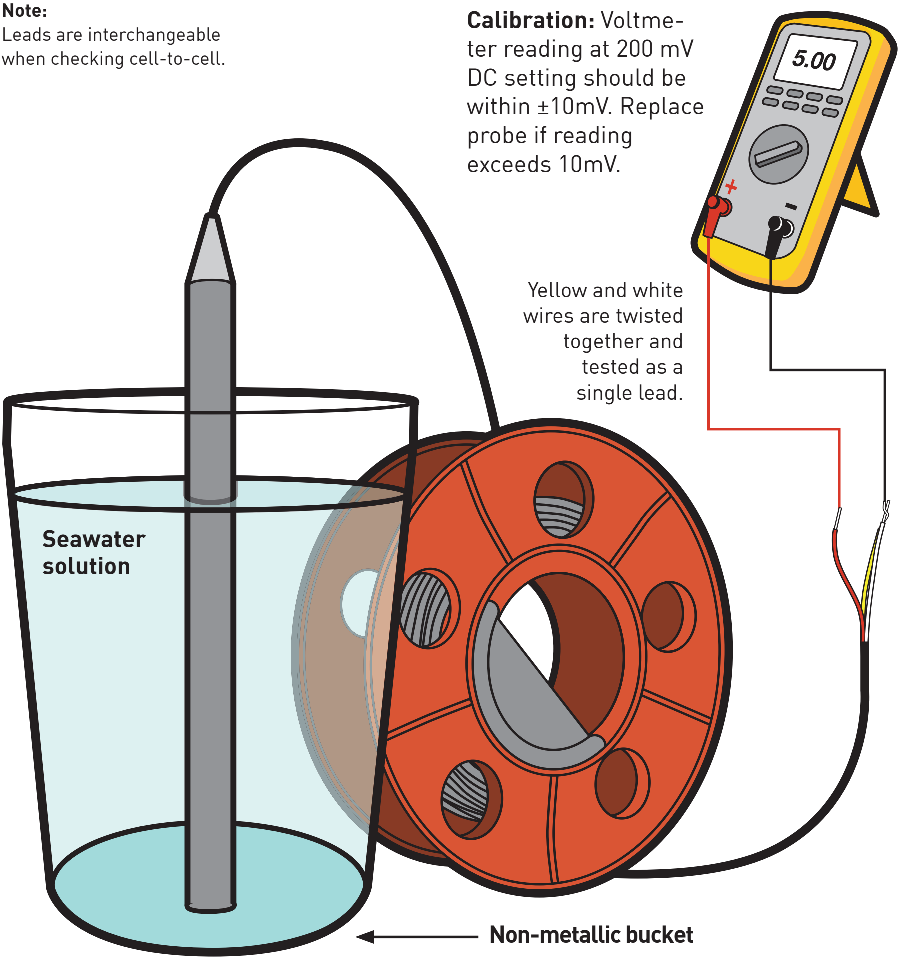
Figure 1

CELL TO CELL CALIBRATION

DC-II™ CALIBRATION WIRING SCHEMATIC

Note:
Leads are interchangeable when checking cell-to-cell.

Calibration: Voltmeter reading at 200 mV DC setting should be within ±10mV. Replace probe if reading exceeds 10mV.



Step	+VE	—VE	DC Scale	Expected result
01	Ref 1	Ref 2	200mV	0 ±10.0 mV max

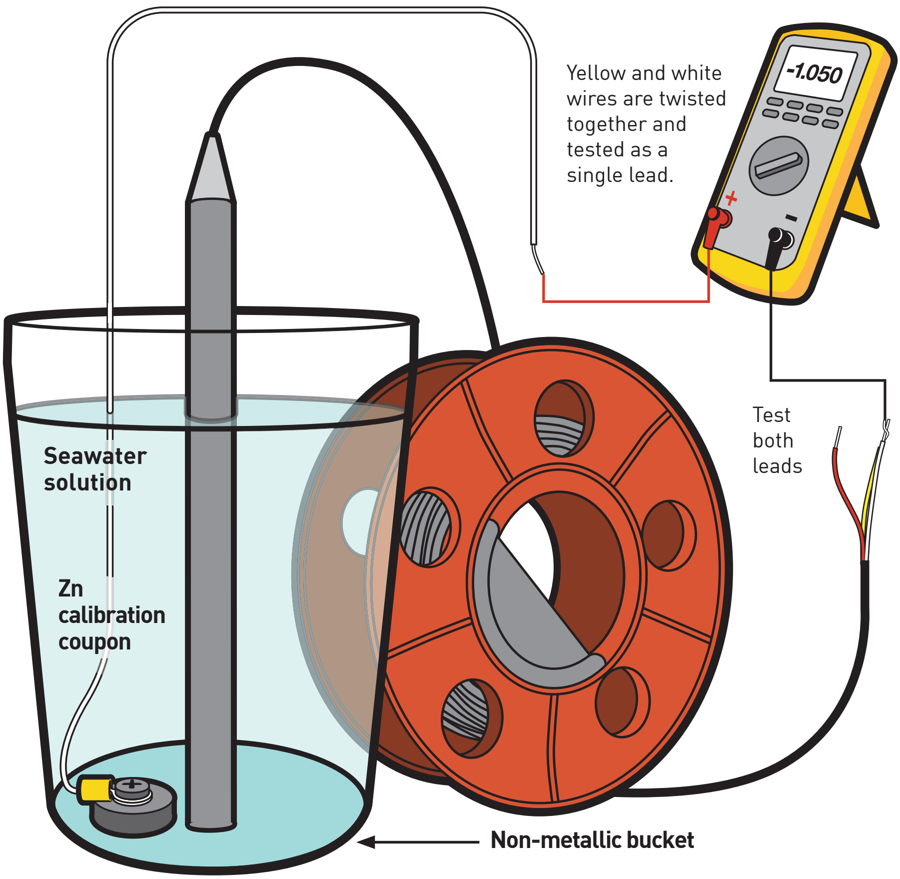
Note: To avoid damaging the cable, do not invert the DC-II™ when placing it in the bucket.

Figure 2

CELL TO ZN COUPON

DC-II™ CALIBRATION WIRING SCHEMATIC

Voltmeter display at 2.0V DC setting should be within -1.030V and -1.070 V. Readings outside this range indicate possible damage to wire on spool.



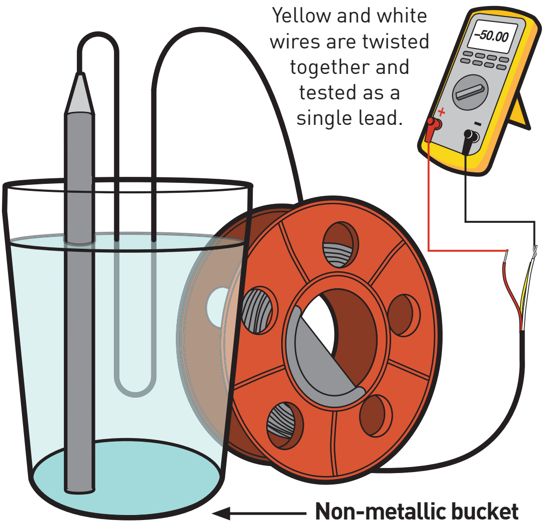
Step	+VE	–VE	DC	Expected result
01	Master	Reference electrode 1	2 V	-1.030 to -1.070
02	Master	Reference electrode 2	2 V	-1.030 to -1.070

Note: Clean the Zn coupon with a file or sandpaper before using.

Figure 3

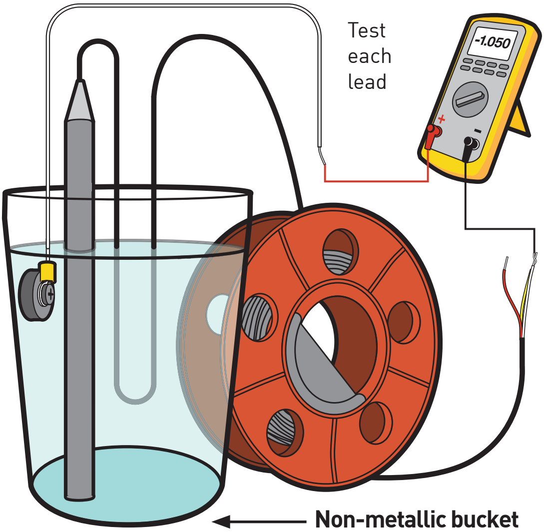
CABLE IMMERSION TEST

CHECKING DC-II™ CABLE FOR DEFECTS



Voltmeter to leads

Without a Zn coupon, you can determine if a cable is defective. Pull lengths of cable through the bucket; when the readings suddenly shift, you've found the defect. Use an undamaged probe for the survey instead.



Using a Zn coupon

With the voltmeter display at 2.0V DC setting, feed lengths of cable through the bucket. Any nicks will cause a noticeable shift in the voltmeter readings. Do this individually with each wire within the cable. If the damage is isolated to only one wire, readings can still be taken using the unaffected lead if no other undamaged probe is available.

Note: Clean the Zn coupon with a file or sandpaper before using.

NOTES

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