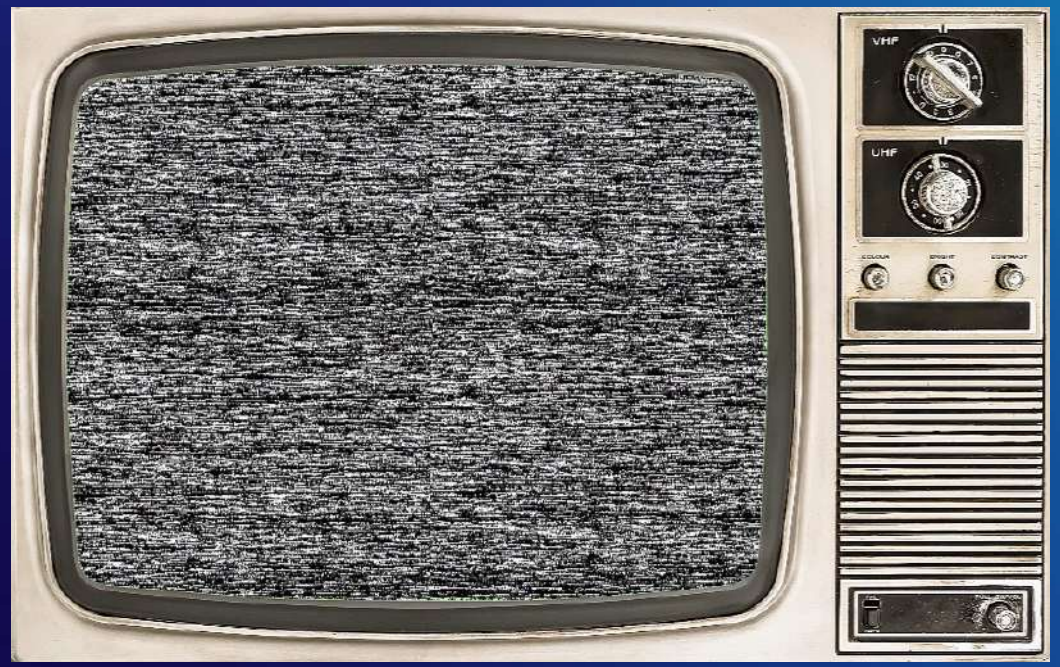
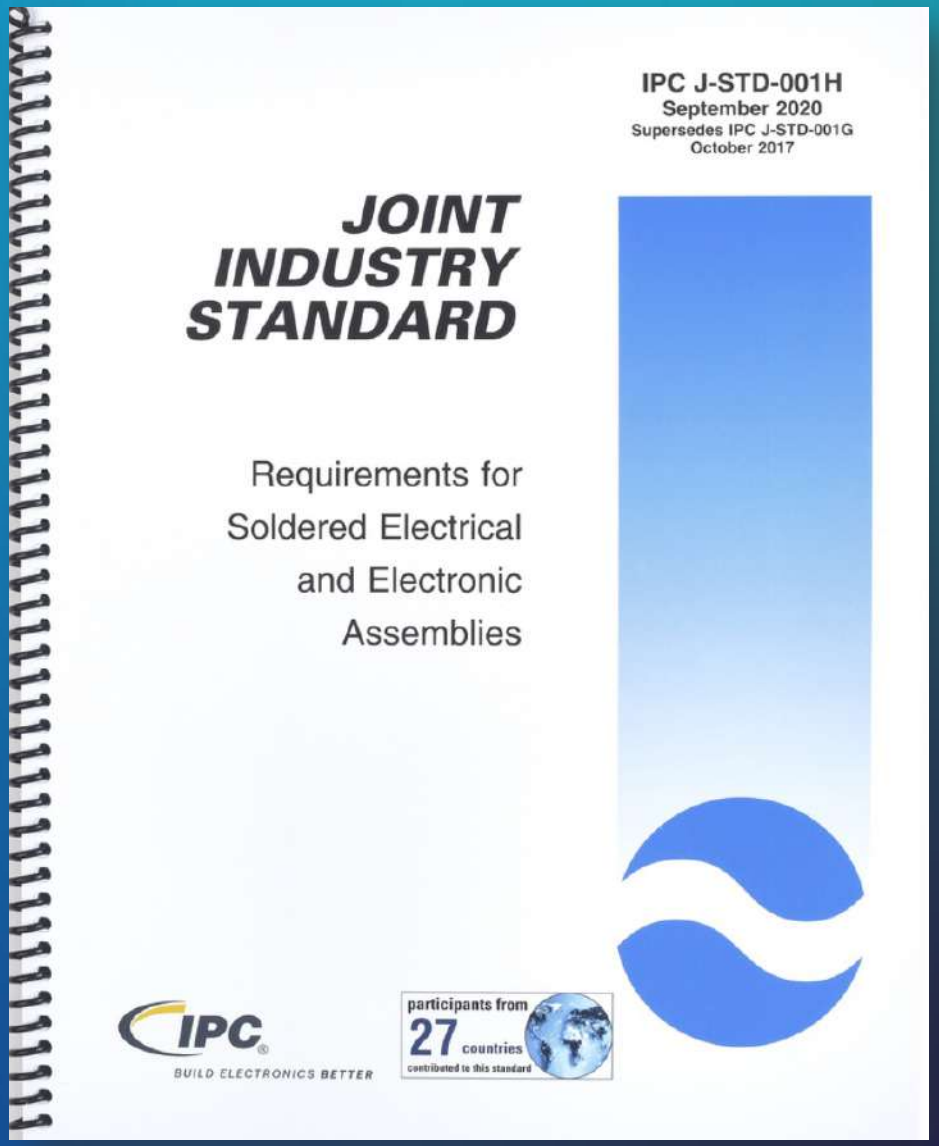
Decoding the New IPC Cleanliness Testing Standard

Aqueous TECHNOLOGIES

Mike Konrad
Founder / CEO
Aqueous Technologies

How Clean is Clean Enough?





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How Clean is Clean Enough?

120.4 µg NaCl/in²
13.8 µg NaCl/in²
4.7 µg NaCl/in²
0.1 µg NaCl/in²
3.1 µg NaCl/in²
0.6 µg NaCl/in²
1 µg NaCl/in²
10.06 µg NaCl/in²
4 µg NaCl/in²
5.1 µg NaCl/in²
0.7 µg NaCl/in²
1.4 µg NaCl/in²
7.1 µg NaCl/in²
2 µg NaCl/in²
11.2 µg NaCl/in²
0.9 µg NaCl/in²
3.2 µg NaCl/in²
77 µg NaCl/in²
8 µg NaCl/in²
45.8 µg NaCl/in²
85.3 µg NaCl/in²
1.7 µg NaCl/in²

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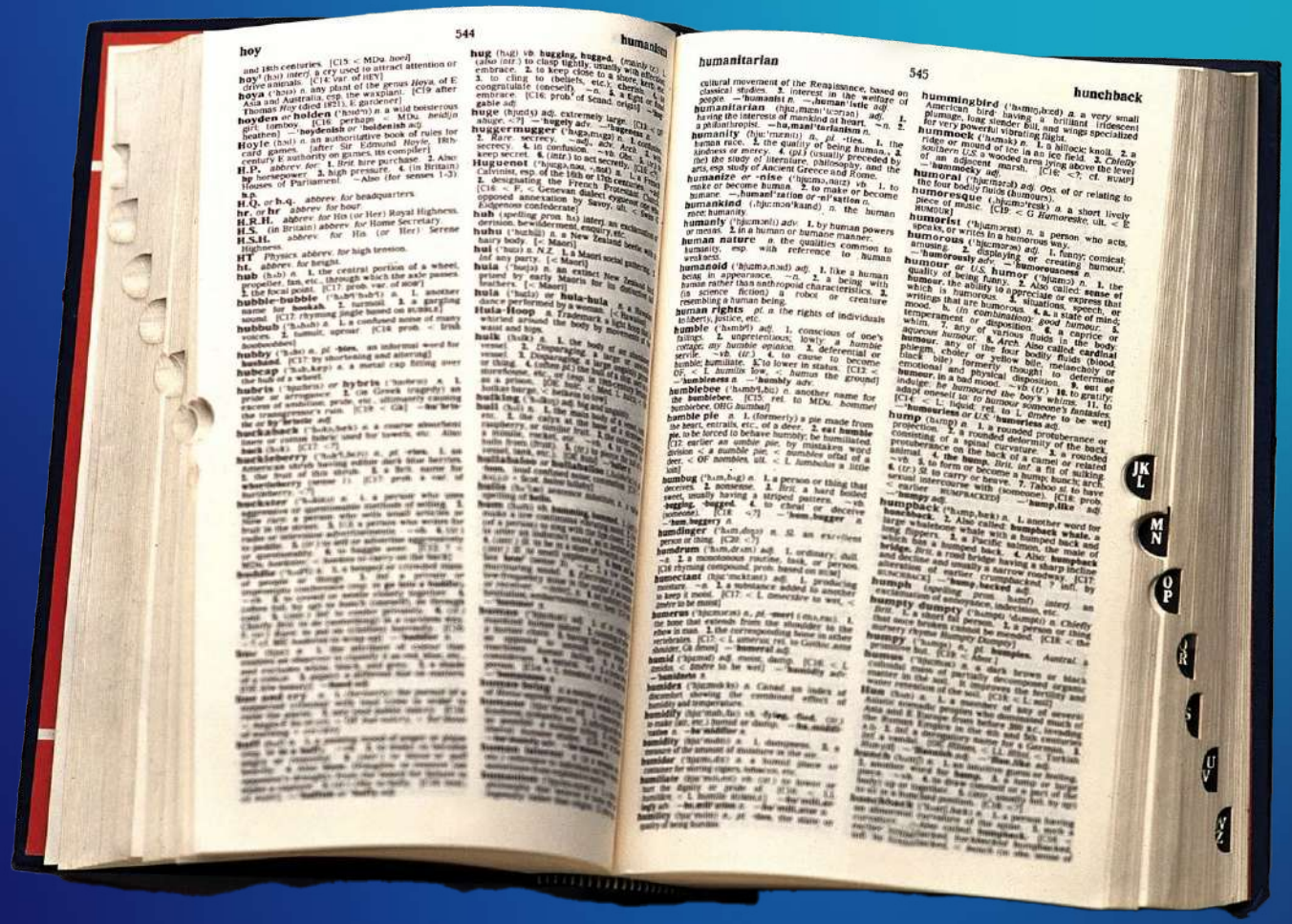
Definitions



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SIR Testers

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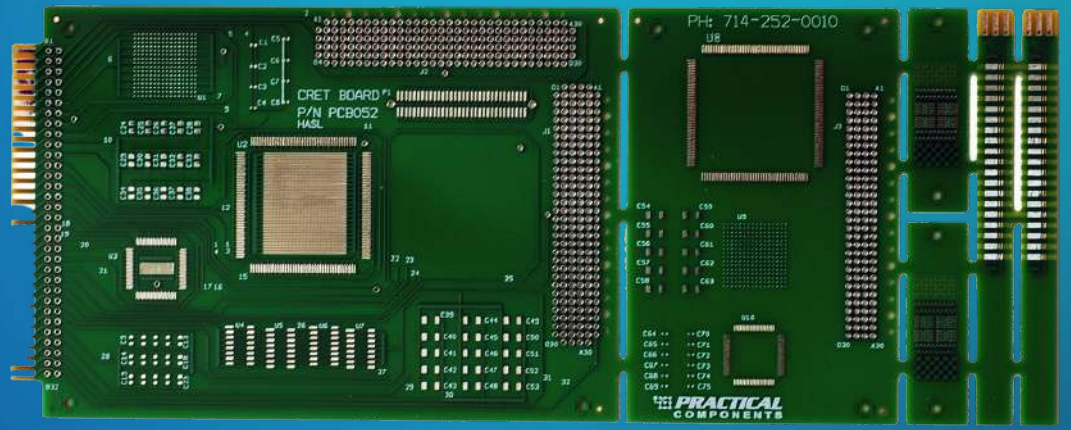
Surface Insulation Resistance



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ROSE Testers

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Resistivity Of Solvent Extract

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How Clean is Clean Enough?

Circuit Assemblies Need to be Clean Enough to Operate Reliably for the Expected Life of the Product in the Intended Climatic Operating Environment.

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2-Step Process:

- Verify **Product** is Clean Enough
- Verify **Process** is In Order

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2-Step Process:

Product Process

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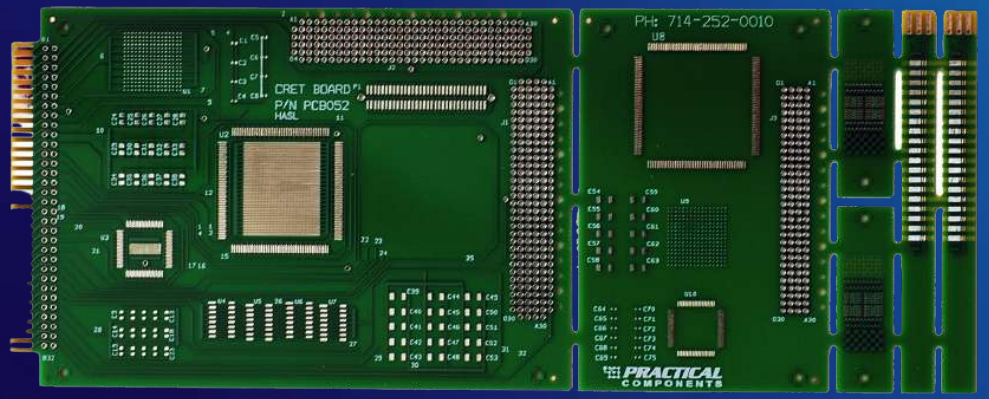
2-Step Process:

Product



Test Coupon

Process

Production Assembly

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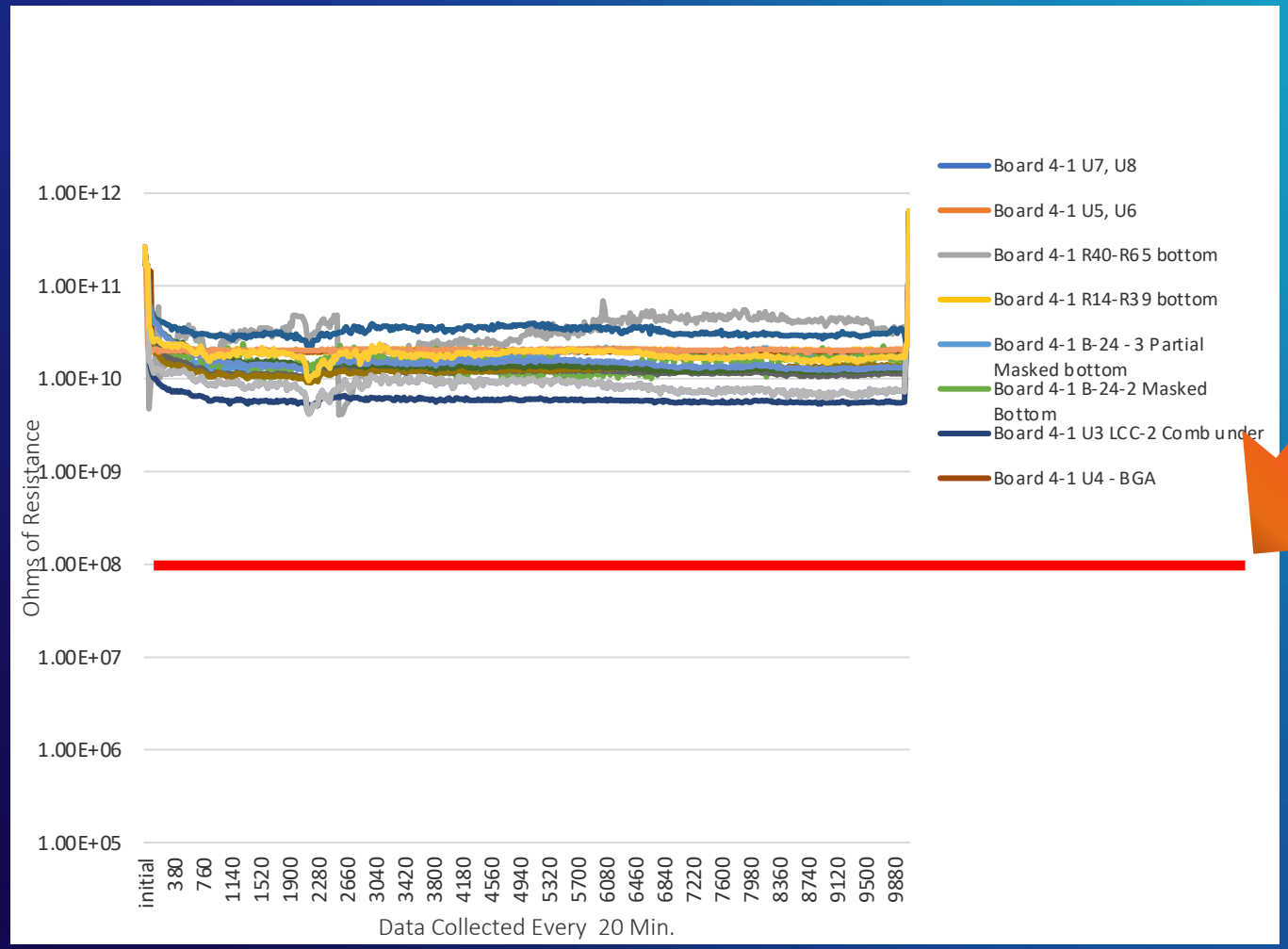

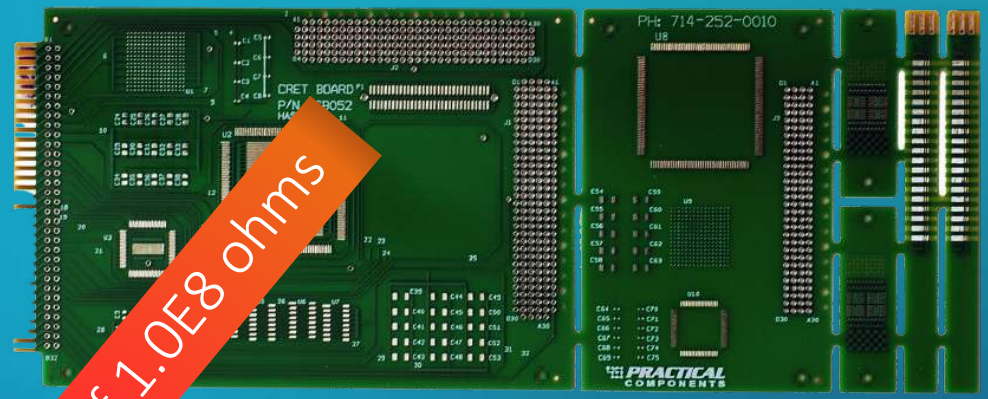

IPC Limit of 1.0E8 ohms

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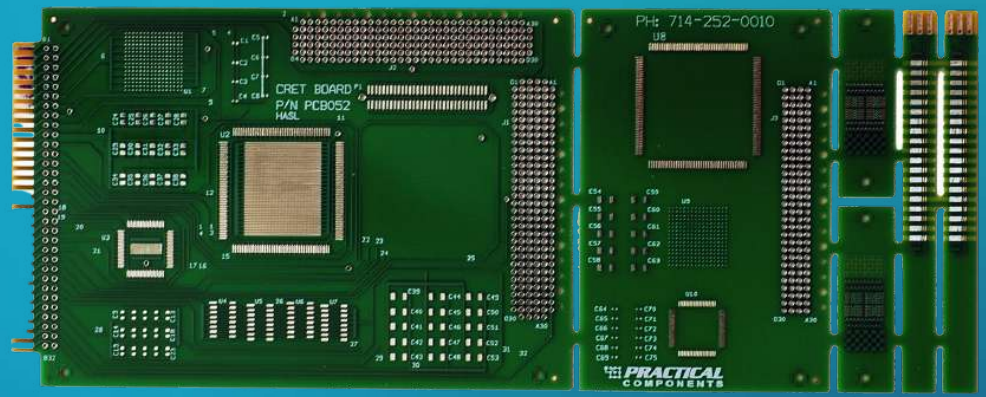

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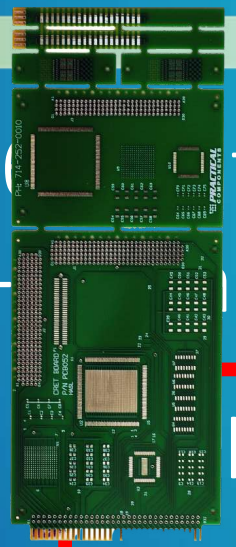

(…th a standard deviation of 0.3

6.0 + …n x 3 sigma) = 6.9 µg NaCl/in^2

…µg NaCl/in^2 is Assigned as an Upper Control Limit (UCL)

6 µg NaCl/in^2

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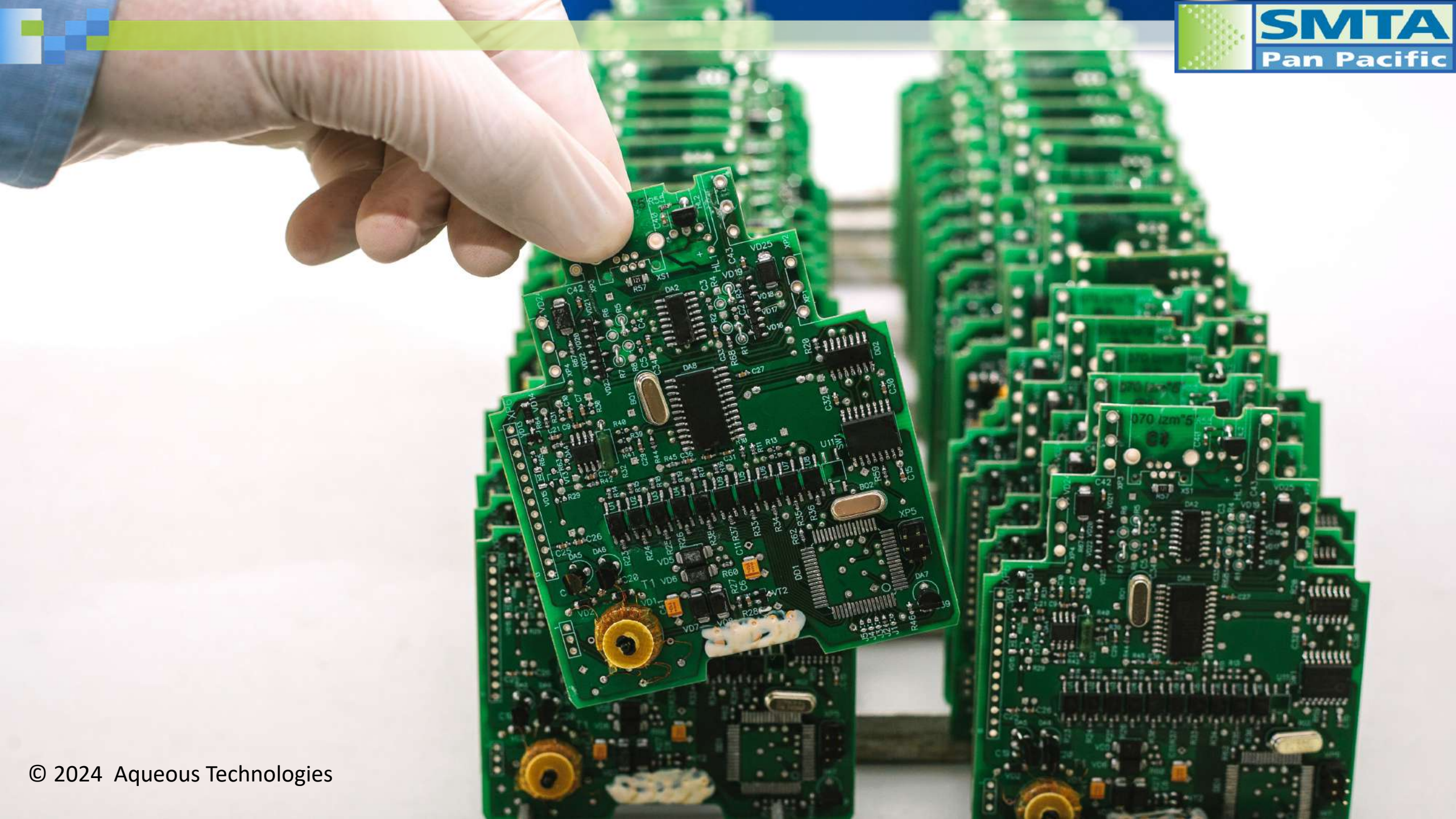

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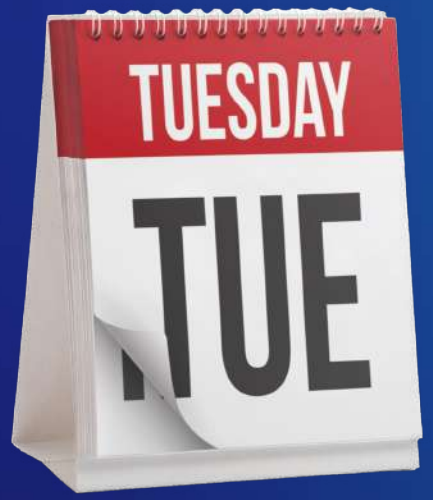

Actual:
3.5 µg NaCl/in^2

UCL:
6.9 µg NaCl/in^2

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Actual:
> 7.0 µg NaCl/in^2

UCL:
6.9 µg NaCl/in^2

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What is (and Isn't) a ROSE Tester? *(per IPC Standards)*

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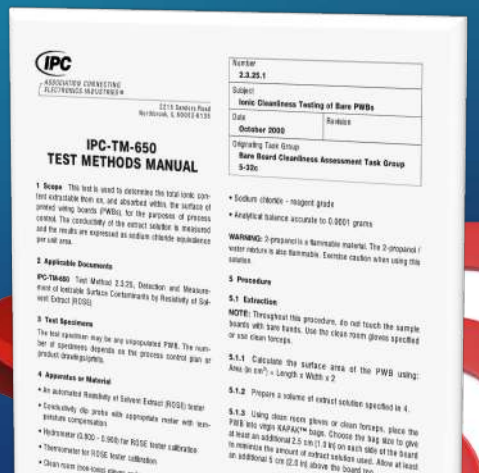
8.2.1 Sampling Plan

The Manufacturer shall determine an objective sampling plan (see IPC-9194 for guidance) for measuring ionic residues of the process by using ROSE testing per IPC-TM-650, method 2.3.25, or other methods as agreed between Manufacturer and User.

NOTE:

IPC test method requires IPA/water mixture.
Water only is not permitted.



IPC

IPC-TM-650
TEST METHODS MANUAL

Number 2.3.25.1
Subject Ionic Cleanliness Testing of Bare PWBs
Date October 2000
Revision
Originating Task Group Bare Board Cleanliness Assessment Task Group (5-32c)

- Extract solution: 25% v/v deionized water (18 MΩ-cm nominal resistivity), 75% v/v 2-propanol (electronic or HPLC grade). No alternative solution or composition is allowed.

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HOW DOES IT WORK?

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Static & Dynamic

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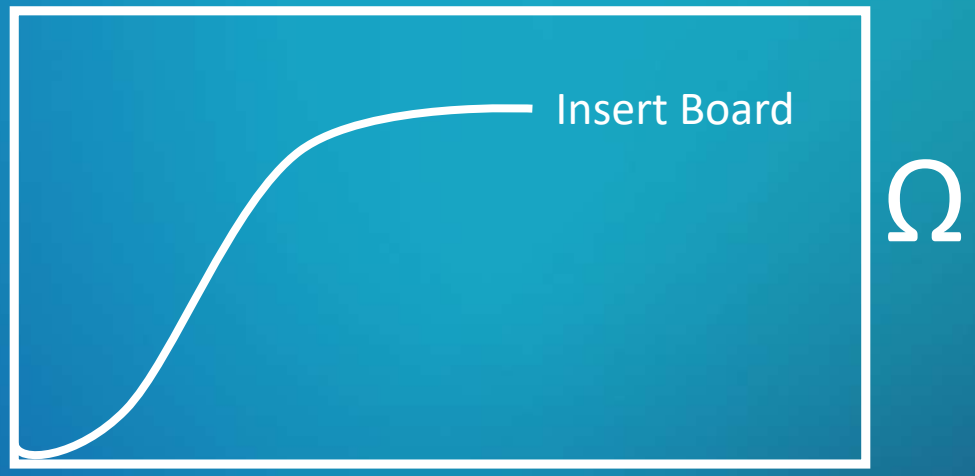
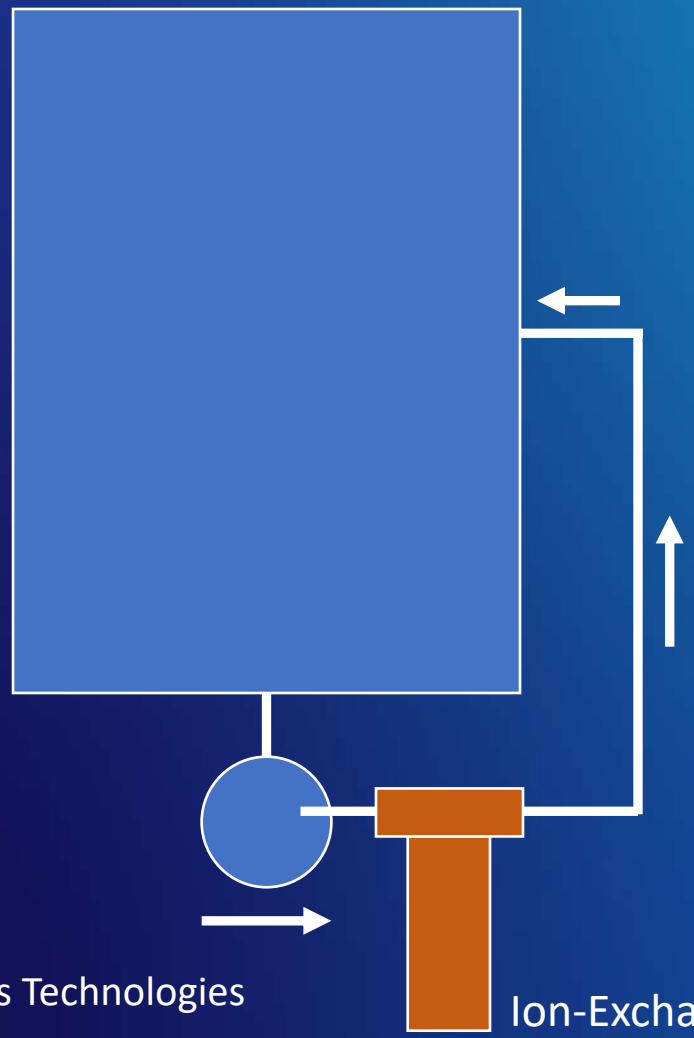
Static Method





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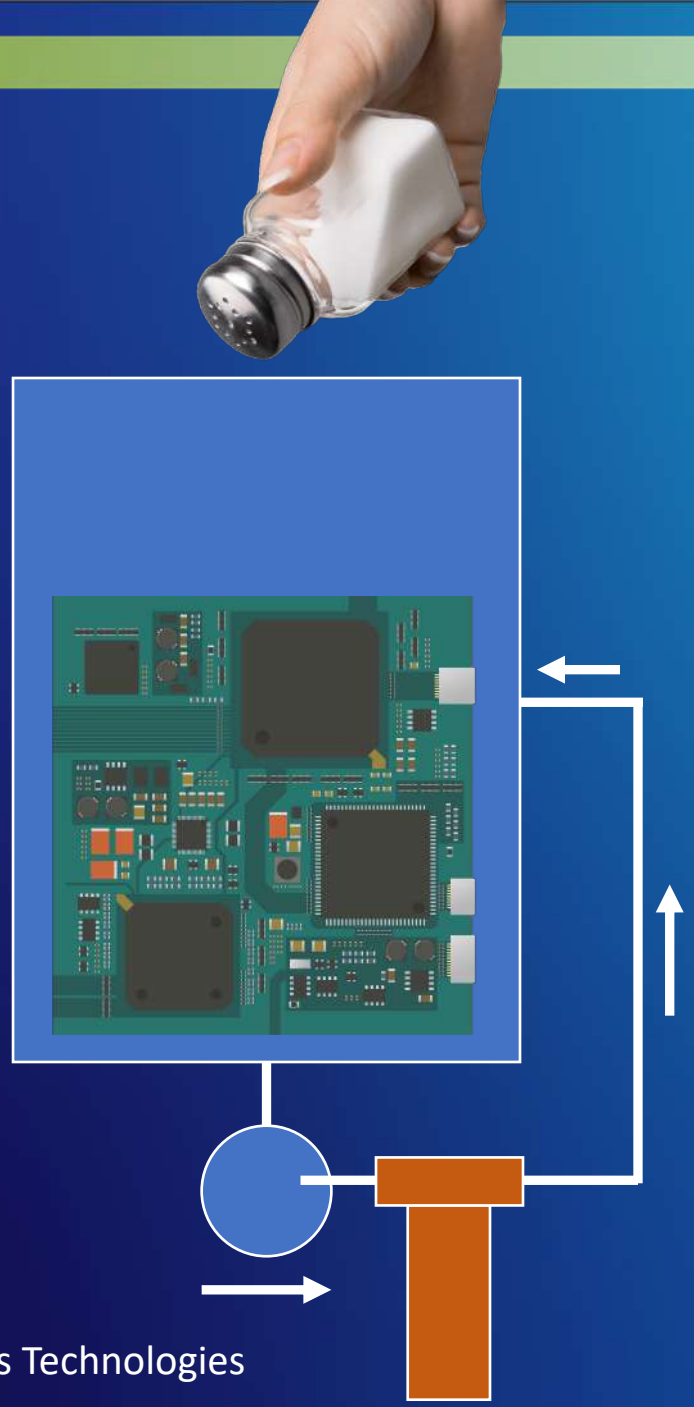
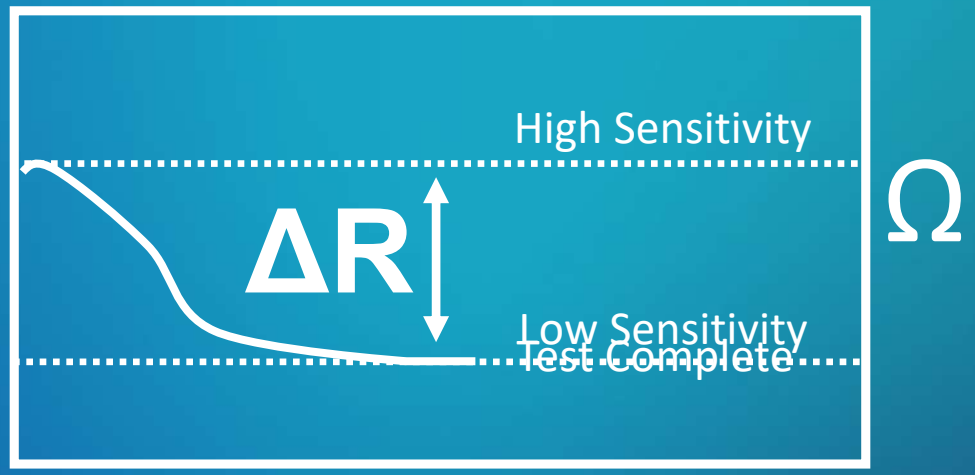
Static Method





Possibility of “Saturation Limit Effect”

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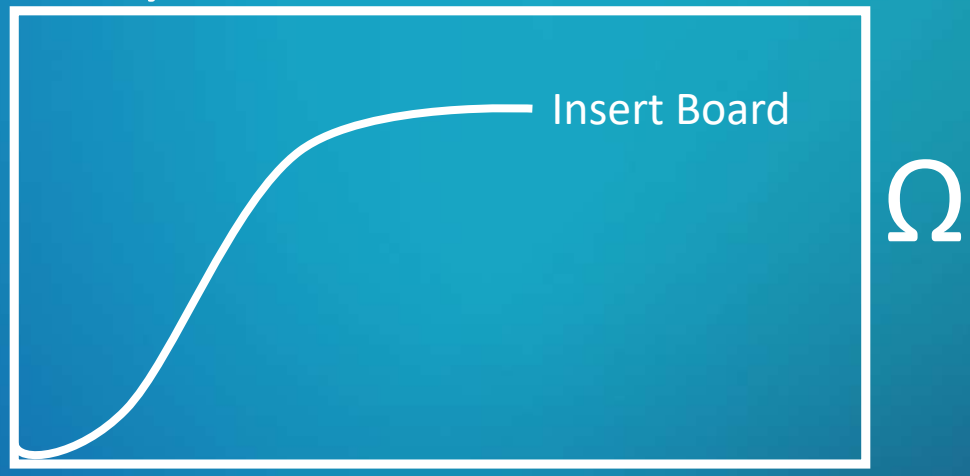
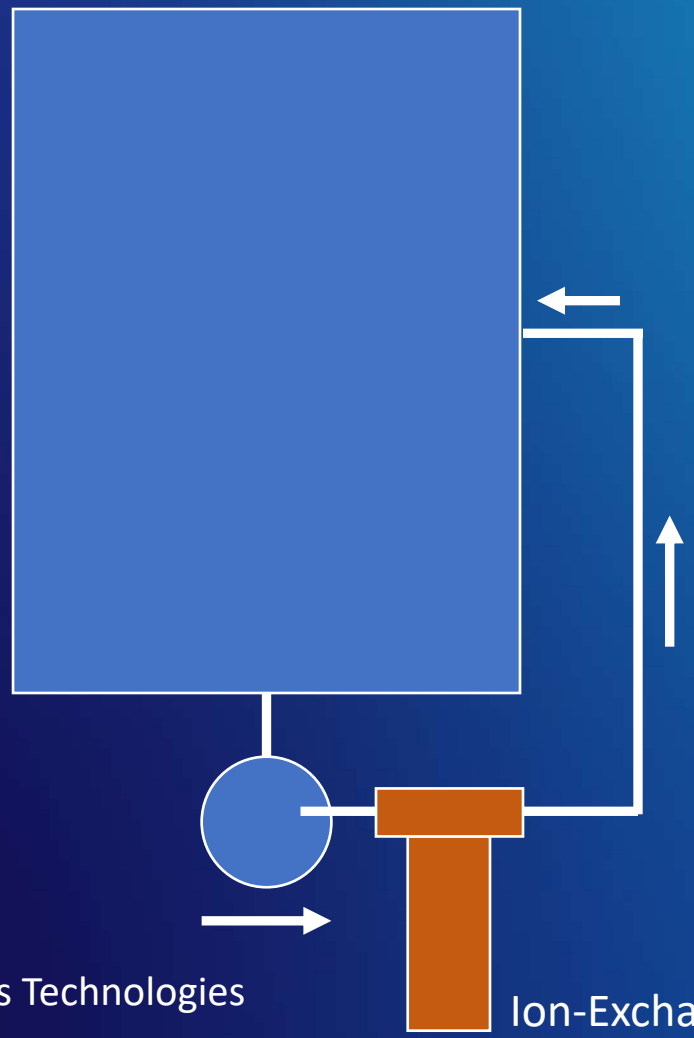
Dynamic Method





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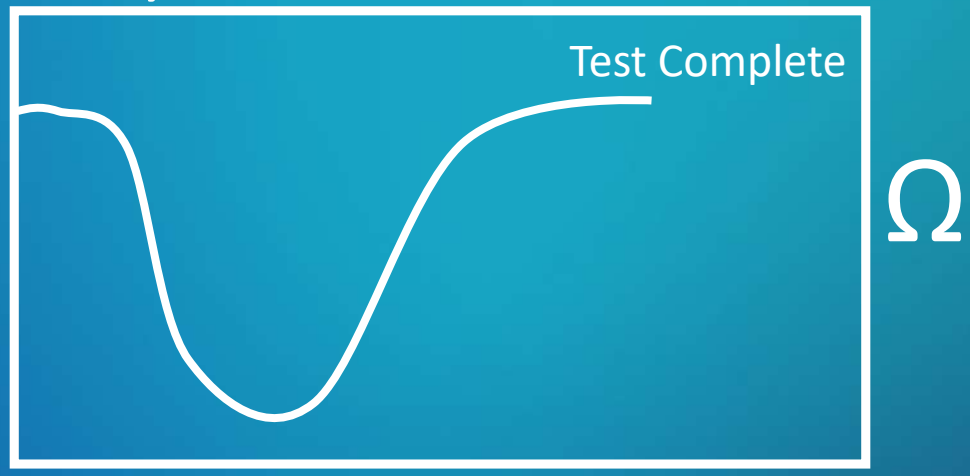
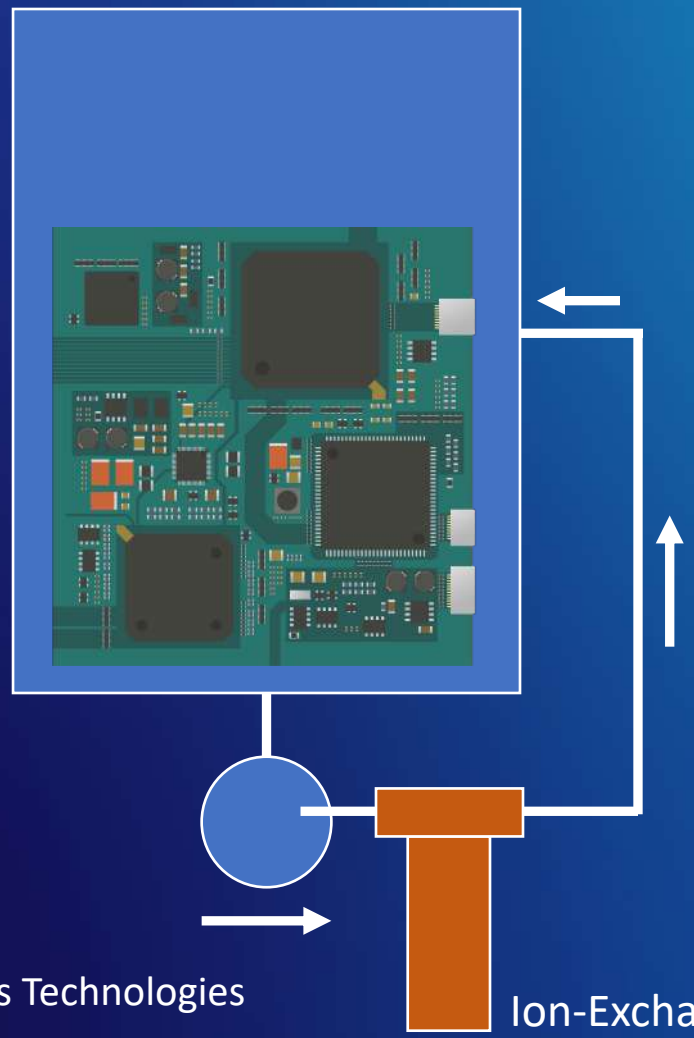
Dynamic Method



Amount Under Starting Resistivity Over Time



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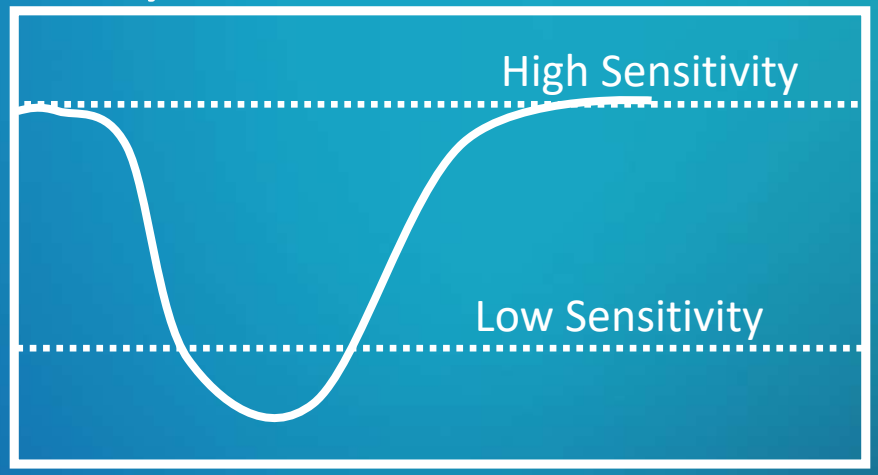
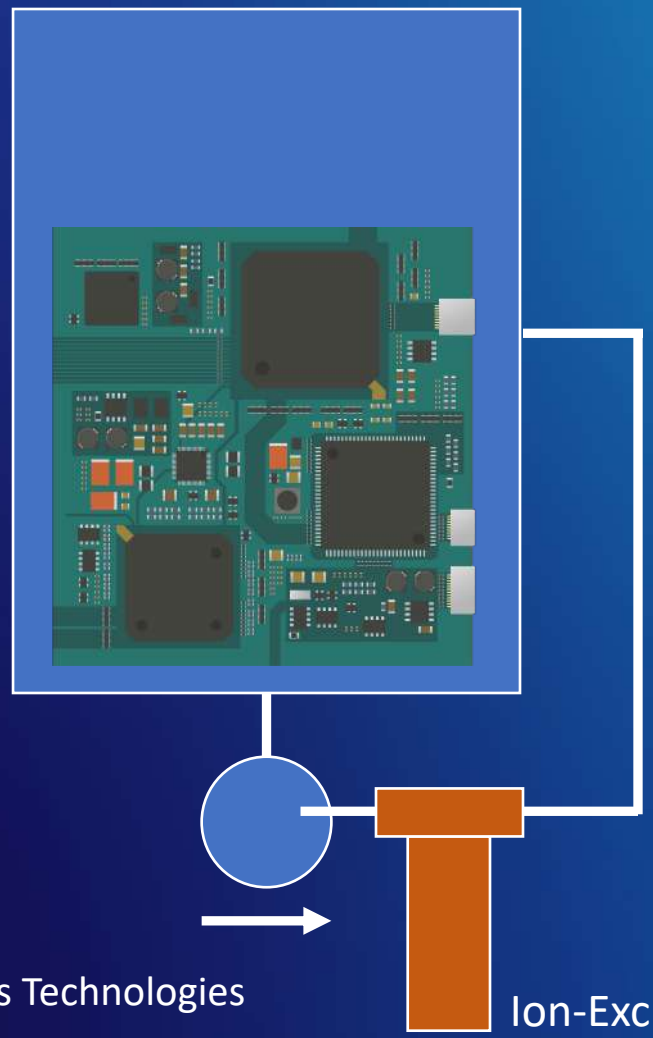
Dynamic Method



Dynamic Method Avoids “Saturation Limit Effect”

Automatic “Rinsing” Effect”



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ROSE Testing Best Practices

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ROSE Testing Best Practices:

- Keep Your Hands Out of the Extraction Solution

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ROSE Testing Best Practices:

- Avoid Heated Solution

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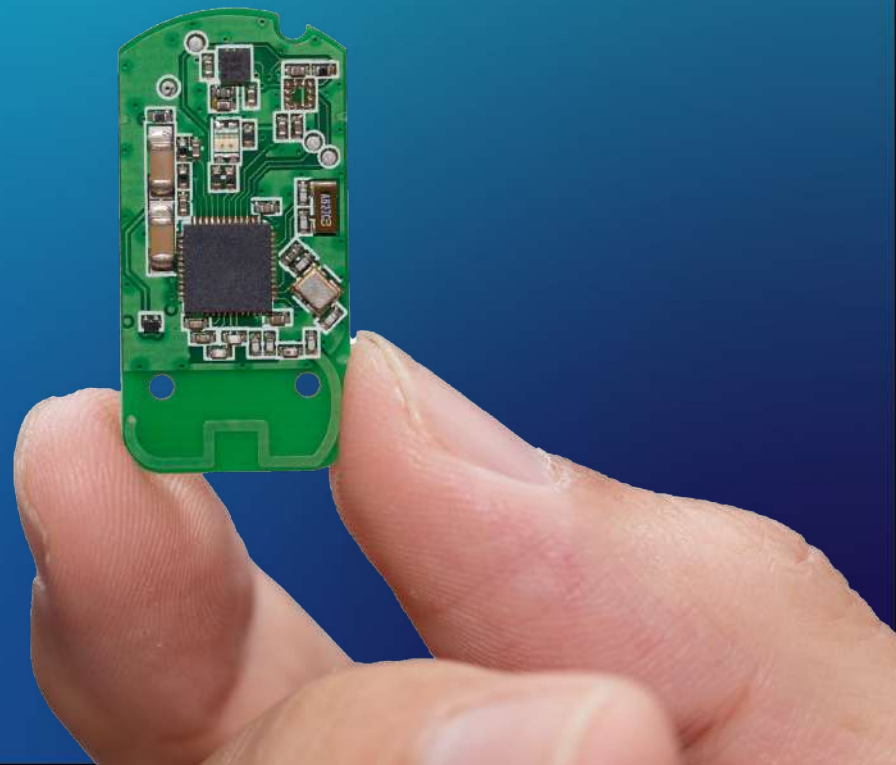
ROSE Testing Best Practices:

- Avoid Small Assemblies in a Large Test Cell

ie: Test Cell Dimensions = 12” x 12”
Qty 1- 2.5”x2.5” Assembly = 12.5 in^2

(L x W)*2 (+10-30% Component Area)



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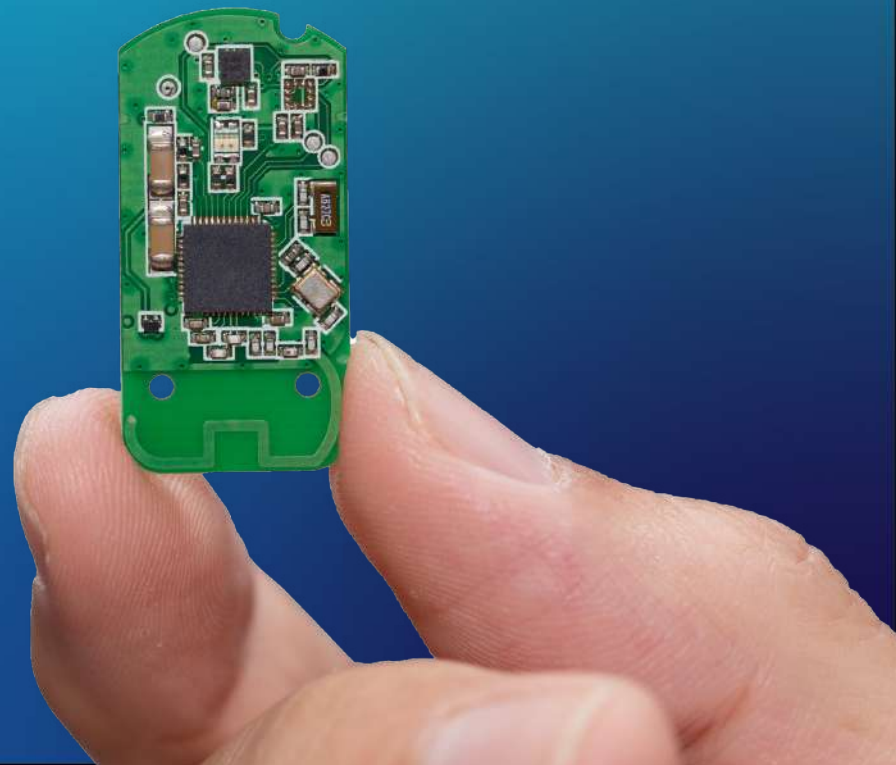
ROSE Testing Best Practices:

- Avoid Small Assemblies in a Large Test Cell

ie: Test Cell Dimensions = 18” x 18”
Qty 1- 3”x3” Assembly = 18 in^2



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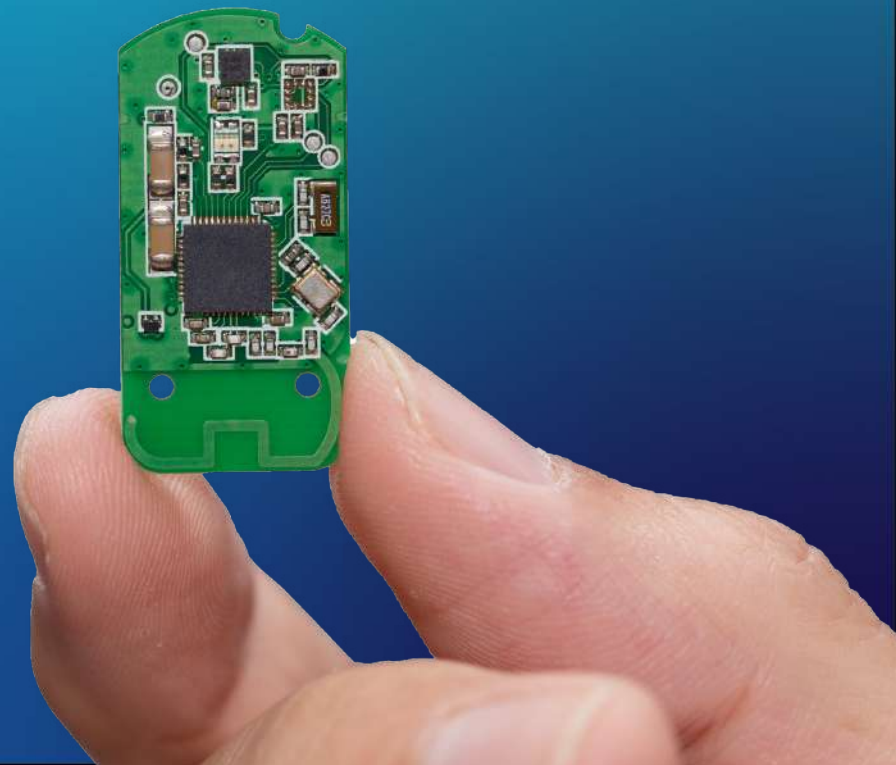
ROSE Testing Best Practices:

- Avoid Small Assemblies in a Large Test Cell

ie: Test Cell Dimensions = 24” x 24”
Qty 1- 3.5”x3.5” Assembly = 24.5 in^2



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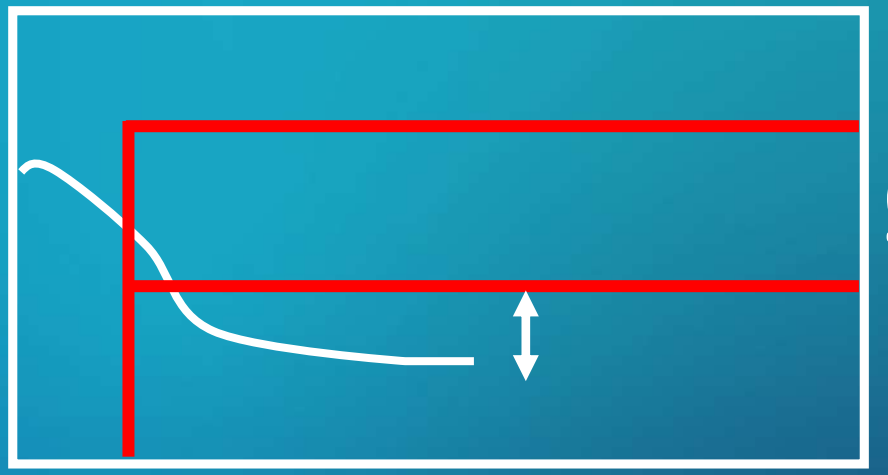
ROSE Testing Best Practices:

- Avoid Fixed-Time Testing



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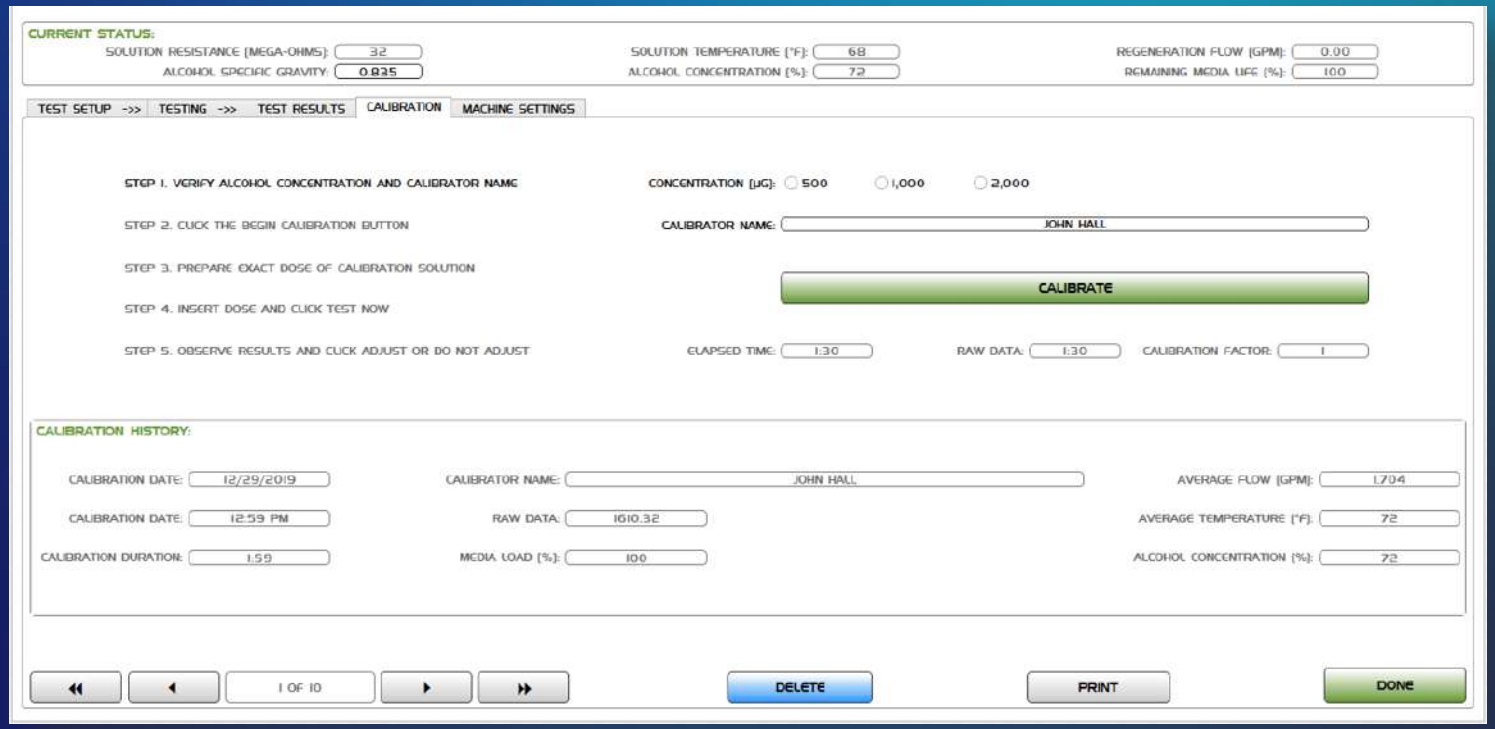
ROSE Testing Best Practices:

- Calibrate Extraction Solution Monthly



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ROSE Testing Best Practices:

- Test Specific Gravity Daily

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ROSE Testing Best Practices:

- Keep Test-Cell Cover On Except When Inserting or Removing an Assembly

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ROSE Testing Best Practices:

- Don’t Use “Rubbing Alcohol When Making Extraction Solution

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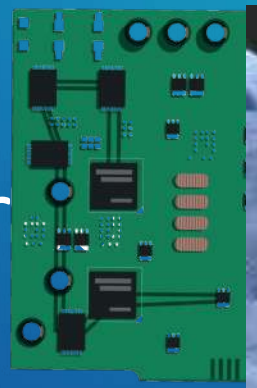
ROSE Testing Best Practices:

- Don’t Touch Assemblies with Bare Hands
- Don’t Use Talc / Powered Gloves



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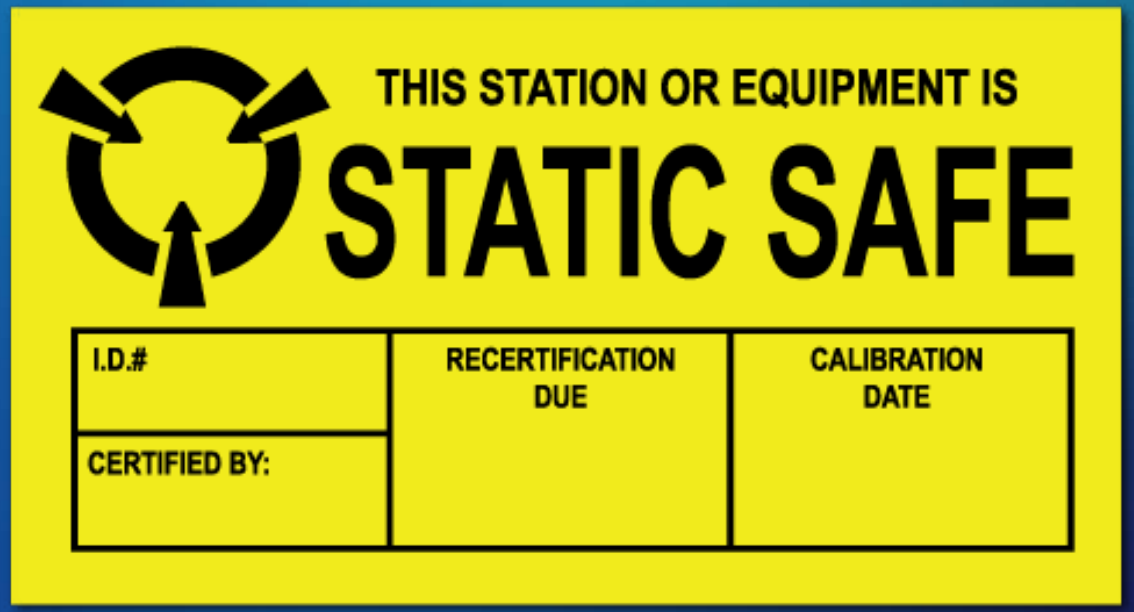
ROSE Testing Best Practices:

- Ensure ROSE Tester Has ESD-Safe Worktop



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ROSE Testing Best Practices:

- Avoid Testing Multiple Assemblies at One Time to Avoid Over-Averaging

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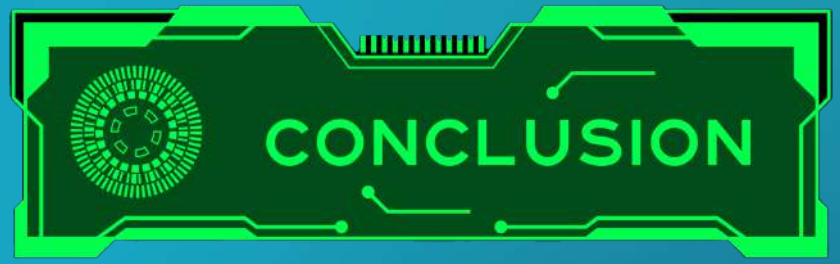

- Comply with IPC’S J-STD001-H

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CONCLUSION

- Comply with IPC’S J-STD001-H
- Comply with TM650 2.3.25

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CONCLUSION

- Comply with IPC'S J-STD001-H
- Comply with TM650 2.3.25
- Avoid Testing Multiple Assemblies at One Time

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CONCLUSION

- Comply with IPC'S J-STD001-H
- Comply with TM650 2.3.25
- Avoid Testing Multiple Assemblies at One Time
- Maintain and Verify Specific Gravity Regularly

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CONCLUSION

- Comply with IPC'S J-STD001-H
- Comply with TM650 2.3.25
- Avoid Testing Multiple Assemblies at One Time
- Maintain and Verify Specific Gravity Regularly
- Don't Use Rubbing Alcohol

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CONCLUSION

- Comply with IPC’S J-STD001-H
- Comply with TM650 2.3.25
- Avoid Testing Multiple Assemblies at One Time
- Maintain and Verify Specific Gravity Regularly
- Don’t Use Rubbing Alcohol
- Avoid Hand Contact with Assemblies & Extraction Solution

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CONCLUSION

- Comply with IPC’S J-STD001-H
- Comply with TM650 2.3.25
- Avoid Testing Multiple Assemblies at One Time
- Maintain and Verify Specific Gravity Regularly
- Don’t Use Rubbing Alcohol
- Avoid Hand Contact with Assemblies & Extraction Solution
- Wear Gloves (Don’t Use Powdered Gloves)

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CONCLUSION

- Comply with IPC'S J-STD001-H
- Comply with TM650 2.3.25
- Avoid Testing Multiple Assemblies at One Time
- Maintain and Verify Specific Gravity Regularly
- Don't Use Rubbing Alcohol
- Avoid Hand Contact with Assemblies & Extraction Solution
- Wear Gloves (Don't Use Powdered Gloves)
- ROSE Testing is the Only Analytical Test Method that Tests Your Actual Production Assemblies

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