



SMART GROUNDING WITH SMART GROUND® TESTING

Safety around energized equipment is paramount. Grounding systems protect people and equipment, and the more complex and sensitive a facility's equipment and processes are, the more crucial it is to properly verify and maintain an effective grounding system.

WHAT SHOULD YOU DO?

Test It. And Test It Again.

Once installed, a grounding system should be tested by a qualified grounding expert at start-up, periodically as it ages, and any time changes are made to or around the site so that anomalies and risks can be identified and mitigated.

Hire An Expert

While there are copious methods and tools to test a ground grid, the "by a qualified grounding expert" is the important part. It can be more dangerous to make decisions based on inaccurate information than to have never tested at all. Even when using the most sophisticated testing equipment, it's absolutely crucial that the operator not only knows how to use it properly, but understands advanced grounding theory and all the variables that impact results.

Hood Patterson & Dewar (HP&D) grounding specialists offer a wide range of grounding tests:

- Testing of energized systems per IEEE Standard 81
- Ground grid mat and system impedance
- Point-to-point continuity
- Step and touch voltage
- Transfer voltage
- Soil resistivity
- Tower ground impedance (transmission, distribution, telecom, wind turbines)
- Fall-of-potential test (three-point)
 - » Method intended for isolated systems only
- Clamp-on induced frequency

Testing is Only the Beginning

Grounding is complex, and a properly-conducted test generates volumes of data and information, but how do you know what it all means to you? This is where HP&D really shines. Our grounding specialists thoroughly analyze your test results to provide a comprehensive engineering report, and when applicable, identify concerns and other relevant recommendations.

In addition to this standard report, we can analyze:

- Safety (per IEEE Standard 80 or IEC 479)
- Steady state
- Lightning protection



OUR LOCATIONS

Georgia (Corporate)

850 Center Way
Norcross, GA 30071
(770) 453-1410

Arizona

1525 North Hayden Rd.
Suite 100
Scottsdale, AZ 85257

Tennessee

1531 Hunt Club Blvd.
Suite 200
Gallatin, TN 37066
(615) 527-7084

Texas

15924 Midway Rd.
Addison, TX 75001
(214) 461-0760

Virginia

4511 Daly Dr.
Suite I
Chantilly, VA 20151
(571) 299-6773



SMART GROUND METHOD

IEEE developed a standard (81) that addresses how to test grounding systems. While previous versions of the standard focused on the fall-of-potential (FOP) method, FOP and other short-cut methods described are riddled with pitfalls that are difficult, if not impossible, to hurdle.

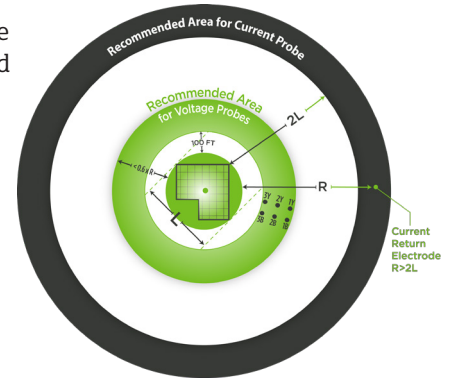
The biggest pitfall of these methods is that the grounding system under test must be de-energized and completely isolated. That means a complete shutdown of your facility and a complete electrical and physical disconnect from the utility, communications, and distribution system for accurate results. In new construction at a remote greenfield site, you're "isolated," so FOP is feasible. Otherwise, the system is already bonded and energized, rendering conventional test methods futile.

In 2012, IEEE revised the standard to acknowledge these complexities and prescribe a better approach - computer-based testing, specifically with a "computer-based grounding multimeter".

SMART GROUND MULTIMETER (SGM)

At HP&D, we use Smart Ground® Multimeter (SGM) to test grounding systems. The SGM is a computer-based multi-function instrument as prescribed by the standard that was developed specifically to test energized grounding systems; it is both a variable-frequency current source and seven-channel data acquisition platform. Its processing software filters out electronic noise, compensates for errors, and reports on the coherence and quality of the measured data.

In conjunction with the SGM, we use Integrated Grounding System Design software (IGS) to develop a complete picture of the grounding system under test and provide remediation recommendations when needed.



SGM VS. FOP AND OTHER METHODS

As a computer-based grounding multimeter, SGM overcomes the inherent pitfalls presented by traditionally-accepted methods.

SGM Method	Conventional Test Methods
Can be used at energized sites	Site must be de-energized and isolated
Reduces required lead length to 2x the site diagonal	Extremely long lead lengths are required (5-10x the site diagonal)
Filters out EMI/RFI and power frequency (60 Hz noise)	Interference (stray currents, EMI/RFI noise) affects results
Computer modeling corrects for nearby facilities and infrastructure	Nearby facilities and infrastructure affect results
Quantifies error	Unknown confidence in data
Onboard diagnostics and reporting (probe performance, data quality)	No diagnostics
Accurate results and quantified data for informed decisions	Bad data informs bad decisions

This product incorporates technology developed for the Electric Power Industry under the sponsorship of EPRI, the Electric Power Research Institute.

THE HP&D DIFFERENCE

HP&D is a customer-driven, employee-owned collaborative team of engineers, technicians, and service professionals offering electrical and mechanical testing and commissioning, engineering consulting, grounding design and assessment, power systems studies, facility assessments, and training services.

HP&D is a subsidiary of Patterson & Dewar Engineers, Inc. (pdengineers.com), which has provided electrical and civil engineering services to electric utility clients since 1947.

For more information, visit us on the web at hoodpd.com or call (770) 453-1415.

