


**How To Test Your
Data Center's
Grounding System**



**Nashville, Tennessee
March, 2010**

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Agenda



- Common Ground / Importance – Pyramid
- Site Specific Design – Achieving 5[?] Ohms
- Electrode Choices – Pros / Cons
- Ground System Testing – Why 95% Invalid



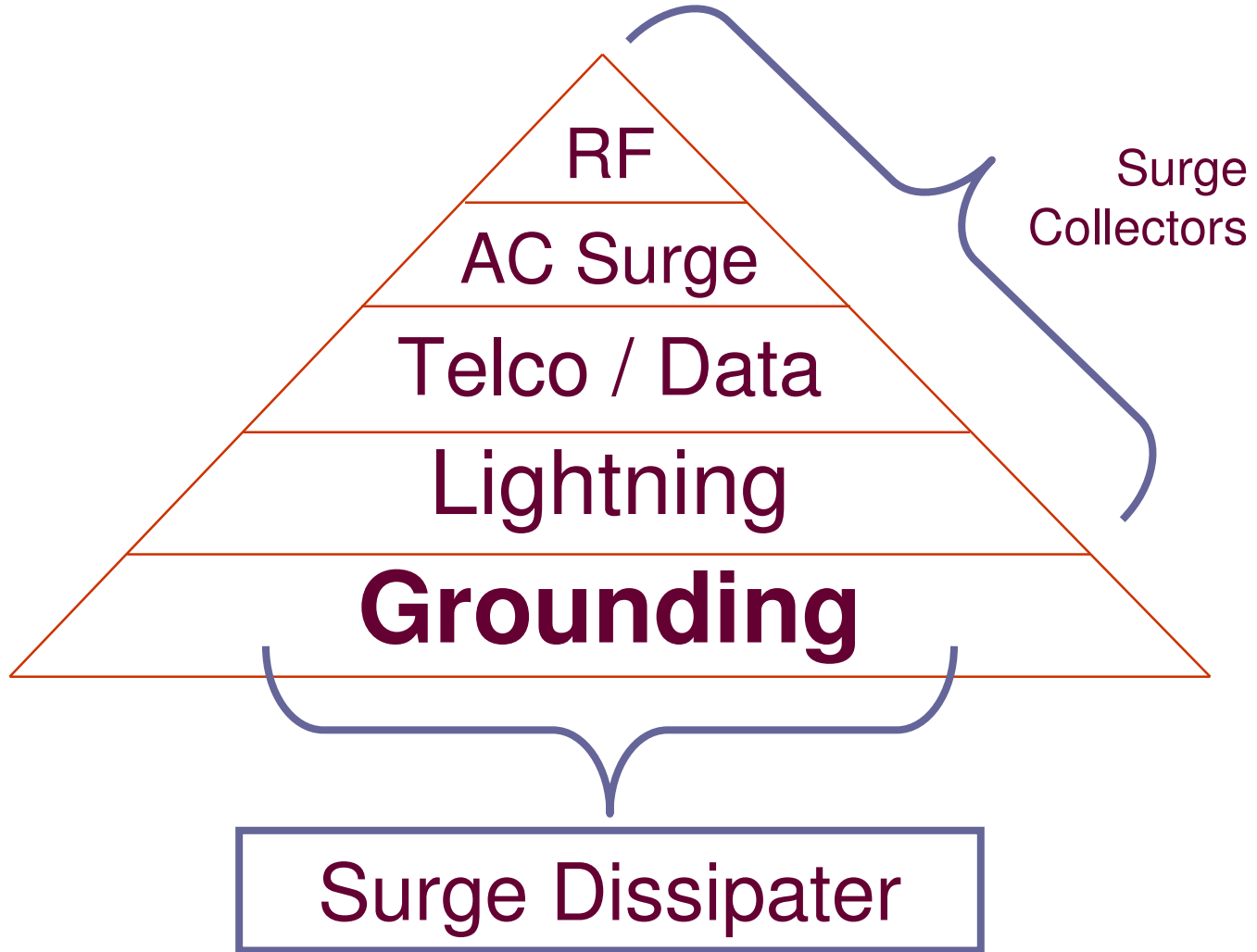
Why Ground?



- Equipment Protection
- Satisfy Warranty Requirements
- Service Protection
- System Performance
- Personnel Safety (NEC)

Electrical Protection Systems

Protection Pyramid™





4 Step Engineering Ground Design Process





← Ground System Resistance? →

– The Simple Formula:

$$R = \mathbf{P} / \mathbf{A}$$

R = Ground System Resistance

P = Soil Resistivity

A = Cross Sectional Area of
The Ground System



Four Step Engineering Process



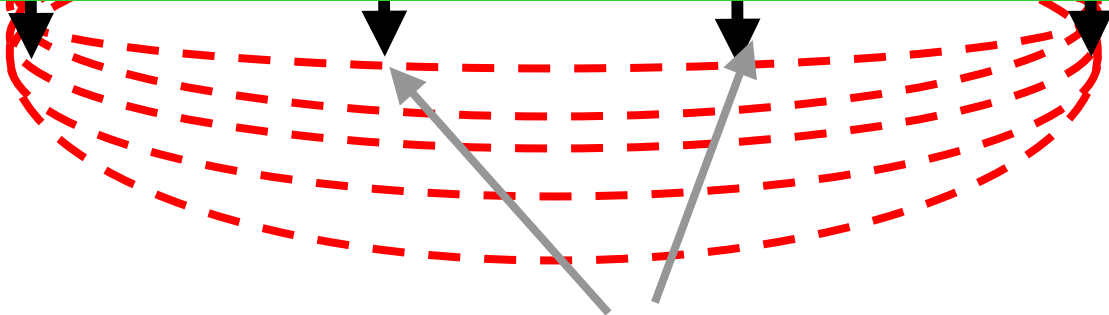
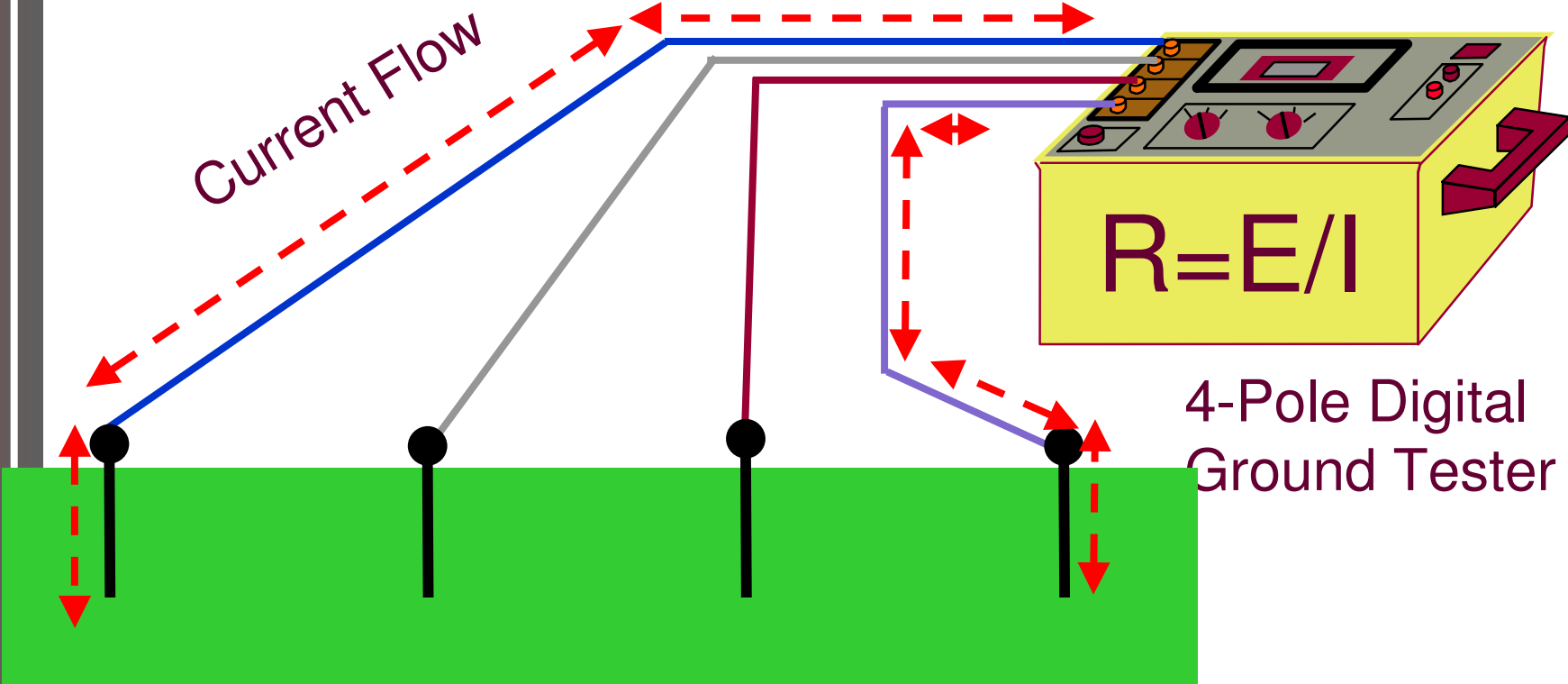
- Purpose of Design?
 - Predictable Ground System Performance
- Four Steps
 - (1) Data Collection / Testing
 - (2) Design
 - (3) Installation
 - (4) Inspection / Testing

Data Collection / Testing (Step 1)

- Info Required
 - Soil Resistivity
 - Performance Requirement
 - GeoTec Report (If Available)
 - Site Diagram
 - Area Available, Structures?



Soil Resistivity Testing



Voltage Drop

4-Pole Digital
Ground Tester

Internal Design Process (Step 2)

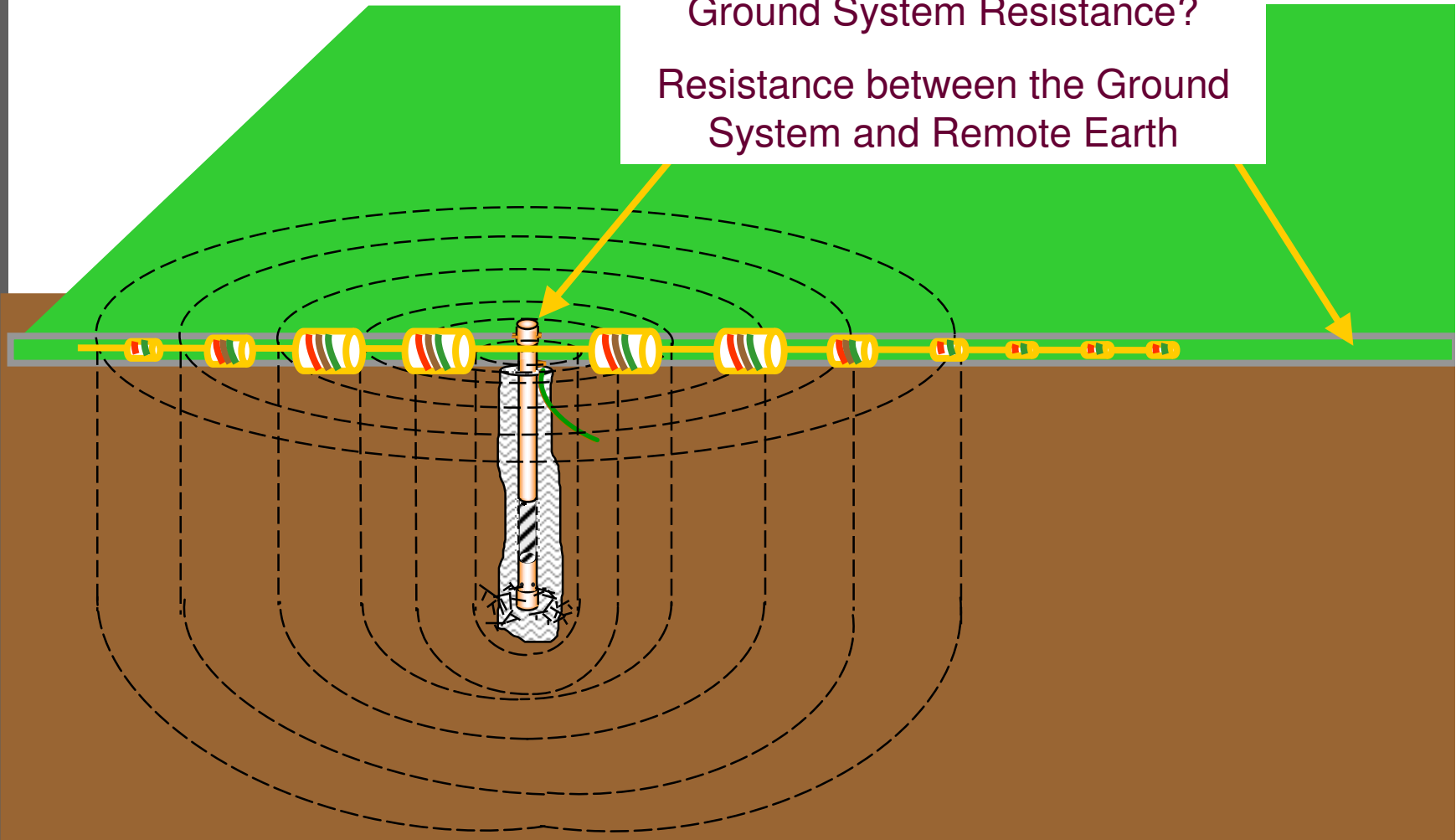
- Develop Soil Model
 - Evaluate Soil Data
 - Enter Soil Data
 - Computer Model Of Site
- Develop System Design
 - Buried Ground Ring Size
 - Electrode Lengths
 - Electrode Quantity



Ground System Resistance....., Defined



Ground System Resistance?
Resistance between the Ground System
and Remote Earth





Testing Methods



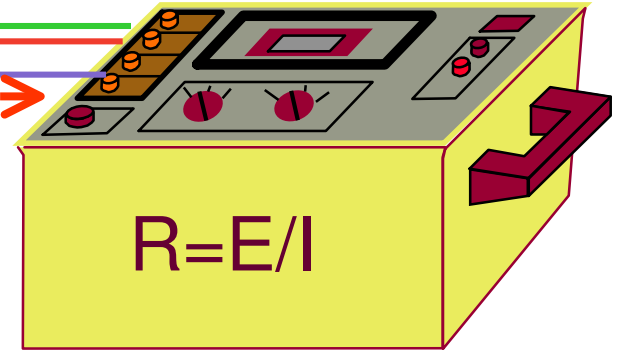
– Two Test Methods

- Fall Of Potential Test - Inserting Current /
Measuring Voltage
- Clamp-On Test - Inducing Voltage /
Measuring Current

Fall Of Potential Test

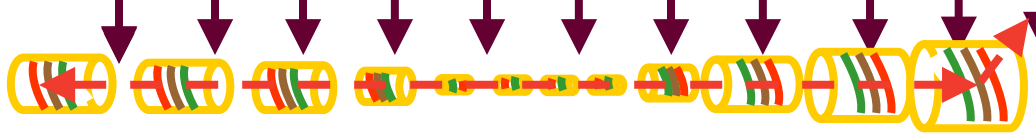
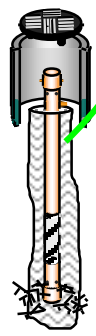
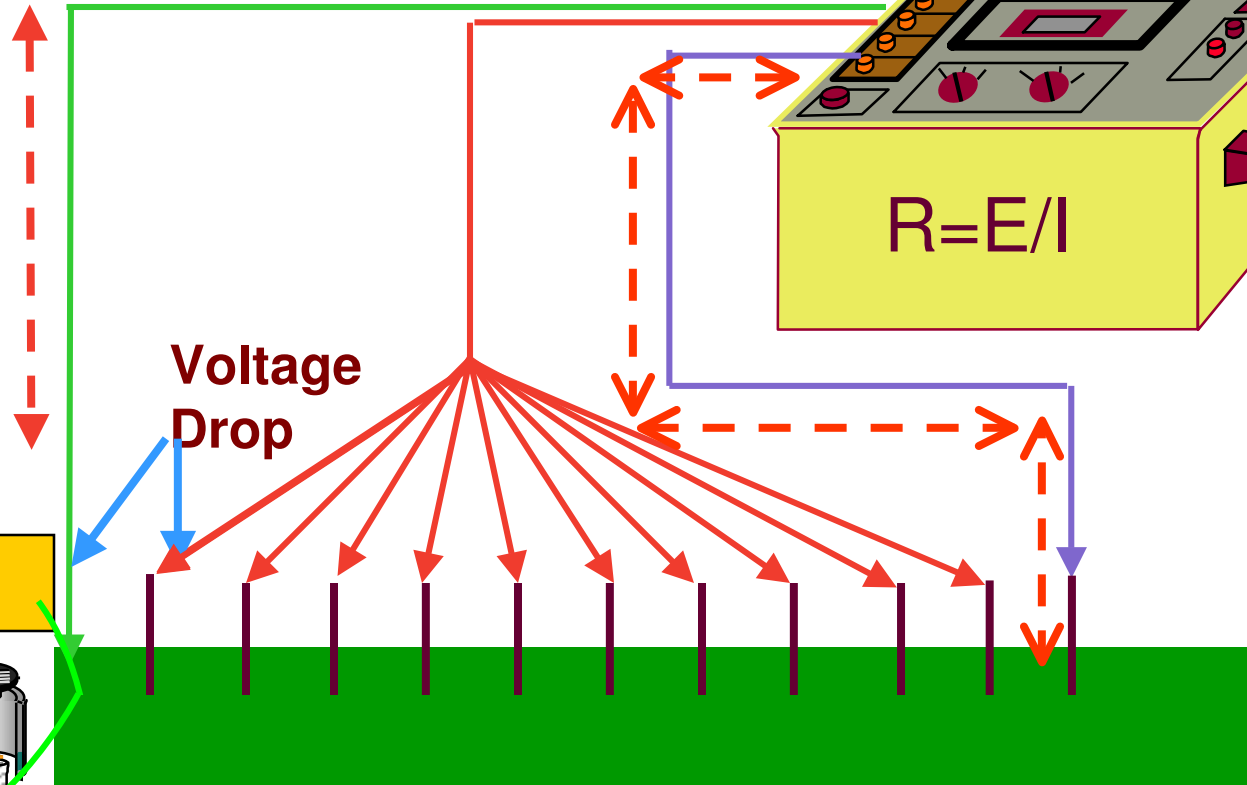


Current Flow



$$R = E / I$$

Voltage Drop



Fall of Potential

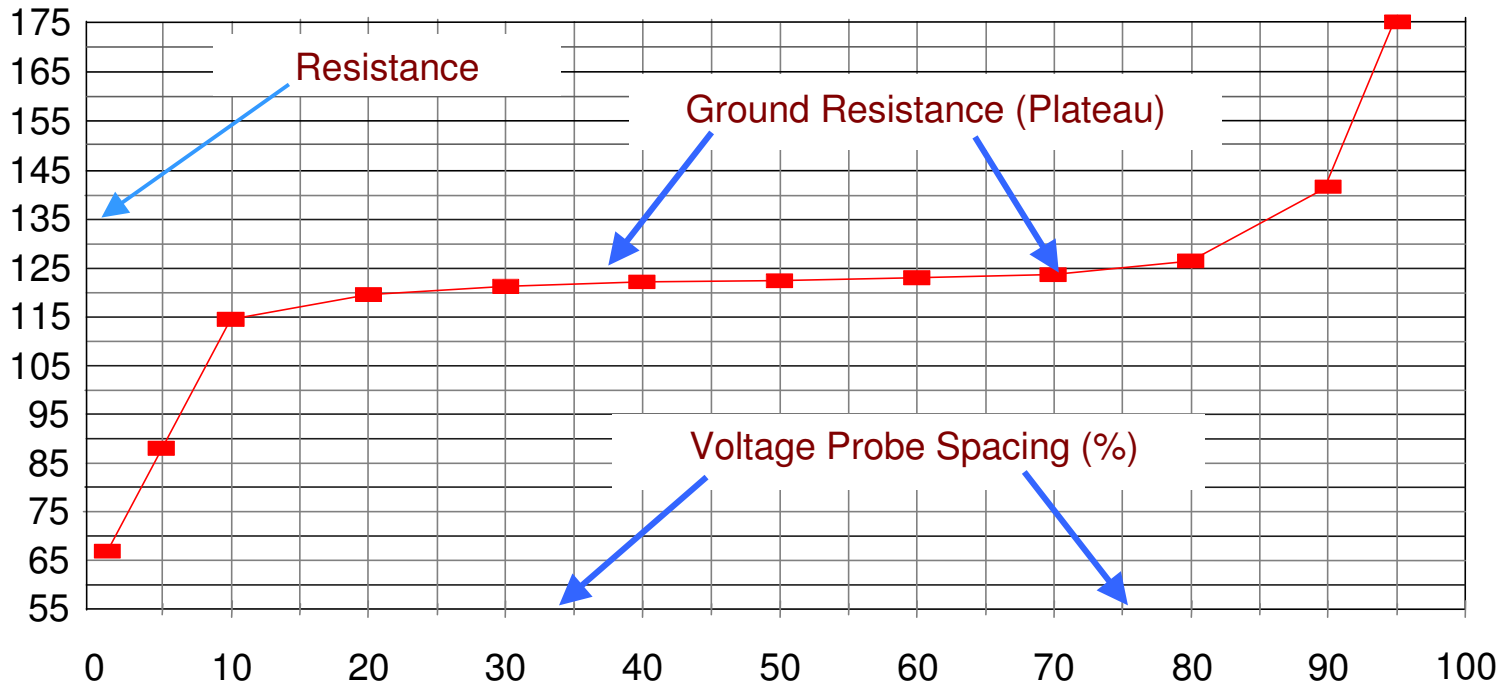
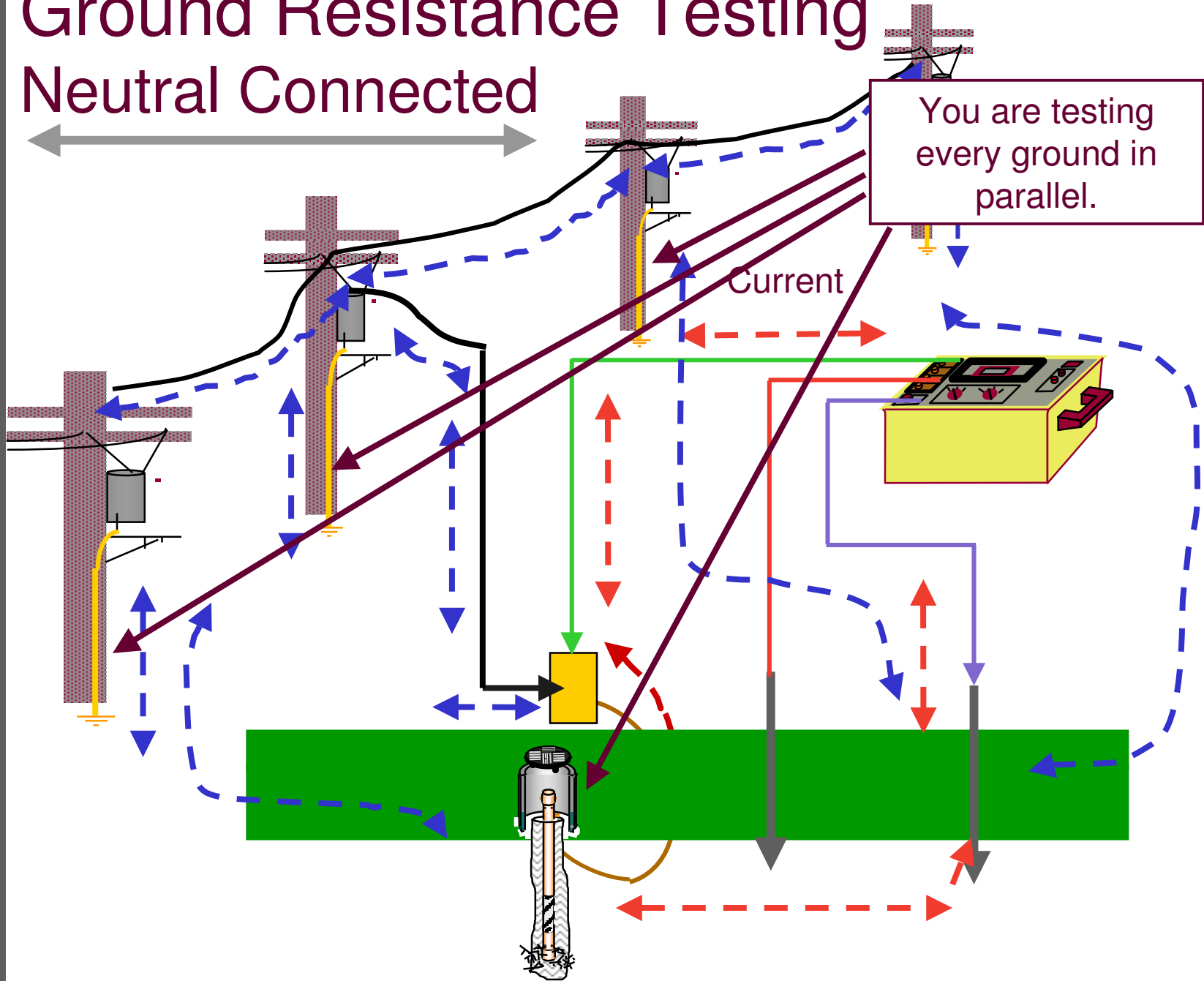


Figure 2. Ground System Test Results

Ground Resistance Testing Neutral Connected



Clamp-On Test Meter

– Advantages

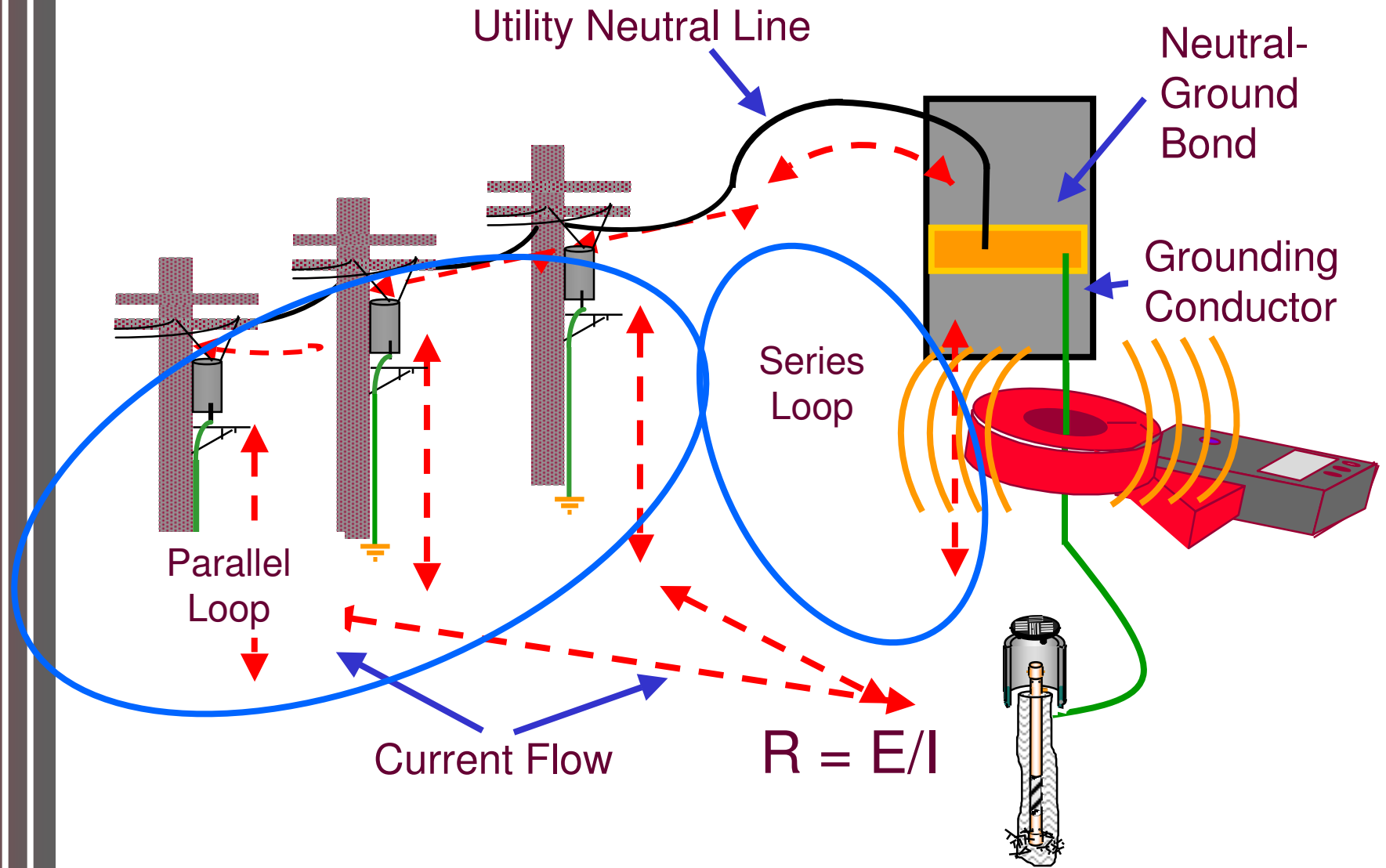
- Quick and Easy
- No Disconnecting Neutral
- No Long Leads, Property

– Disadvantage

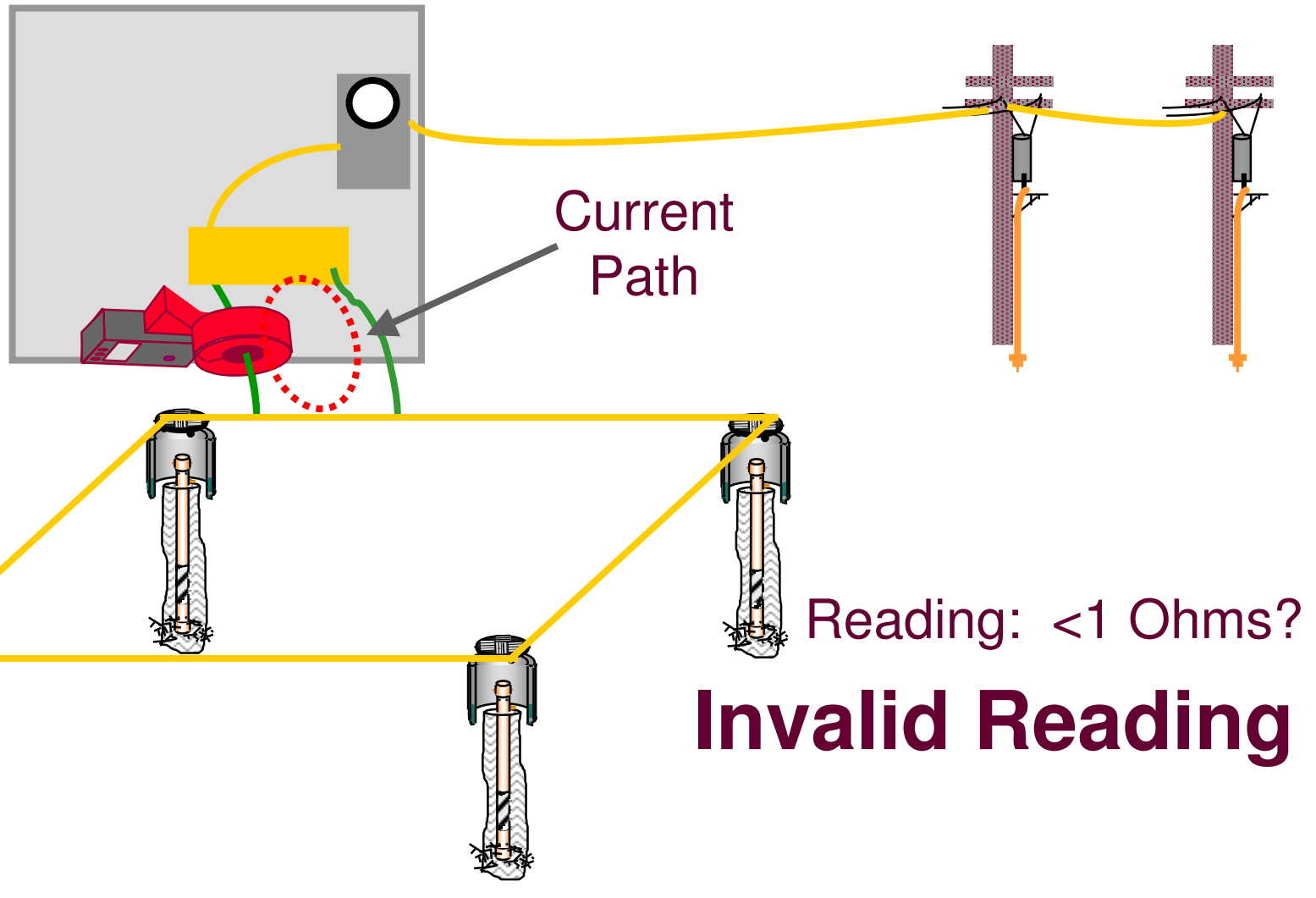
- Ground Configuration
- Finding Proper Location To Test
- Invalid 95+% Of The Time



Clamp-On Meter Operation



Clamp -On Meter Operation





Testing Solution?



- Summary / Cure
 - Design To Test - Single Point Ground?
Neutral Access? Alternative Ground?
GRM2000RS?
 - Use Experienced Professionals - Ground
System Testing Is Difficult, most of the
time.



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