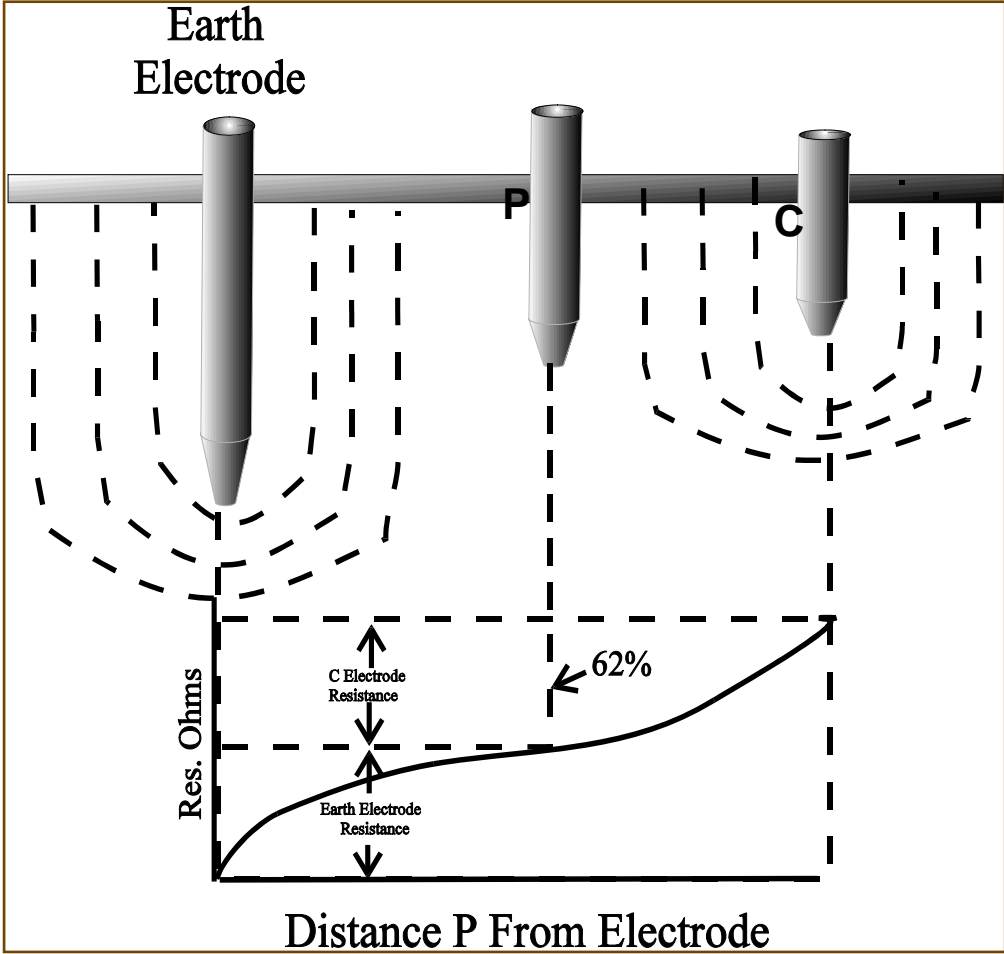


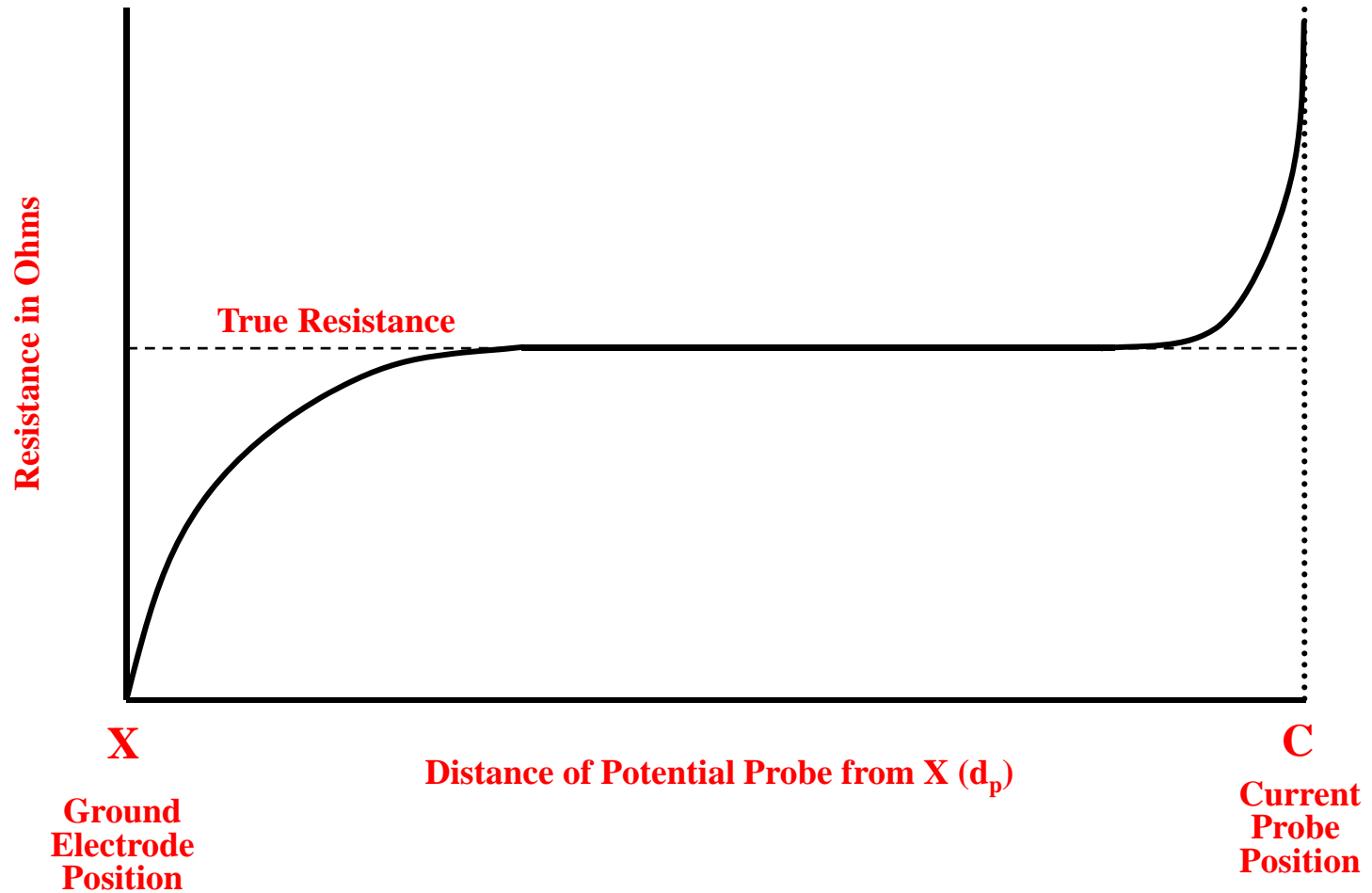
MEASURING GROUND RESISTANCE (theoretical background)

Proper Probe
Spacing

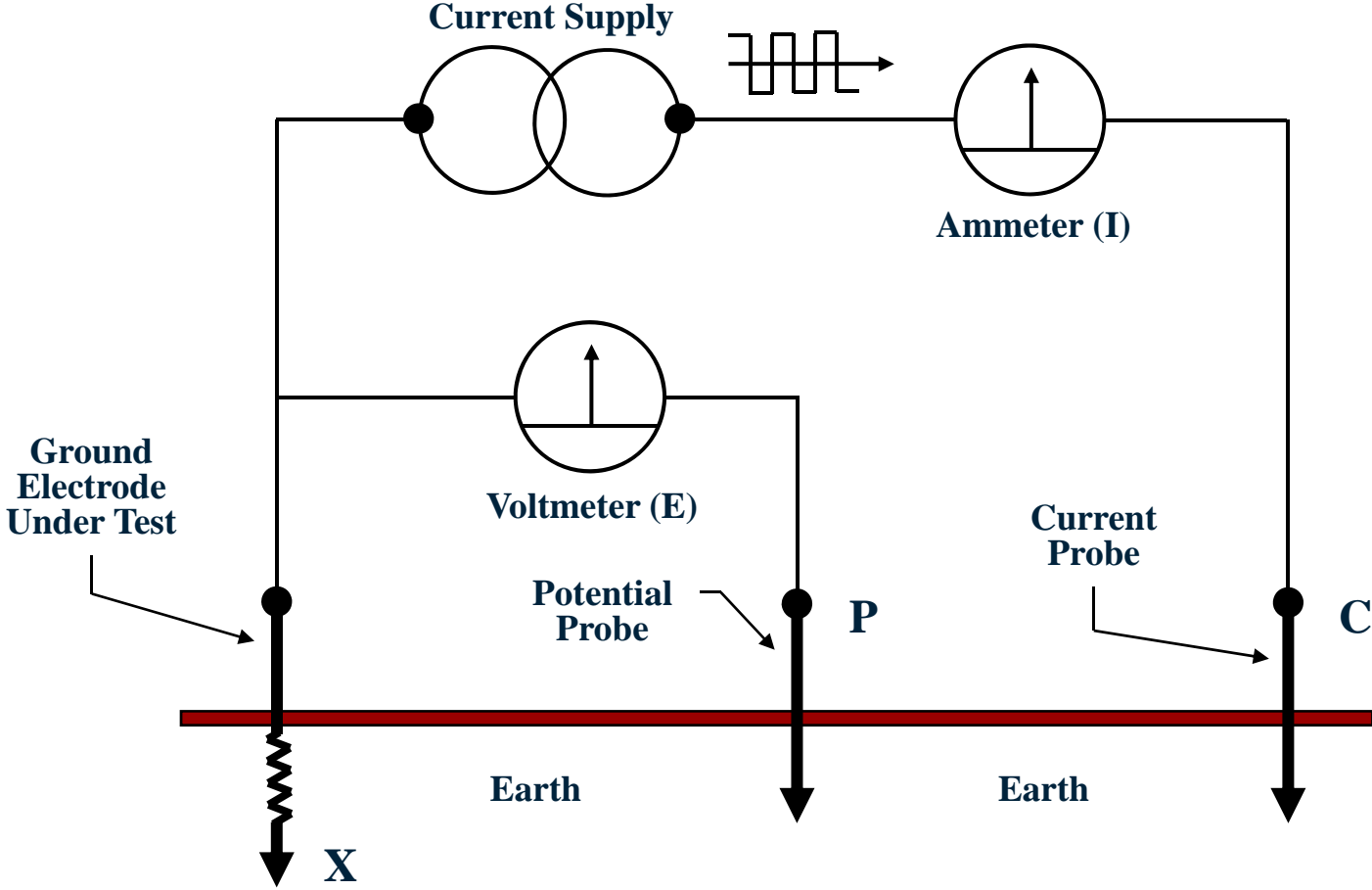




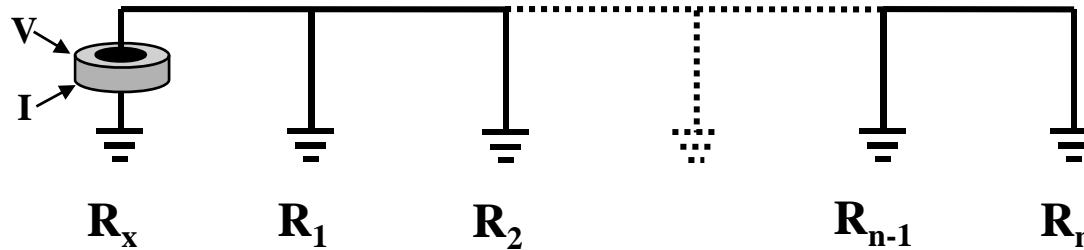
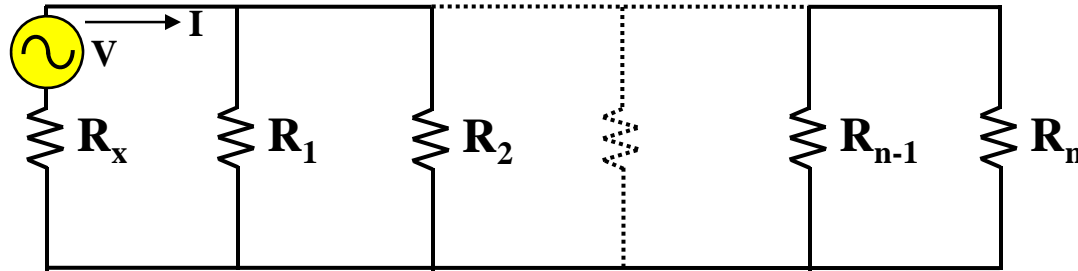
Theoretical Background - Resistance Curve



3-Terminal Earth Tester



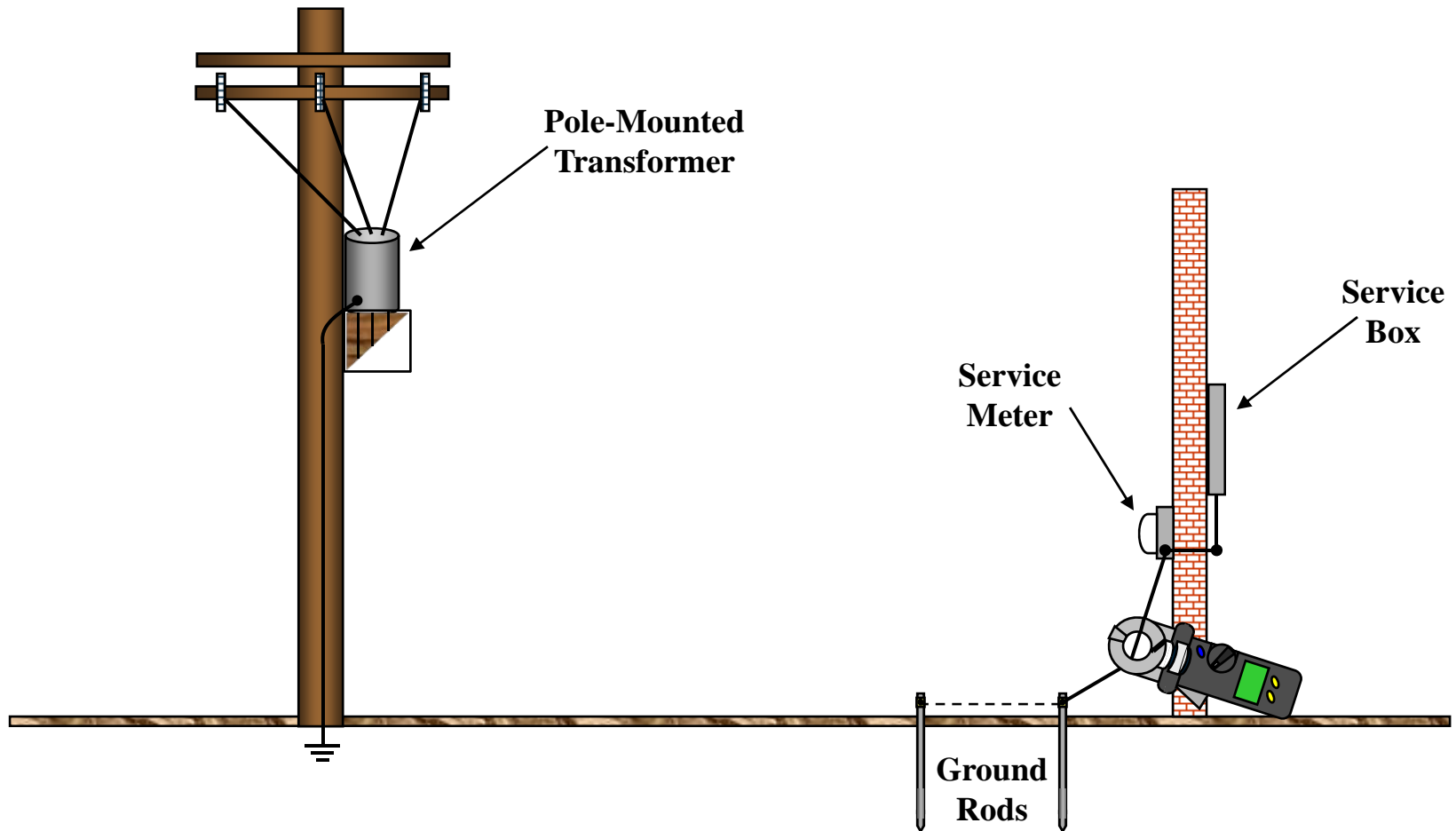
Clamp-On Methodology



$$V/I = R_x + \frac{1}{\sum_{k=1}^n \frac{1}{R_k}} \quad \text{where, usually} \quad R_x \gg \frac{1}{\sum_{k=1}^n \frac{1}{R_k}}$$

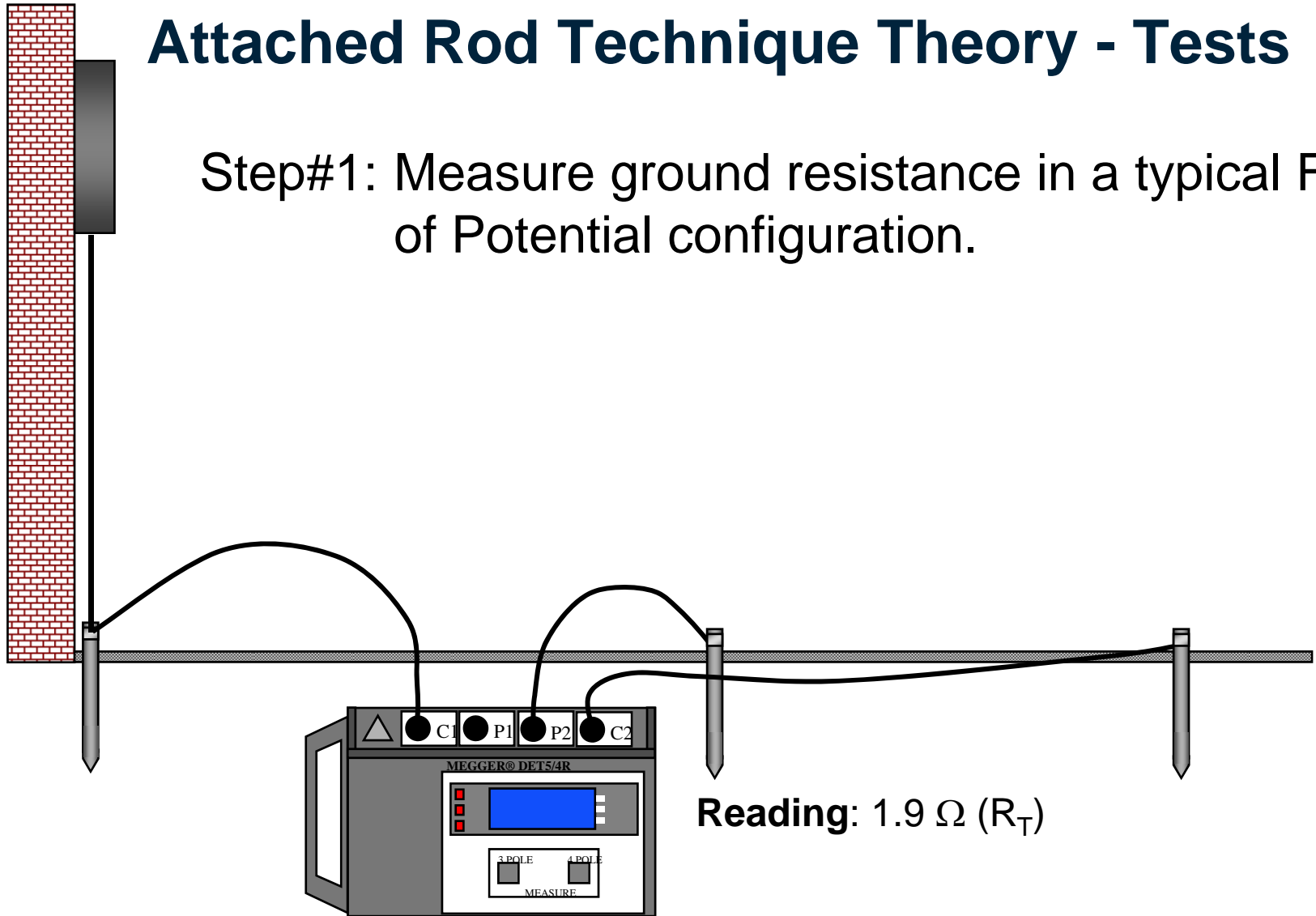


Applications – Service Entrance/Meter

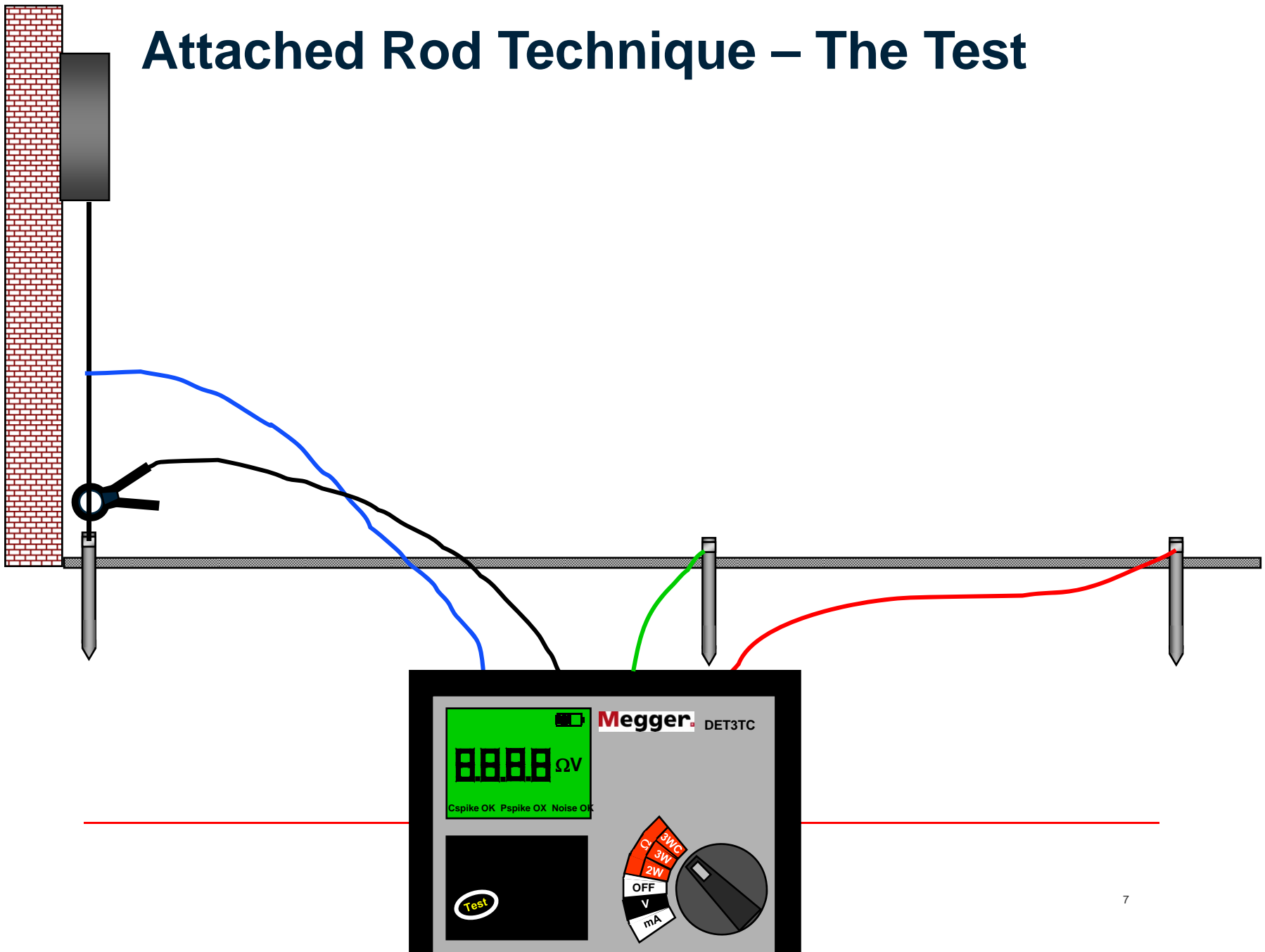


Attached Rod Technique Theory - Tests

Step#1: Measure ground resistance in a typical Fall of Potential configuration.



Attached Rod Technique – The Test



MIT410 - TC



Multi-Meter Units for CATV Applications

- To determine status of inside premise wire for VOIP services
 - Identify Resistive faults
 - Ohm meter function for hard to high resistive faults
 - Verify Voltage levels produced by the VOIP modems
 - AC and DC volt meter from zero to 600 volts
 - Leakage faults due to hidden or “healed” conditions
 - Up to 1kv insulation resistance tests
-

Multi-Meter Units for CATV Applications

- Twisted pair premise wire mystery
 - CATV experts in coax cable applications / RF technology
 - Limited experience dealing with twisted pair cable
 - Limited experience with analog technology
 - Telephony becomes analog within the customer premise
 - Education of analog is key for CATV to understand telephony issue analysis

MIT410-TC

The competition

- Simpson KS8455-L2



Simpson KS8455 L2

- **Operation**

- **Volts**

- It's recommended to start any test sequence by connecting the meter to the line and measuring voltage. This way you can confirm that the line either is or is not powered. If the line is powered when you think it is not, the other tests will be invalid.

1. Turn "OFF" to read volts on "POINTS" scale (i.e. 0 to 100 VDC) **Ohms**

- 1. Turn meter on
 2. Short leads
 3. Adjust for red zero reading
 4. Measure Ohms on red top scale
-

Simpson KS8455 L2

- Used by the telephone companies since the 1950's
 - Only meter available and was standard issue
 - Banned in the 80's
 - Did not identify many faults that caused repeat trouble calls
 - Only had DC volt meter, no AC
 - No “stress” test
 - Breaks easily, now hard to get repaired
 - Operated on 45v battery, hard to find replacements
 - Only plus: It's cheap!!
-

MIT410-TC

The Competition

- Tempo SideKick – VOC



Tempo SideKick - VOC

■ Features:

- Identifies defective Inside Wire and jacks.
 - Measures resistance, AC/DC volts, quasi square wave, and pair balance.
 - Identifies shorts, opens, crosses and grounds.
 - Replaces the need for other meters.
 - Provides tone for twisted pair or crossed conductor identification.
 - Single set-up for testing Tip-Ring, Tip-Ground, and Ring-Ground with ground connection.
 - Field replaceable leads.
 - Softcase with adjustable hook.
 - Low Battery indicator light.
-

Tempo SideKick - VOC

■ SideKick 7B/VOC

- Basic multimeter functions including AC and DC voltage measurements up to 100 Vdc and 200 Vac.
 - Resistance measurements in less than 100 megohm range increments.
 - Stress test measurements that involve a 100 volt burst with a 1000 cycle RF signal over-riding to indicate higher resistive faults normally associated with longer lengths of copper cable not found in the CATV market which deals with only the copper wire within the customers premise.
-

Tempo SideKick - VOC

- Three terminal tester requiring a ground connection
 - Ground connection sometimes difficult inside the customer premise
 - Analog or digital models, not both combined
 - Difficult to understand and operate
 - Factory training only discusses meter and functions
 - CATV has had multiple training sessions without total success to understand the concept for the use of the unit thus many meters still in box on back of truck.

MIT410 - TC



MIT410 - TC

- **Insulation resistance testing up to 1000 V and 100 G ohms**
 - **50, 100, 250, 500 and 1000 V ranges**
 - **Patented analog arc and dual digital display**
 - **CAT IV 600 V rating**
 - **TRMS AC and DC voltage measurements up to 600 V**
 - **Continuity testing**
 - **Three year product warranty**
 - **IP54 rated for difficult working conditions**
-

MIT410 - TC

- Basic multimeter functions including AC and DC voltage measurements up to 600 Vdc and 600 Vac.
- Resistance measurements in less than 100 megohm range increments.
- Insulation resistance tests of up to 1000 volts (maximum of 500 volts for telephone systems recommended).
 - Insulation test allows for instant identification of hidden or “healed” faults

MIT410 - TC

- Comprehensive training available via on-site or DVD.