

## Grounding Considerations for the Trek 152 Resistance Meter

Due to continuous improvement of Advanced Energy products, this application note is divided into two parts: Part 1 covers the grounding considerations for meter versions 1.04 and later; Part 2 covers grounding considerations for meter versions 1.03 and earlier. The meter version appears on the LCD screen when the unit is powered on.

### Introduction

The Trek 152 Resistance Meter includes a shield/ground connection which is not found on most other surface resistance meters. The shield/ground connection is useful to minimize the effect of extraneous fields, line frequencies, and other noise sources on very high resistance measurements. However, it is important to understand the circumstances of how to earth ground the shield/ground connection.

### PART 1 - Meter Version 1.04 and Later

#### When To Ground the Meter Version 1.04

The Trek 152 (v1.04) should be grounded anytime the Trek 152 is powered by any source other than batteries.

Furthermore, grounding will minimize noisy measurements due to line noise and other sources.

The Trek 152 (v1.04) should be grounded if measuring an object that is resting on an insulated surface that isolates the object from earth ground.

In these instances, ground the Trek 152 (v1.04) by connecting the green Shield/Ground terminal to an earth ground point. This provides shielding from extraneous electric fields and other noise sources, which would otherwise cause measurement instability, particularly in higher resistance ranges.

### Measurement Technique

Figure 1-1 shows a single path to earth ground. When measuring a sample resistance, there is no diversion of measurement current and therefore the measurement value is not affected.

In practice, an earth ground connection may appear at any point along the sample resistance, depending on the application as shown in figure 1-2.

### Measurement Technique (cont.)

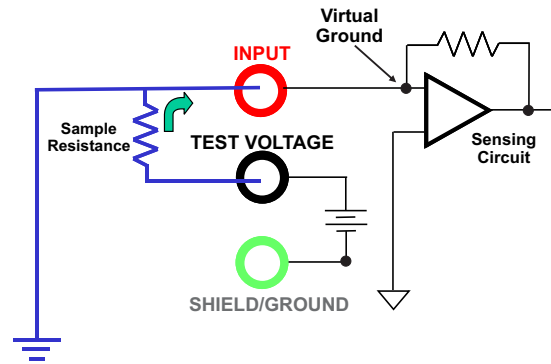


Figure 1-1: Single earth ground path - normal measurement

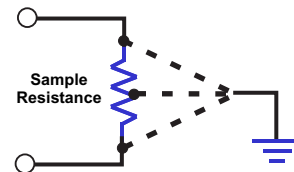


Figure 1-2: Earth ground connections

Many objects, such as conductive flooring and workstation mats, are connected to a facility ground point. When making point-to-point resistance measurements, connect the Trek 152 (v1.04) as illustrated in Figure 1-3.

This grounding strategy will minimize noise by decoupling as much line induced noise to ground as possible.

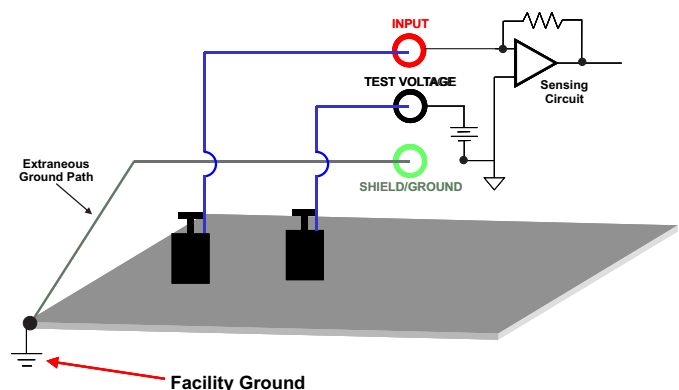
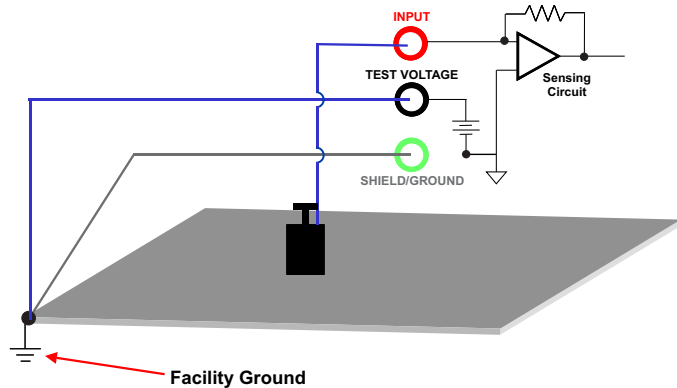


Figure 1-3: Conductive flooring test

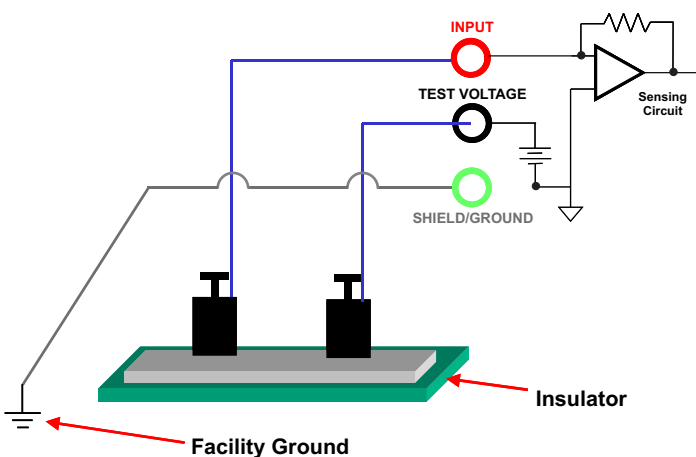
## Measurement Technique (cont.)

When performing resistance-to-ground measurements, connect the Trek 152 (v1.04) as seen in Figure 1-4.



**Figure 1-4: Resistance to ground tests - should use instrument ground**

The Trek 152 (v1.04) should be grounded when the object to be measured is isolated from ground. An example of this occurs when the object to be measured is resting on an insulative surface that isolates the object from ground. In this instance, grounding the Trek 152 (v1.04) provides shielding from extraneous electric fields and other noise sources. (See Figure 1-5.)



**Figure 1-5: Isolated sample resistance - instrument ground may be used**

## PART 2 - Meter Version 1.03 and Earlier

Part 2 covers grounding considerations for Model meter versions 1.03 and earlier. The meter version appears on the LED screen when the unit is powered on.

### **When Not To Earth Ground the Meter Version 1.03**

Many test surfaces or objects to be measured are already earth grounded. Examples of these objects include workstation mats, ESD flooring, and dissipative parts of automated handling equipment.

When the surface or object to be measured is already connected to earth ground (a facility ground point, equipment ground point, or earth ground point), **DO NOT** ground the Trek 152 (v1.03).

Connecting the Trek 152 (v1.03) to earth ground in these instances causes measurement error.

### **When To Ground the Meter Version 1.03**

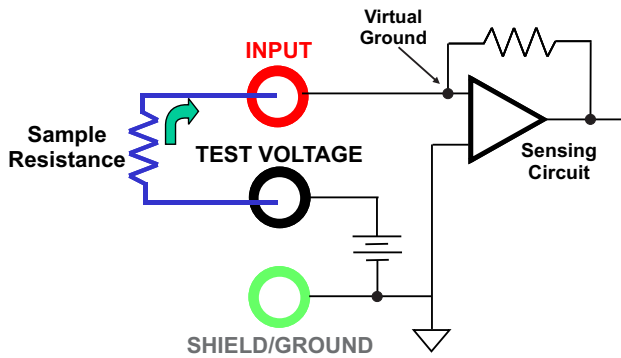
The Trek 152 (v1.03) *may* be earth grounded when the object to be measured is isolated from earth ground. An example of this occurs when the object to be measured is resting on an insulative surface that isolates the object from earth ground.

In this instance, ground the Trek 152 (v1.03) by connecting the green Shield/Ground terminal to an earth ground point. This provides shielding from extraneous electric fields and other noise sources, which would otherwise cause measurement instability, particularly in higher resistance ranges.

## **Measurement Technique**

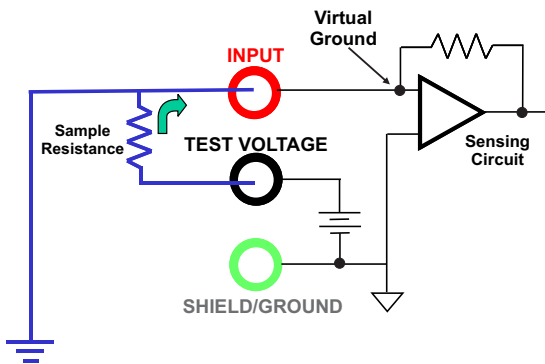
Normally, current flows from the test voltage terminal, through the sample resistance, and returns to the shield/ground connection through the virtually grounded sensing circuit at the input terminal. (See Figure 2-1.)

**Measurement Technique (cont.)**

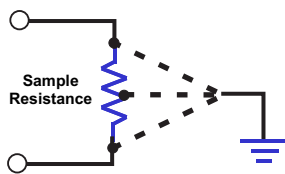


**Figure 2-1: No earth ground paths - normal measurement**

Figure 2-2 shows a single path to earth ground. When measuring an sample resistance, there is no diversion of measurement current and therefore the measurement value is not affected.



**Figure 2-2: Single earth ground path - normal measurement**

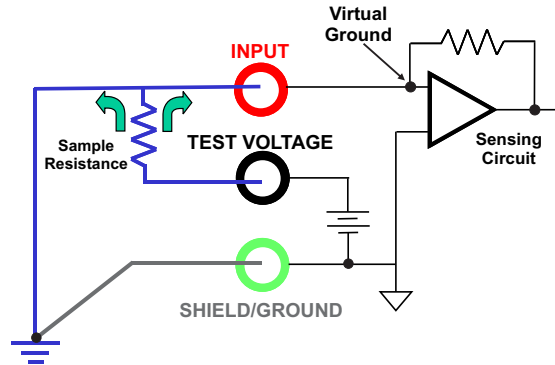


**Figure 2-3: Earth ground connections**

In practice, an earth ground connection may appear at any point along the sample resistance, depending on the application as shown in figure 2-3.

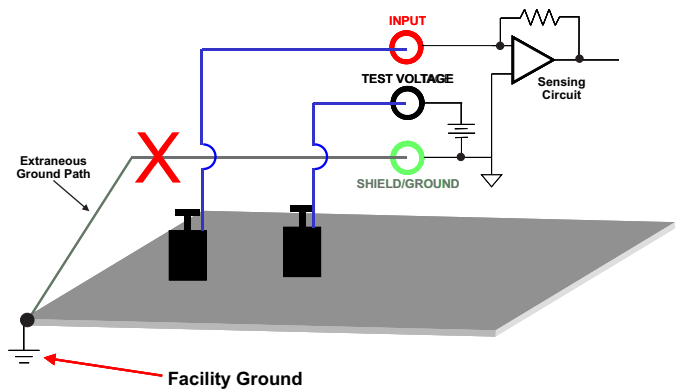
**Measurement Technique (cont.)**

However, measuring an earth grounded sample resistance with an earth ground connection to the instrument's shield/ground terminal will establish multiple ground paths. Some measurement current will be diverted and prevented from returning through the Trek 152 (v1.03) sensing circuit thus producing measurement error. (See Figure 2-4.)



**Figure 2-4: Multiple earth ground paths - measurement errors occur**

Many objects, such as conductive flooring and workstation mats, are connected to a facility ground point. When making point-to-point resistance measurements, **DO NOT** earth ground the Trek 152 (v1.03). This will avoid producing measurement errors due to current bypassing the sensing circuit and flowing through the extraneous ground path (See Figure 2-5.)



**Figure 2-5: Conductive flooring tests - do not use instrument ground**

## Measurement Technique (cont.)

In addition, **DO NOT** earth ground the Trek 152 (v1.03) when performing resistance-to-ground measurements. (See Figure 2-6.)

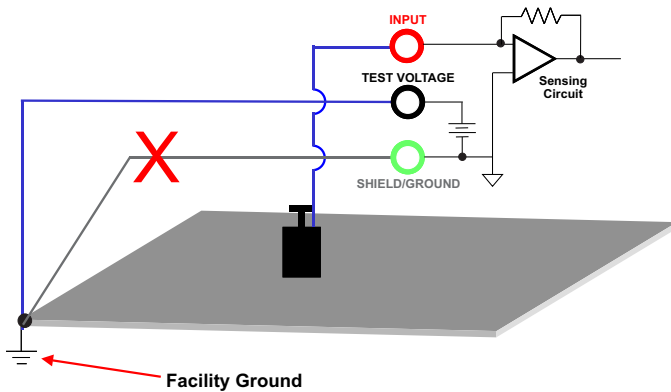


Figure 2-6: Resistance to ground tests - do not use instrument ground

## Measurement Technique (cont.)

The Trek 152 (v1.03) *may* be grounded when the object to be measured is isolated from ground. An example of this occurs when the object to be measured is resting on an insulative surface that isolates the object from ground. In this instance, grounding the Trek 152 (v1.03) provides shielding from extraneous electric fields and other noise sources. (See Figure 2-7.)

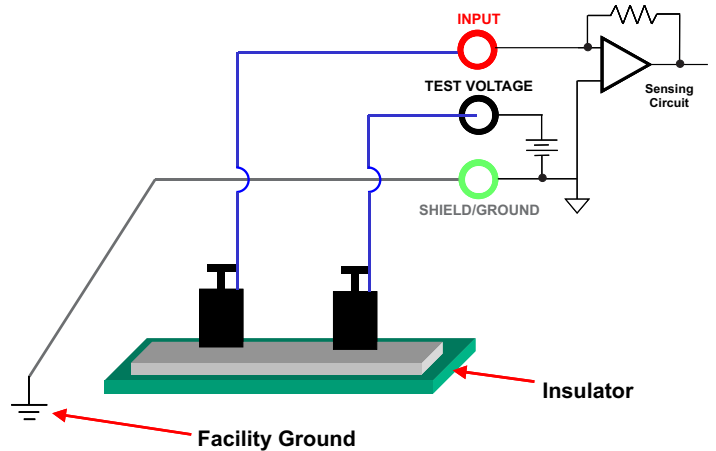


Figure 2-7: Isolated sample resistance - instrument ground may be used



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