Installation and Maintenance of ESD Protective Work Surfaces

Foreword

To enhance your understanding of this technical bulletin we recommend that you read the following Standards:

EN 61340-5-1:
Electrostatics - General Requirements
PD CLC/TR 61340-5-2:
Electrostatics - User Guide

These documents can be purchased from the British Standards Institution web site: http://shop.bsigroup.com/.

Introduction

The purpose of an ESD protective working surface is to aid in the prevention of damage to ESD sensitive items (ESDS) and assemblies from electrostatic discharge. An ESD protective working surface provides protection in the following two ways:

1. Providing a low charging (antistatic) working surface area that will limit static electricity to be generated below potentially damaging levels.

2. Removing the electrostatic charge from conductive objects placed on the working surface.

ESD protective working surfaces are catagerised into two general categories: conductive and dissipative.

A conductive working surface is defined by most documents as a material that has a surface resistance of less than 1 x 10^4 ohms. Conductive materials are the quickest to ground a charge, but they can also cause damage by discharging too rapidly. Conductive materials are usually used as floor mats or flooring products.

A dissipative working surface is defined as being materials having a surface resistance of at least 1 x 10^4, but less than 1 x 10^9 ohms. Dissipative materials will dissipate a charge slower and are recommended for handling electronic components. Dissipative materials are usually the preferred choice for bench top working surfaces.

General Guidelines

1. EN 61340-5-1 requires that all conductors, including personnel, be electrically connected and attached to a known ground.

2. Per EN 61340-5-1, the ESD control programme cannot replace or supercede the requirements for personnel safety. Ground fault circuit interrupters (GFCI) and other safety protection should be considered wherever personnel might come into contact with electrical sources.

3. All electrical circuits at an ESD protected workstation, especially those used as the tie-in point to the utility ground, should be verified for proper wiring configuration, ground impedance and GFCI function when the station is installed, and periodically thereafter.

4. The selection of ground cords is intimately related to the material selected for an ESD protected work area, personnel safety, and the products' relationship to the organisation's material handling procedures. It is important for a user to be familiar with their organisation's grounding specifications and ESD control procedures prior to selecting ground cords.

Common Ground Points or Earth Bonding Points

A Common Ground Point (formerly called an Earth Bonding Point or EBP) is a grounded device or location where the conductors of two or more ESD control items are bonded.

Examples of conventional earth bonding points are illustrated below.

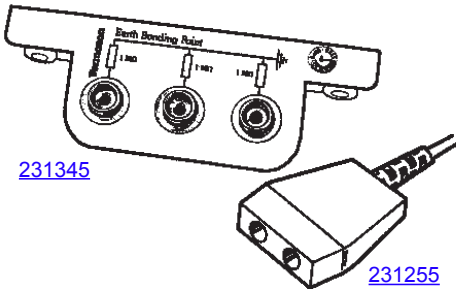

Figure 1. Typical earth bonding points.

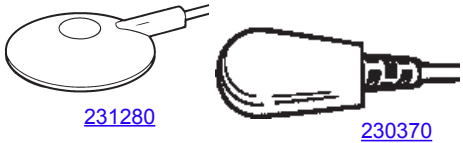

Figure 2. Other ground cords.

Earth bonding points are designed to provide protective earth ground for bench top mats and wrist straps. **NOTE**: DO NOT DAISY CHAIN. Because of the high resistances inherent to many types of protective surfaces, daisy chaining of these materials can cause the overall resistance to exceed the required limit of EN 61340-5-1.

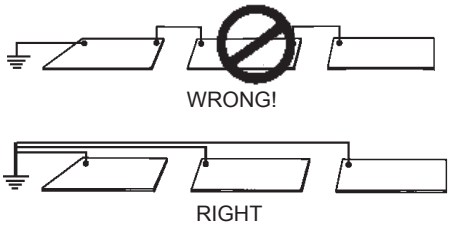

Figure 3. ESD working surface should never be grounded in series, i.e. daisy chained.

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Grounding Methods

Method 1 *(Grounding via ground cords)*

1. Vermason recommends using an earth bonding point cord when grounding via ground cords. Most earth bonding point cords will ground an ESD protective working surface and provide banana jacks for two wrist strap grounds.

2. An earth bonding point should be installed at each workstation and should be connected directly to a verified electrical system ground or to a verified grounding bus which is connected to the protective earth ground. Only one groundable point should be installed on a working surface.

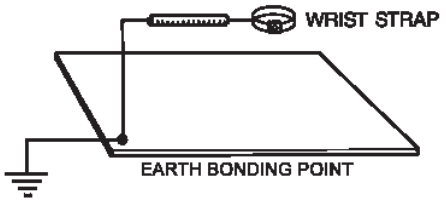

Figure 4. Earth bonding point for each workstation.

3. Wrist straps should never be grounded through a working surface, as the added resistance of the working surface material will prevent the wrist strap from operating properly.

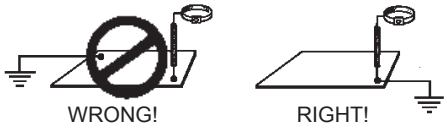

Figure 5. Proper grounding of wrist straps.

4. A current limiting resistor in the wrist strap ground cord is recommended. Per ANSI/ ESD S1.1, the most common is a one megohm resistor.

Method 2 *(Grounding via a grounded conductive surface)*

1. This alternate form of grounding should only be employed when using a homogeneous dissipative material with a volume resistance of less than 1 x 10^8 ohms.

2. The dissipative working surface may be placed on a properly grounded laminate, metal or other conductive surface. The working surface will electrically couple to the grounded surface and may not require a separate ground cord.

3. When using this type of grounding method be sure to test that the working surface Rg is less than 1 x 10^9 ohms, tested per IEC 61340-2-3. Also consider increasing Compliance Verification test frequency.

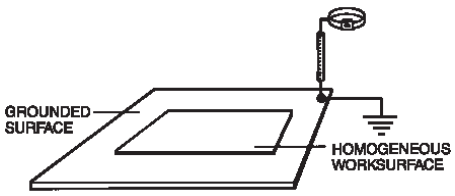

Figure 6. Alternate grounding method

Groundable Point Installation

1. Before installing a groundable point on your work surface you must first determine whether you will need a male stud or female socket, the type of snap hardware and the desired location.

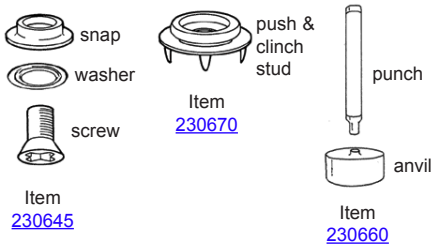

Figure 7. Snap kits and tools

2. Vermason has three types of 10mm field installable mat grounding snaps. The first type is a screw-on snap kit designed for use on homogeneous mats, but it can also be used on two-layer working surfaces. This is Vermason item number 230645.

   A. Determine the position of the grounding snap **(one only per mat)**. Punch a hole through the material with a small Phillips screwdriver or awl.

   B. Remove the release paper from the circular label and affix it so that it aligns with the hole on the top of the mat.

   C. Select one of the screws as follows:
   ESD working surface bench top - wood screw
   ESD matting - machined screw

   D. Insert the screw through the bottom on the snap fastener, the washer, and the material. Affix the assembly with the conical nut supplied with the kit and tighten down the screws.

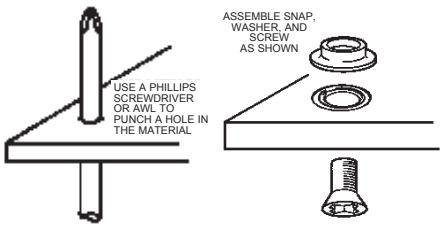

Figure 8. Installing screw-on mat grounding snap.

3. The second type of mat grounding snap is the push and clinch snap. This snap is designed for use with any type of soft mat material: dissipative, conductive or multi-layered. It is recommended for use with three-layered material, because it provides better contact with the internal conductive layer. It is recommended that before inserting this snap, the mat be punctured with a sharp tool where the snap will be placed. This type of snap is available as a male stud, item 230670.

   Center the prongs on the snap assembly with the label. Apply pressure to the snap until the prongs come through the back of the mat, then clinch over prongs making flat to the mat's bottom side to secure snap as shown in Figure 9.

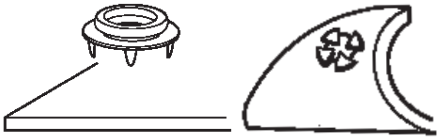

Figure 9. Installing push and clinch mat grounding snap.

4. Grounding Points must be riveted through bench and floor mats to connect ground cords. The Vermason 230660 Punch and Anvil are simple but effective tools to achieve a neat finish with firm materials no more than 4mm thick.

   A. Punch a 5mm diameter hole at the desired location of the mat.

   B. Insert the post from underneath and apply the stud over the protruding post on the top side.

   C. Fit the anvil under the post and place the punch inside the stud and hammer the post (or use an arbor press) until it rolls and a tight assembly is achieved.

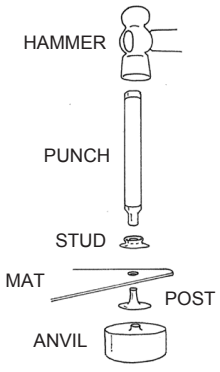

Figure 10. Using the 230660 Punch and Anvil.

Selection of Common Point & Floor Mat Grounding Systems

1. Determine the type of common point grounding system you will use: barrier strip, bus bar, grounding block, or common point ground cord. Vermason recommends the use of our common point ground cords or our earth bonding point.
2. If you determine that you will use ground cords, you must now determine the type of ground cord you will use for your workstation grounds. It is the user's preference to use a ground cord with or without a current limiting 1 megohm resistor to ground working surfaces or floor mats. Selection of the ground cord is determined by user needs and specifications; the resistor is not for ESD control.
3. Vermason offers a variety of ground cords designed to ground working surface mats or floor mats. See website for details on ground cords.
4. The Vermason 231345 earth bonding point allows the grounding of multiple operators at one common ground point. The 231345 mounts easily under the front edge of a workstation benchtop. For detailed information on this common point grounding device see Technical Drawing 231345.

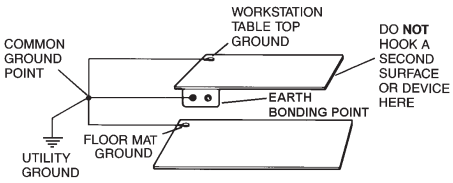

Figure 11. Earth bonding point installation.

5. The Vermason 231280 floor mat ground may be either attached to a mat by snapping onto a 10mm socket, or by bolting it to the mat with the hardware supplied with the ground cord. When bolting the 231280 to the mat use a 9.5mm diameter hole punch to create the hole for mounting. This will allow cord to sit flush on the mat. **Note:** For both applications, remove screw from floor mat ground before attaching to mat.

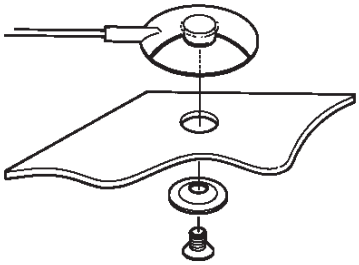

Figure 12. Installing 231280 to mat using supplied hardware.

Mat Installation

1. For best results, allow the mats to lay flat for about four hours at room temperature before installing. This will give the material time to flatten out from being rolled for shipment.
2. Test all workstation grounds for proper resistance to ground.
3. Lay the mat in position and snap the ground cord to it. Bring the other end of the ground cord to the common ground point (or earth bonding point) and attach it using the ring terminal (or other termination device). The electrical systems junction box and connecting conduit should all also connect to earth protective ground. Tie the ground wire to the bench to keep it out of the way and neat. You may cut and strip the ground wire to a shorter length and attach it with the extra ring terminal included with each Vermason ground cord.
4. If your kit includes a floor mat, you should duplicate step 2 and attach the floor mat ground to the same ground point as the working surface ground.
5. Measure the resistance from the ground snap on the mat to the common ground point. It should read 1 megohm ±20 percent if you are using a ground cord with a resistor, and less than 10 ohms if you are using a ground cord without a resistor.
6. If you have a surface resistance or resistance to ground tester available, you may wish to test the resistance to ground from the mat surface. Note: depending upon the accuracy of the instrument you are using, you may get a wide range of results in resistance to ground tests. In order to get the electrical readings specified per IEC 61340-2-3, 2.2 Kg electrodes are to be used. This will require a megohmmeter with 100 volt open test circuit voltage and two 2.2 Kg electrodes. Vermason sells this as the Surface Resistance Test Kit, Item 222642. See Technical Bulletin TB-7588.
7. If you are using a mat kit that includes the wrist strap, install the wrist strap directly to the common point mat ground cord. Again, test the resistance from the backplate of the wrist strap to the common ground point. It should read 1 megohm ± 20 percent.

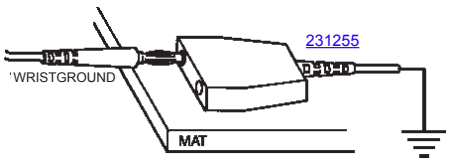

Figure 13. Adding the wrist strap.

8. Your completed installation of a Vermason ESD workstation should comply with one of the electrical diagrams illustrated in Figure 14.

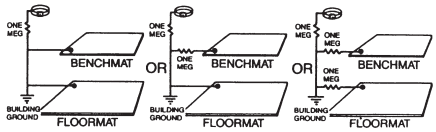

Figure 14. Proper wiring diagrams for conductive and dissipative ESD workstations.

BE SURE YOU TEST ALL GROUNDS AND THE WRIST STRAP FREQUENTLY.

The following bulletin is available from Vermason:
TB-7504 Wrist Straps, Grounding, Testing, Maintenance

Maintenance and Cleaning

For optimum performance, periodic cleaning is required following manufacturer's recommendations. Vermason recommends Reztore™ Surface and Mat Cleaner for workstation, floor mats and other surfaces.

Note: Vermason's Reztore™ Surface Mat Cleaners contain no silicone or harsh solvents. Cleaners with silicone leave an insulative residue on surfaces and solvents such as 2-Butoxyethanol or Ethanolamine used in cleaners can dry out the material; both can prevent conductive or dissipative mats from functioning properly.

Limited Warranty, Warranty Exclusions, Limit of Liability and RMA Request Instructions
See Vermason's Terms and Conditions at Vermasonco.uk

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