

Installation and Maintenance of ESD Protective Work Surfaces



Made in the United Kingdom

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 categorised 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 1×10^4 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 1×10^4 , but less than 1×10^9 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.

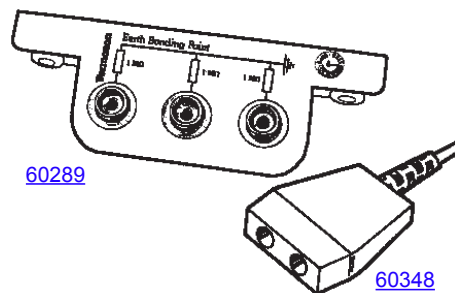


Figure 1. Typical earth bonding points.

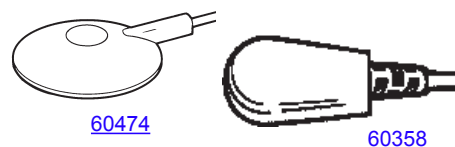


Figure 2. Other ground cords.

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.

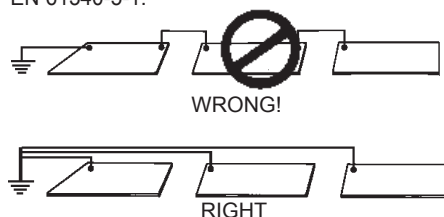


Figure 3. ESD working surface should never be grounded in series, i.e. daisy chained.

Grounding Methods

Method 1 (Grounding via ground cords)

1. Charleswater 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.

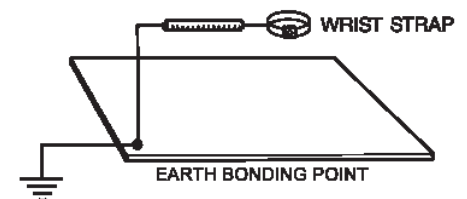


Figure 4. Earth bonding point for each workstation.

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 1×10^8 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 R_g is less than 1×10^9 ohms, tested per IEC 61340-2-3. Also consider increasing Compliance Verification test frequency.

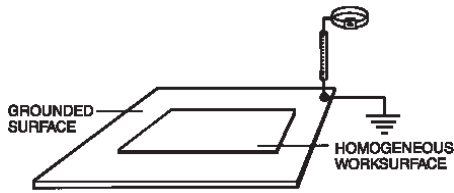


Figure 6. Alternate grounding method

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.

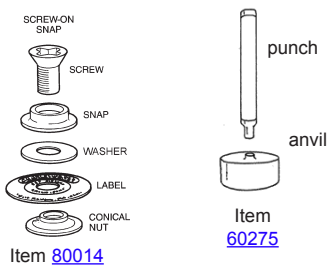


Figure 7. Snap kits and tools

2. Charleswater's screw-on snap kit designed for use on homogeneous mats, but it can also be used on two-layer working surfaces. This is Charleswater item number [80014](#).
 - 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:
 - Material less than 2.5mm thick - short screw
 - Material greater than 2.5mm thick - long screw
 - D. Insert the screw through the top on the snap fastener, the washer, the label and the material. Affix the assembly with the conical nut supplied with the kit and tighten down the screws.

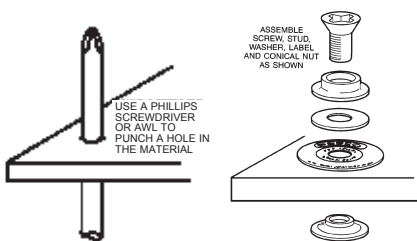


Figure 8. Installing screw-on mat grounding snap.

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. Charleswater 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. Charleswater offers a variety of ground cords designed to ground working surface mats or floor mats. See [website](#) for details on ground cords.
4. The Charleswater [60289](#) earth bonding point allows the grounding of multiple operators at one common ground point. The [60289](#) mounts easily under the front edge of a workstation benchtop.

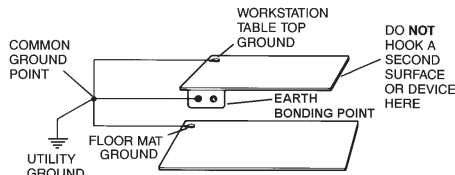


Figure 9. Earth bonding point installation.

5. The Charleswater [60286](#) 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 [60286](#) 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.

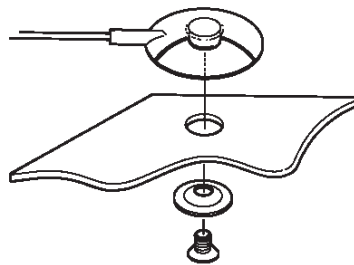


Figure 10. Installing [60286](#) to mat using supplied hardware.

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 Charleswater 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 \pm 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. Charleswater sells this as the Surface Resistance Test Kit, Item [99026](#). See Technical Bulletin [PPE-5103.E](#).
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 \pm 20 percent.

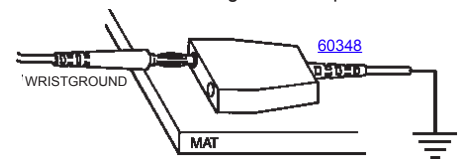


Figure 11. Adding the wrist strap.

8. Your completed installation of a Charleswater ESD workstation should comply with one of the electrical diagrams illustrated in Figure 12.

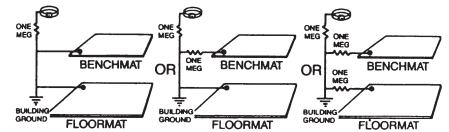


Figure 12. Proper wiring diagrams for conductive and dissipative ESD workstations.

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

The following bulletin is available from Charleswater: [PPE-5001.E](#) Wrist Straps, Grounding, Testing, Maintenance

Maintenance and Cleaning

For optimum performance, periodic cleaning is required following manufacturer's recommendations. Charleswater recommends [Reztore™ Surface and Mat Cleaner](#) for workstation, floor mats and other surfaces. Note: Charleswater'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 Charleswater's Terms and Conditions at [Charleswater.co.uk](#)