# Installation and Maintenance of ESD Mats

Made in the United States of America

## Introduction

The purpose of an ESD worksurface is to aid in the prevention of damage to ESD sensitive components and assemblies from electrostatic discharge. An ESD worksurface provides protection in the following two ways:

1. Providing an antistatic worksurface area that will limit static electricity generation.
2. Removing the charge from a conductive object placed on the worksurface.

A dissipative worksurface having a surface resistance of at least 1 x 10E6, but less than 1 x 10E9 ohms is recommended by worksurface standard ANSI/ESD S4.1. Dissipative materials minimize the generation of static charges, and will dissipate a charge slow enough so that a spark will not occur. Dissipative materials are usually the preferred choice for bench top worksurfaces.

Conductive materials are the quickest to remove a charge, but they can also cause damage by discharging too rapidly. Conductive materials are usually used as floor mats, which is defined by ANSI/ESD S7.1 as less than 1 x 10E6 ohms.

## General Grounding Guidelines

1. ANSI/ESD S20.20 requires that all conductors in an ESD protected area, including personnel, must be grounded.
2. The ESD ground must be tied directly to and at the same potential as the building or “green wire” equipment ground.
3. Per ANSI/ESD S20.20, the ESD control program can in no way replace or supercede any 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.
4. All electrical outlets should be verified for proper wiring configuration, resistance or impedance and GFCI function when the mat is installed and periodically thereafter.

## Common Point Grounds

A common point ground is defined by the grounding standard ANSI/ESD S6.1, as:

1. A grounded device where two or more conductors are bonded.
2. A system or method for connecting two or more grounding conductors to the same electrical potential.

Examples of common point grounds with ground cords are illustrated below.

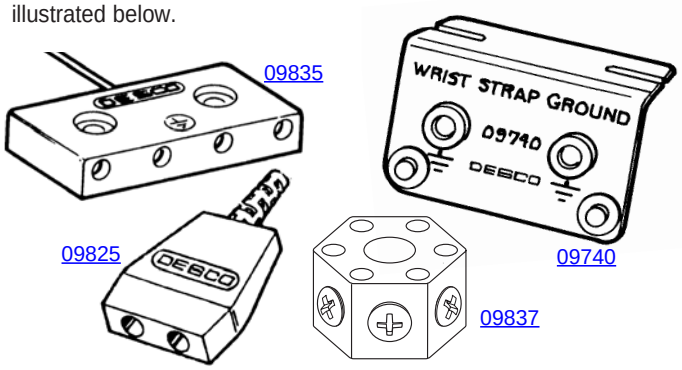



*Figure 1. Typical common point grounds.*

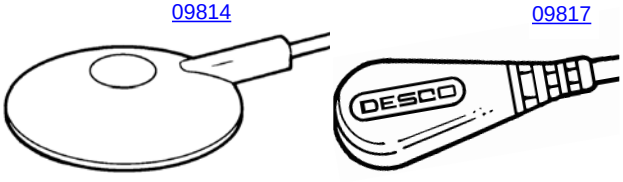



*Figure 2. Other ground cords.*

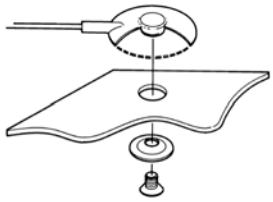


*Figure 3. 09814 with screw allows ground cord to be bolted to mat to keep cord from disconnecting.*

Common point grounds are designed to provide ground for worksurface mats, wrist straps, and other items.
**NOTE**: DO NOT DAISY CHAIN. Because of the high resistances inherent to many types of protective surfaces, daisy chaining of these materials can severely limit their ability to properly dissipate and protect against static charges.

### *COMMON POINT GROUND*

Per ANSI/ESD S6.1, Grounding section 4.1.1 “Every element to be grounded at an ESD protected station shall be connected to the same common point ground.”

ESD Handbook ESD TR20.20 section 5.1.3 Basic Grounding Requirements “The first step in ensuring that everything in an EPA is at the same electrical potential is to ground all conductive components of the work area (worksurfaces, people, equipment, etc.) to the same electrical ground point. This point is called the common point ground. The next step in completing the ground circuit is to connect the common point ground to the equipment ground (third wire, green).”

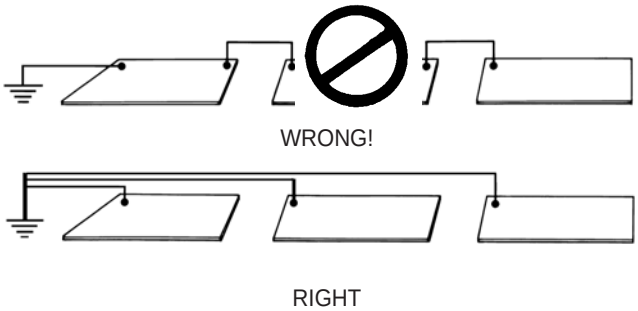



*Figure 4. ESD mats should never be grounded in series, that is daisy chained.*

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## Grounding Methods

**Method 1** (Grounding via ground cords)

1. Desco recommends using a common point ground cord when grounding via ground cords. Most common point ground cords will ground your ESD worksurface and provide banana jack ground points for two wrist straps.
2. A common point ground should be installed at each workstation and should be connected directly to a verified “green wire” equipment ground. Only one groundable point should exist on a worksurface.

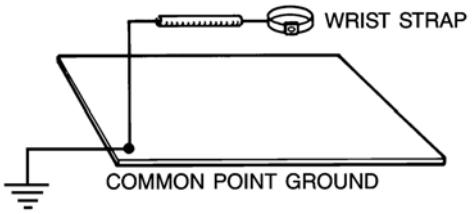



*Figure 5. Common point ground for each workstation.*

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

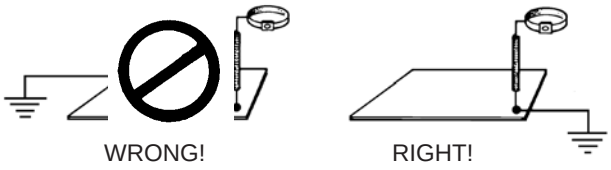



*Figure 6. Proper grounding of wrist straps.*

4. Per ANSI/ESD S1.1, a current limiting resistor in the wrist strap ground cord is recommended. If other than a one megohm resistor, special marking in red is required.

For additional information on grounding we recommend Desco Technical Bulletin TB-2007.

## Groundable Point Installation

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

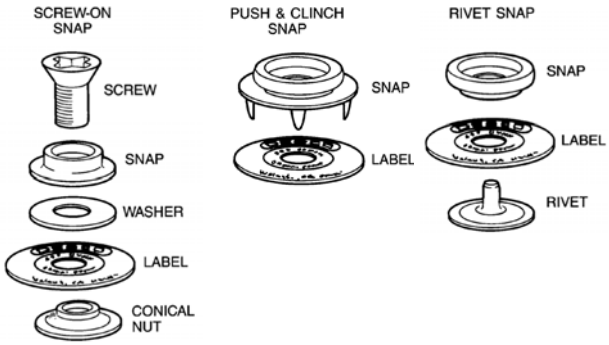



*Figure 7. Three kinds of snaps.*

2. Desco has three types of 10mm (.395") field installable mat grounding snaps. The first type is a screw-on snap kit Desco item number 09864 Universal Snap Kit.
   A. Determine the position of the grounding snap (one only per mat) and type of fastener you will be installing (socket or stud). Take precautions not to cut your hand, and punch a hole through the material with a small Phillips screwdriver or awl.
   B. Remove the release paper from the circular common point ground label and affix it so that it aligns with the hole on the material.
   C. Select one of the screws as follows:
   Material less than .100" thick - short screw
   Material greater than .100" thick - long screw
   D. Insert the screw through the top on the snap stud or socket, the washer, the label and the material. Affix the assembly with the conical nut supplied with the kit and tighten down the screw using a Phillips screwdriver.
   E. Remaining will be either a 10mm stud or socket, and either a long or short screw to be discarded or saved for another application.

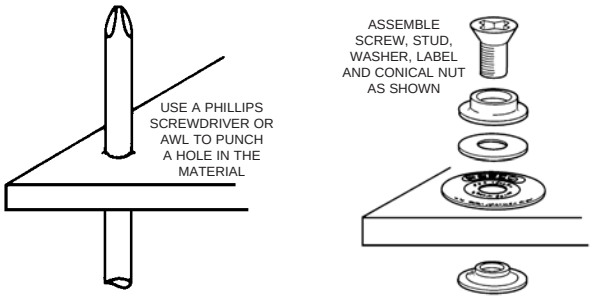



*Figure 8. Installing Universal Snap Kit on mat.*

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 excellent contact with the internal conductive scrim layer. It is recommended that before inserting this snap, the mat be punctured with a sharp tool where the snap will be placed. Take precautions not to cut your hand. Push and Clinch snaps are available as a snap stud as item #09861 and as a snap socket as item #09863.
   A. Remove the release paper from the circular label and affix it onto the mat material in the desired location.
   B. 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 to secure snap as shown in Figure 9.

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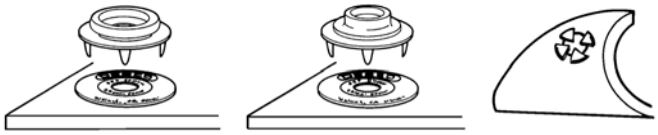


*Figure 9. Installing push and clinch mat grounding snap.*

4. The third type is the rivet style mat grounding snap. This type of snap assembly is installed using a rivetting hand tool, item #09867. Male snap studs and rivets are available as item #09856 and female snap sockets and rivets are available as item #09857. Groundable point labels are not included with either the item #09856 or #09857 snap kits.

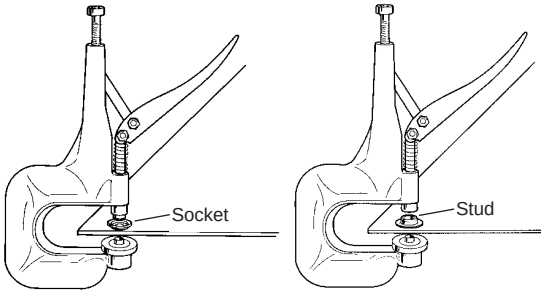



*Figure 10. Installation using a rivetting hand tool.*

## Selection of Common Point and 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. Desco recommends the use of common point ground cords or our 09740 dual bench mount.
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. ANSI/ESD S6.1 recommends that a non-resistor ground cord be used to ground worksurfaces and floor mats. However, cord may have a 1 megohm resistor for non ESD puropses. Selection of the ground cord is determined by user needs and specifications.
3. The 09837 Multi Ground Hub is designed for use as either a multiple grounding block or as a common point ground. The Multi Ground Hub incorporates six standard banana jacks, and six terminations for ring terminals (10-32 screw in threaded holes). Note: Also available as Desco item 19219 Ground Hub Monitor

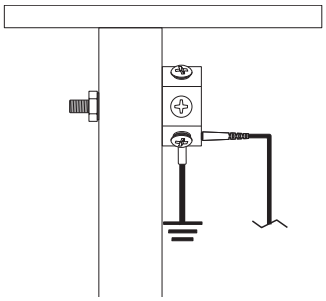


*Figure 11. Mounting the 09837 to a table leg.*

4. The 09740 dual bench mount allows the grounding of two operators at one common point. The 09740 mounts easily under the front edge of a workstation. For detailed information on this common point grounding device ask for Technical Bulletin TB-2003.

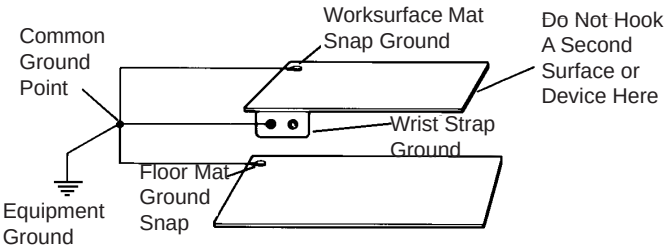



*Figure 12. 09740 dual bench mount.*

## Desco Ground Cord Item Numbers

| Model # | 1 Megohm Resistor | Designed for Floor Mat Use | Designed for Worksurface Use | Wire Length | Banana Jacks |
|---|---|---|---|---|---|
| 09814 | X | X | | 15' | 0 |
| 09813 | | X | | 15' | 0 |
| 09817 | X | X | | 10' | 0 |
| 09818 | | X | | 10' | 0 |
| 09820 | X | | X | 10' | 2 |
| 09821 | | | X | 10' | 2 |
| 09825 | X | | X | 15' | 2 |
| 09826 | | | X | 15' | 2 |
| 09835 | X | | X | 10' | 4 |
| 09836 | | | X | 10' | 4 |
| 09837 | | | X | 6' | 6 |
| 09740 | | | X | 10' | 2 |
| 09741 | | | X | 10' | 2 |

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6. The 09813 / 09814 mat ground cord 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 cord. When bolting the 09814 to the mat use a 3/8" 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.

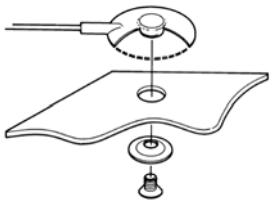


*Figure 13. Installing 09814 to mat using supplied hardware.*

## Mat Installation - General Information

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 grounds for proper resistance to ground. See Desco Technical Bulletin TB-2007 for a complete discussion of grounds.
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 and attach it using the ring terminal. A suggested ground point is the center screw of a standard AC electrical outlet. Testing is recommended to ensure that the screw is properly grounded. 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 Desco ground cord.

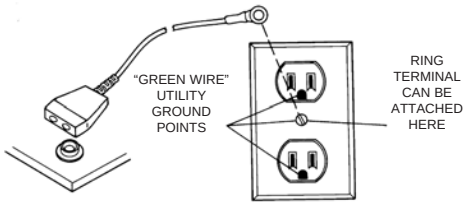



*Figure 14. Hooking up ground cords.*

4. If your installation includes a floor mat, you should duplicate step 2 and attach the floor mat ground to the same point as the worksurface ground wire.
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 1 ohm if you are using a non-resistor ground cord.
6. Using a surface resistance tester per ESD TR53, test the resistance to ground from the center of the mat surface. Required equipment: a megohmmeter with 100 volt open test circuit voltage and two five pound electrodes per ASTM-150. Desco sells this as the Digital Surface Resistance Test Kit, item #19780. For more information on the 19780, ask for Technical Bulletin TB-3014.
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 banana jack. Again, test the resistance from the backplate of the wrist strap to the common ground point. It should read 1 Megohm ± 20 percent.

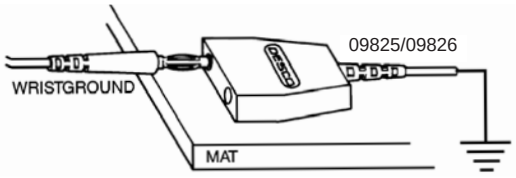



*Figure 15. Adding the wriststrap.*

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

The following bulletins are available from Desco:
TB-2004 Operation of 19350 Wrist Strap Tester
TB-2005 Wrist Straps, Grounding, Testing, Maintenance
TB-2007 Safe Grounding of Static Controlled Workstations

## Maintenance and Cleaning

For optimum electrical performance, Desco recommends for work surface mats our Reztore™ Surface and Mat cleaner, item #10435, and for floor mats our Statguard® Floor Mat cleaner, item #10443. DO NOT USE CLEANERS WITH SILICONE. They will build up a silicone coating on the surface which will cause the surface to become an insulator. Many common household cleaners contain silicone.

**Limited Warranty**
Desco expressly warrants that for a period of one (1) year from the date of purchase, Desco grounding products will be free of defects in material (parts) and workmanship (labor). Within the warranty period, the product will be tested, repaired, or replaced at Desco's option, free of charge. Call our Customer Service Department at 909-627-8178 (Chino, CA) or 781-821-8370 (Canton, MA) for a Return Material Authorization (RMA) and proper shipping instructions and address. Include a copy of your original packing slip, invoice, or other proof of purchase date. Any unit under warranty should be shipped prepaid to the Desco factory. Warranty repairs will take approximately two weeks.

If your unit is out of warranty call Customer Service at 909-627-8178 (Chino, CA) or 781-821-8370 (Canton, MA) for a Return Material Authorization (RMA) and proper shipping instructions and address. Ship your unit freight prepaid and Desco will quote repair charges necessary to bring your unit up to factory standards.

**Warranty Exclusions**
THE FOREGOING EXPRESS WARRANTY IS MADE IN LIEU OF ALL OTHER PRODUCT WARRANTIES, EXPRESSED AND IMPLIED, INCLUDING MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE WHICH ARE SPECIFICALLY DISCLAIMED. The express warranty will not apply to defects or damage due to accidents, neglect, misuse, alterations, operator error, or failure to properly maintain, clean or repair products.

**Limit of Liability**
In no event will Desco or any seller be responsible or liable for any injury, loss or damage, direct or consequential, arising out of the use of or the inability to use the product. Before using, users shall determine the suitability of the product for their intended use, and users assume all risk and liability whatsoever in connection therewith.

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