

# Protecting Shack Equipment from Electrostatic Discharge

**Dino Papas, KLOS**

In many parts of the world, the onset of winter means cold, dry air, which is just the thing you want for conducting static electricity experiments, but it also means a painful zap after walking across a carpet and reaching for a doorknob. These zaps are doubly dreaded by Amateur Radio operators because without adequate precautions, that spark can signal the destruction of sensitive electronic components. Fortunately, there are some easy and inexpensive steps to take for static protection.

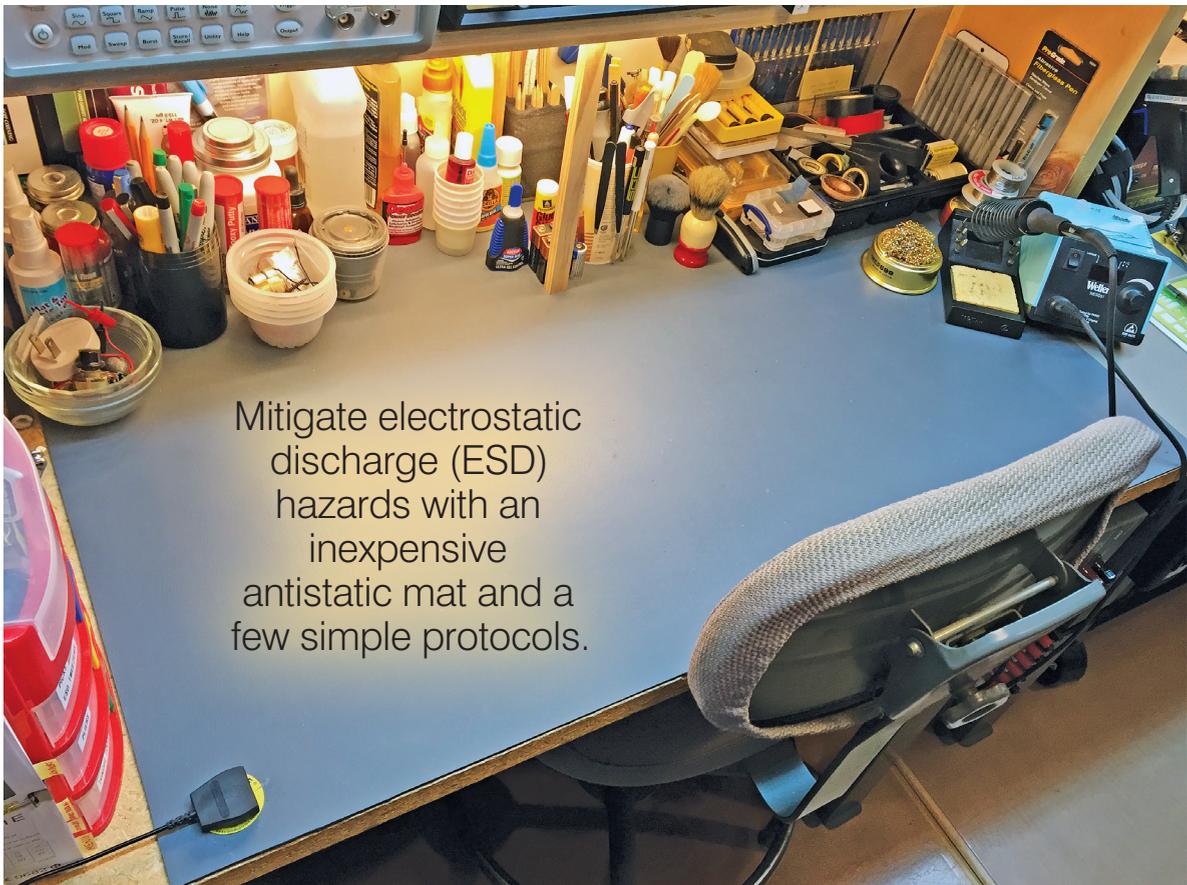
## The Antistatic Mat

The antistatic mat (see Figure 1) is one low-cost way to provide localized ESD protection. It is made of a material that presents a very high resistance between any two points, dissipating any charge differential between components placed on its surface. It further dissipates static charge by a connection to earth ground, which is easily made through your home's ground system by a connection to the screw that attaches an ac outlet's cover plate. The 3M Company has an excellent guide that depicts this, along with a more exten-

sive system that includes an additional floor mat — something to consider if your workbench sits on carpeting.<sup>1</sup>

Higher quality antistatic mats are also quite resistant to heat and liquids, and you can actually touch the mat with your soldering iron tip without damaging it, so it makes a

<sup>1</sup>B. Beamer, "How to Install an ESD Workstation," a 3M Company publication available for download from [www.digikey.com/Web%20Export/Supplier%20Content/3M\\_19/PDF/3M\\_Installing\\_an\\_ESD\\_Workstation.pdf?redirected=1](http://www.digikey.com/Web%20Export/Supplier%20Content/3M_19/PDF/3M_Installing_an_ESD_Workstation.pdf?redirected=1).



Mitigate electrostatic discharge (ESD) hazards with an inexpensive antistatic mat and a few simple protocols.

**Figure 1** — A large antistatic mat covering the author's workbench. The mat's ground connection is at the lower left, which also provides a wrist strap connection point.



**Figure 2** — The wristband, which plugs into the antistatic mat's ground connection point.



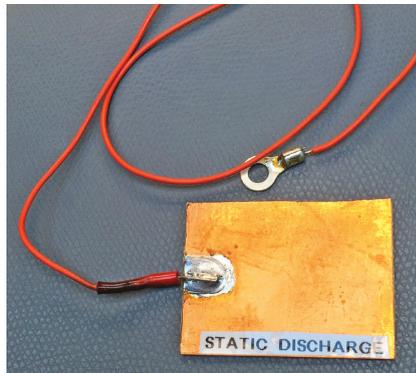
**Figure 3** — The antistatic mat ground connection point.

great workbench surface. However, they are not suitable as a cutting surface like a self-healing cutting mat is.

### A Conductive Wristband

Simply working on an ESD mat doesn't always preclude zapping a component — you need to ground your body as well. The clothes you're wearing can contribute significantly to building up a static charge on your body. A conductive elastic wristband (see Figure 2) that plugs into the mat's ground point (see Figure 3) ensures that the charge is sufficiently drained away to prevent component damage.

It's up to you if you want to wear the conductive wristband every time when sitting down to do some work at the bench. Most of the time, simply touching your finger to the ground connection point or mat will most likely drain off any charge you may



(A)



(B)

**Figure 4** — (A) shows the safe discharge point for the operator's desk, comprised of copper-clad PC board connected to a grounding wire through a 10 MΩ resistor. (B) shows the convenient location of the discharge point beneath the receiver's tuning knob.

have built up. However, when the humidity is low, even moving your body while seated can build up a charge from your clothes rubbing together or against the fabric of your seat. Touching a piece of unprotected test gear might result in a damaging discharge, so being directly connected to a dissipative mat while grounded via your wrist strap is a good way of protecting yourself and any static-sensitive components you may work with.

### Making the Station ESD Safe

You might be inclined to install another antistatic mat at the operator's desk to provide similar ESD protection for your station's equipment, but there is a caveat — the soft mat makes a poor writing surface. I got around this problem by creating a safe discharge point that I touch first when sitting down at the operator's desk.

I made the discharge point from a small piece of copper-clad printed circuit board (PC board) connected via a 10 MΩ resistor to my station's grounding bar that runs behind the operator's desk and serves as the local ground connection for the station's equipment (see Figure 4A). The high resistance means that any accumulated charge drains off *slowly*

without a zap whenever I touch the plate. The discharge point resides conveniently just below my receiver's tuning knob (see Figure 4B).

So, on a cold, dry day when I know that static sparks are going to be flying, before sitting down at my operating position, I simply touch the discharge point and the static charge is gone. I can then touch anything on or around my desk without doing damage to the gear, or getting a painful zap to my finger.

Photos by the author.

Amateur Extra-class licensee and ARRL Life Member Dino Papas, KL0S, has been an Amateur Radio operator for almost 50 years. He holds a BSEE degree from the University of California at Davis and a Master's in engineering management from George Washington University. Dino retired as a colonel after 26 years active duty in the US Army. He now resides with his wife Toby, KL0SS, who is also an Amateur Radio operator and Life Member, in Williamsburg, Virginia, where he is president of the Williamsburg Area Amateur Radio Club. Dino and his wife host the club's Builders Group, a regular meeting of hams to homebrew together, that was described in "Ham Radio Makerspace" in the February 2015 issue of *QST*. You can contact Dino at [kl0s@arrl.net](mailto:kl0s@arrl.net).

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