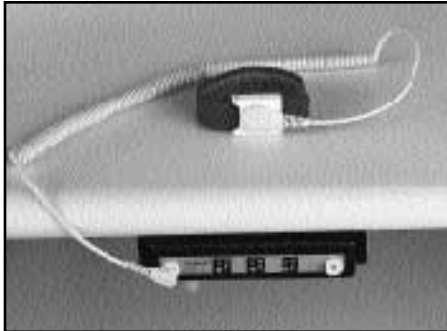


About Continuous Wrist Strap Monitors



While wrist straps are the first and best line of defense against ESD, they must be tested to ensure that they are installed and working properly. On-demand or "touch" testers have become the most common testing method. On-demand testers complete a circuit when the wrist strap wearer touches a contact plate.

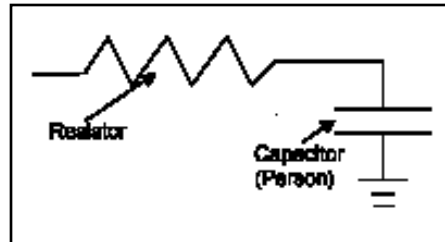
One drawback with on-demand type testers is that they require a dedicated action by the wearer of the wrist strap to make the test. Also, knowing that the wrist strap has failed after the fact may possibly have exposed a highly sensitive or valuable assembly to risk. Continuous monitors eliminate the possibility of a component being exposed to ESD during the time period that the wrist strap was not working properly.

1-Wire Systems (Older Technology)

AC CAPACITANCE MONITORS

The first constant monitors developed about 15 years ago made use of the fact that a person can be thought of as one plate of a capacitor with the other plate being ground. The ground and the person are both conductors and they are

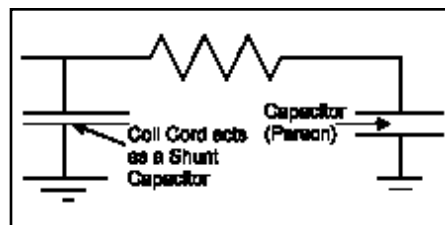
separated (sometimes) by an insulator (shoes, mats, carpet, etc.) thus forming a capacitor. The combined resistance of the wrist strap and person forms a resistor so that the total circuit is a simple RC circuit:



A tiny AC current applied to this circuit will cause a displacement current in the capacitance to flow to ground providing a simple way to make sure the person (capacitor) resistor (wrist strap) and coil cord are all hooked up. Any break in this circuit results in a higher impedance that can be used to trigger an alarm.

AC capacitance monitors have a few drawbacks:

1. They do not provide a reliable way to know if the total resistance of the circuit is too low, i.e., if the current limiting safety resistor is shorted.
2. Simple AC capacitance monitors can be tricked into thinking the person is wearing the wrist strap when they are not. For example, laying a wrist strap and cord on a grounded mat will increase the shunt capacitance, which allows the monitor to show a good circuit even with the person out of the circuit. Forming the cord into a tight bundle or stretching it can also provide false readings.



3. Since the capacitance and therefore the impedance of the circuit will also vary with such things as the persons size, clothing, shoe soles, conductance of the floor, chair, table mat, the person's positions (standing or sitting), etc., these monitors often have to be "tuned" to a specific installation and operator.

2-Wire Systems

DUAL-WIRE RESISTANCE MONITORS



Dual Wire Continuous Workstation Monitor

Dual-wire Resistance monitors were developed to overcome some of the problems with the AC capacitance types. Here again the concept is simple. By providing a second path to ground (without relying on the capacitor above) we can apply a tiny DC current. It is then simple to measure the DC resistance of the circuit and alarm if that resistance goes too high (open circuit) or too low (the safety resistor is shorted). Thus a two-wire monitor provides the same reliability as a touch tester and a simple, easy to understand measurement. The shortcomings with the AC capacitance monitor are eliminated.

Two-wire monitors require two wires to work. This means that the wearer must wear a dual wire two-conductor wrist strap / coil cord which are more expensive than standard single wire wrist straps.

There have been some reports that a constant DC voltage applied to the wristband causes skin irritations. This has been addressed in some models by pulsing the test current and in others by lowering the test voltage.

3-Wire Systems

THREE WIRE RESISTANCE MONITORS

The design of the two-wire monitor circuit and its position in the total grounding circuit may mean that only a portion of the total ground connection is being monitored. This has caused some manufacturers to add a third wire to provide another return path to ground. However these units still do not verify that the wrist strap is actually connected to the building or system ground.

1-Wire (New WDM technology)

WAVE FORM DISTORTION MONITORS (WDM)



Full Time Continuous Workstation Monitor, Item #41116

Many of the shortcomings of the Capacitance and other earlier monitors have been overcome with the development of AC monitors that use the concept of the wrist strap wearer as a capacitor, but in a different way. The concept of the wrist strap and wearer as an RC circuit is not wrong but it is an oversimplification. Actually the total circuit contains resistance, capacitance

and inductance (RCL). Each component value will vary with the environment, size of wearer, and the other factors that effect the accuracy of the AC Capacitance monitor.



Dual Operator Workstation Continuous Monitor, Item #41137

What the wave form distortion monitor looks at is not the impedance level, but at the waveform generated by the circuit. Current will lead voltage at various points due to the combinations of resistance and capacitive reactance. (There is a negligible amount of inductive reactance from the coil cord.) By monitoring these "distortions" or phase shifts the WDM will determine if the circuit is complete i.e.; the wearer is in the circuit and the total equivalent DC resistance is within specifications given a range of installations.

What does this all mean in layman's terms? Essentially the unit will monitor the operator by sending a "signature" signal down the coil cord to the operator's wrist. The operator acts as a load and will reflect that signal back to the monitor with a different signature. The monitor will then compare the reflected signature to its factory pre-set signatures. If the signal is within the "good" range, the operator passes and the monitor will continue its work. If the signature is "not" good, the monitor will go into an alarm-state to warn the operator to stop working and fix the problem.



Workstation Continuous Mini Monitor, Item #41126

The WDM solves many of the problems of the other types:

- It allows the use of any brand of single wire wrist strap
- It cannot be tricked like the AC Capacitance units
- It provides a warning if the lower (safety) resistance limits are compromised
- The tiny amount of current required to generate the waveform has never caused reported skin irritation.

As an added bonus the WDM will also detect an open circuit or bad ground all the way back to the building ground point. This is a fundamental advantage of this kind of monitor. Other monitors may insure that the operator is connected to the monitor. No other monitor automatically ensures that the user is actually grounded.

AVAILABLE RESOURCES

Understanding the technology behind the various types of monitors can get technical. Tech briefs are available on all ESD Systems.com's wrist strap monitors. If you have further questions please contact our technical support department or visit our Web Site found at www.esdsystems.com.