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United States of America

# Multi-Mount Continuous Monitor Operation, Installation and Maintenance



Figure 1. Charleswater [99129](https://www.charleswater.co.uk) Multi-Mount Continuous Monitor

## Description

Leading companies use continuous monitors as a cost effective component in satisfying some of the audit and check requirements of EN 61340-5-1. The Charleswater Multi-Mount Continuous Monitor continuously monitors the integrity of one operator. This monitor will provide virtually instantaneous notification of static control equipment failures, eliminating the need of periodic testing and costly record keeping. This unit is highly cost effective as it is designed to monitor any conventional single-wire wrist strap and ground cord system (wrist strap and mat ground cord to EBP or earth protective ground not included). Its small package and mounting tabs with holes make it highly suitable to install on most any equipment or work bench surface. In addition, optional mounting is available using the provided adhesive-backed Velcro® strips. Using either mounting method makes the Multi-Mount Monitor suitable for most any machinery or workbench even in hard to reach locations.

The Multi-Mount Continuous Monitor is a real time instrument that ensures that critical ESD generators in a sensitive area are effectively grounded. The instant an operator's wrist strap or cord fails, the monitor will issue audible and visual (LEDs) alarms alerting the user and supervisor of the problem.

All Charleswater single-wire monitors with wave distortion technology include the Park Snap feature. Use the Park Snap to store the operator's wrist cord and enable standby mode while the operator is away from the workstation. Before disconnecting the coil cord from the wristband, the operator touches the Park Snap to disable the audio alarm for 6 seconds. Within the 6 second period, the operator can disconnect their wrist cord from their wristband and attach it to the Park Snap before the audible alarm sounds.

## ADVANTAGES OF CONTINUOUS MONITORING OVER PERIODIC TESTING

Many customers are eliminating periodic testing and are utilizing continuous monitoring to better ensure that their products were manufactured in an ESD protected environment. Full time continuous monitoring is superior

to periodic or pulsed testing, and can save a significant amount of money in testing costs and rejected product. Periodic testing detects failures after ESD susceptible products have been manufactured. The costs of dealing with the resulting catastrophic or latent defects can be considerable. Multi-Mount Continuous Monitors eliminate the need for users to test wrist straps and log the results; by their function, these monitors satisfy the ISO 9000 and EN 61340-5-1 test logging.

## WAVE DISTORTION DETECTION TECHNOLOGY PROVIDES TRUE 100% CONTINUOUS MONITORING

From all the technical alternatives available, Charleswater has chosen wave distortion technology for many of its Continuous Monitor product offerings. Wave distortion circuitry monitors current/voltage phase shifts and provides true 100% continuous monitoring. Electrical current will lead voltage at various points due to the combinations of resistance and capacitive reactance. By monitoring these "distortions" or phase shifts, the wave distortion Multi-Mount Continuous Monitor will reliably determine if the circuit is complete.

Wave distortion technology can be referred to "vector impedance monitoring". This description is valid as the wave distortion technology measures the impedance at the monitored banana jack and looks for changes in either the capacitance or resistance of the circuit which includes the wrist strap and its wearer. It uses filtering and time domain sampling to filter out false signals caused by voltage offsets, 60 Hz fields and other electro-magnetic and electrostatic interference.

In normal factory environments, and with persons whose capacitance with respect to ground is within design limits (5 feet tall 90 pound person to 6 foot 5 inch 250 pound person), the Multi-Mount Continuous Monitor cannot be "fooled". It will provide a reliable alarm only when the wrist strap becomes dysfunctional or unsafe according to accepted industry standards. The Multi-Mount Continuous Monitor is drift-free and designed to be insensitive to the effects of squeezing or stretching the coil cord.

## ADVANTAGES OF WAVE DISTORTION AND SINGLE-WIRE TECHNOLOGY

The Charleswater Multi-Mount Continuous Monitor allows the use of any standard, single-wire wrist strap and coil cord. The monitor/wrist strap/cord system life-cycle costs are by far lower than alternative systems which require expensive & fragile dual-wire cords and special wrist straps. Dual-wire cords are expensive and are the weak link of the system, the most likely component to need replacement. Over a five year period, this can make the dual-wire system three to five times as expensive as a system utilizing single-wire wrist straps and cords. See Maintenance and Calibration (page 4) to minimize life-cycle costs.

The dictionary defines constant as uniform and unchanging, and continuous as uninterrupted. Nonetheless, some dual-wire resistance monitors utilize a pulsed test current and do not really provide continuous monitoring. For example, during each 2.2 second pulse cycle of a leading "constant" resistive monitor, electrical current is pulsed for only 0.2 seconds followed by an unmonitored interval of 2 seconds. This leaves the user/wrist strap unmonitored for over 90% of each cycle. Damaging static charges can easily occur in the portion of the time in between the pulses. The off period of 2 seconds equals 2 billion nanoseconds, and "it takes only about 25 volts applied for 100 nanoseconds to blow most memories or microprocessors.\* The dual-wire system does not reliably meet all industry specifications, as the cords do not meet the EOS/ESD S-1.0 paragraph 4.1.6, 1 to 5 pound "breakaway force" requirement for operator safety.

By using the reliable wave distortion technology to determine if the circuit is complete, there are no false alarms. There is no need to adjust or tune the monitor to a specific user or installation. The miniscule amount of electrical current (less than 1 volt coil cord signal) required to generate the waveform has never caused reported skin irritation and is extremely safe for use in voltage sensitive applications such as disk drive manufacturing.

## WORKSURFACE CHANNEL

The Multi-Mount Continuous Monitor's circuitry is sufficiently sensitive to detect extremely low current, allowing it to be used with mats having a resistance of up to  $1 \times 10^7$  ohms Rtg. When the Monitor is connected to an ESD Mat worksurface, the amount of current that flows is a function of the total resistance between the monitor and through the worksurface to ground. When the resistance of the worksurface is below a pre-set threshold, the monitor will indicate good. Conversely, if the resistance level is high when compared to the monitor's reference, the unit will alarm. This is an integrating resistance measuring circuit, therefore it is relatively insensitive to externally induced electromagnetic fields. The resistance threshold is factory set to 10 megohms. (It can be special ordered to other limits. Limits can be varied and set to 100 megohms maximum).

## Packaging

- 1 Multi-Mount Monitor
- 1 Power Adapter
- 1 15 cm Mat Monitor Cord (Black)
- 1 15 cm Mat Ground Cord (Green and Yellow)
- 2 Push and Clinch Snaps
- 2 Mounting Screws
- 2 Countersink Washers
- 1 Set of Hook and Loop Fasteners
- 1 Banana Plug / 10mm Snap Adapter
- 1 Certificate of Calibration

Note: wrist strap and ground cord not included

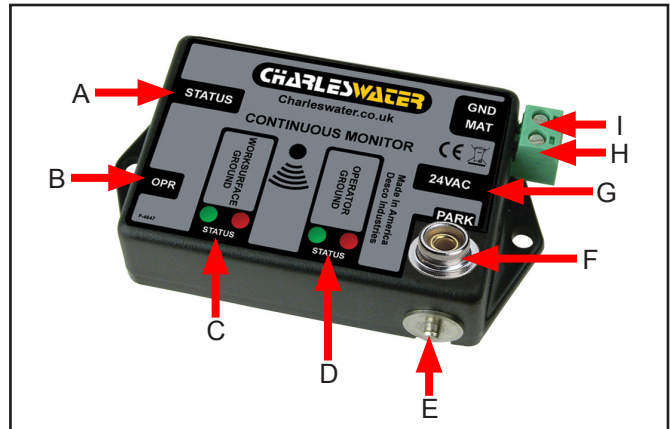


Figure 2. Multi-Mount Continuous Monitor features and components

## Features and Components

**A. Status LEDs:** When the green LED is illuminated, the operator is properly grounded. When the red LED is illuminated, the operator is not properly grounded.

**B. Monitored Operator Jack:** Where the operator connects their wrist cord. The included banana plug / 10mm adapter may be inserted into this jack if a wrist cord with a 10mm snap is to be used with the monitor.

NOTE: The monitor is not compatible with wrist cords that have 1 megohm resistors at both terminations. The termination with the 1 megohm resistor must always be connected to the operator and not the monitor.

**C. Worksurface Ground LEDs:** When the green LED is illuminated, the worksurface mat is properly grounded. When the red LED is illuminated, the worksurface mat is not properly grounded.

**D. Operator Ground LEDs:** When the green LED is illuminated, the operator is properly grounded. When the red LED is illuminated, the operator is not properly grounded.

\*1981 article by Donald E. Frank - Electrical Overstress / Electronic Discharge Symposium Proceedings

**E. 4mm Parking Snap:** When touched by the operator, this snap will deactivate the alarm for six seconds. This allows time for the operator to disconnect the coil cord from the wrist band and park it on this snap. While parked, the coil cord disables the alarm, allowing the operator to leave the workstation. The OPERATOR GROUND LED will remain off while the cord is parked. Upon returning and removing the coil cord from the parking snap, the operator has six seconds to hook up to the wrist band before the alarm sounds.

**F. 10mm Parking Snap:** When touched by the operator, this snap will deactivate the alarm for six seconds. This allows time for the operator to disconnect the coil cord from the wrist band and park it on this snap. While parked, the coil cord disables the alarm, allowing the operator to leave the workstation. The OPERATOR GROUND LED will remain off while the cord is parked. Upon returning and removing the coil cord from the parking snap, the operator has six seconds to hook up to the wrist band before the alarm sounds.

**G. 24 VAC Power Jack:** Connect the power adapter here.

**H. Mat Connection:** Monitor's worksurface mat. NOTE: To disable worksurface monitoring, shunt this terminal to the neighboring GND terminal with bus wire.

**I. Mat Ground:** Grounds worksurface mat.

## Installation

Remove the monitor from its packaging and inspect for any shipping damage. Confirm that the work surface is  $1 \times 10^7$  ohms or less and has a conductive layer such as Dual Layer Rubber, Dissipative 3-Layer Vinyl, or Micastat® Dissipative Laminate with conductive buried layers.

Locate a nearby power outlet and test it for proper wiring and grounding. We recommend the [Charleswater AC Outlet Analyser](#) to verify proper wiring and ground.

The Multi-Mount Continuous Monitor may be mounted to a convenient location using the included mounting screws or Velcro® set.

The Multi-Mount Continuous Monitor can be installed in two different methods. The method illustrated in Figure 3 uses the GND terminal on the continuous monitor to ground the worksurface mat. The method illustrated in Figure 4 does not use the GND terminal and instead uses a separate ground connection to ground the worksurface mat. These methods do not cause the monitor to behave differently and are solely for user preference.

## Method 1: Using the Multi-Mount Monitor to Ground the Worksurface

1. Install Screws and Washers or Push and Clinch snaps 30 to 183 cm inches apart from each other on the worksurface mat. Make sure that they pierce and clinch the bottom side of the mat.
2. Route the black monitor cord to the monitor's green terminal block labeled MAT.
3. Route the green ground cord to the monitor's green terminal block labeled GND.
4. Connect the power adapter to the monitor's power jack labeled "24VAC" and the other end to a proper voltage source.

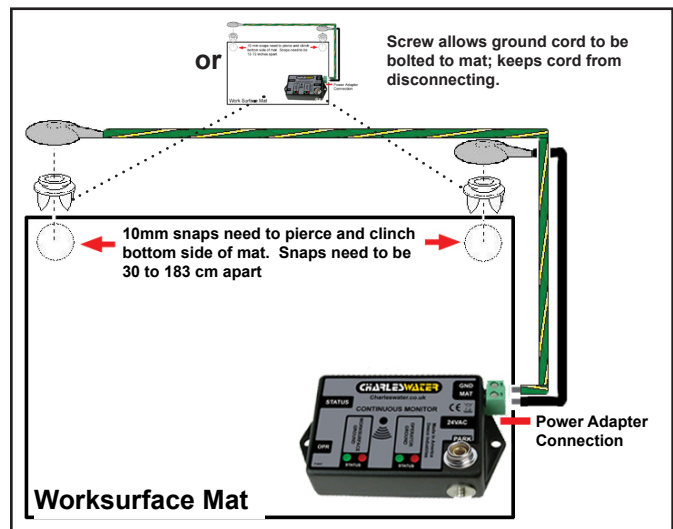


Figure 3. Installation method #1 of the Multi-Mount Continuous Monitor

## Method 2: Using an Independent Ground Cord to Ground the Worksurface

1. Install Screws and Washers or Push and Clinch snaps 30 to 183 cm inches apart from each other on the worksurface mat. Make sure that they pierce and clinch the bottom side of the mat.
2. Connect the included black monitor to the snap closest to the monitor and route it to the MAT terminal located on the green terminal block.
3. Connect the remaining 10 mm snap to ground. This will ground the worksurface mat.
4. Connect the power adapter to the monitor's power jack labeled "24VAC" and the other end to a proper voltage source.

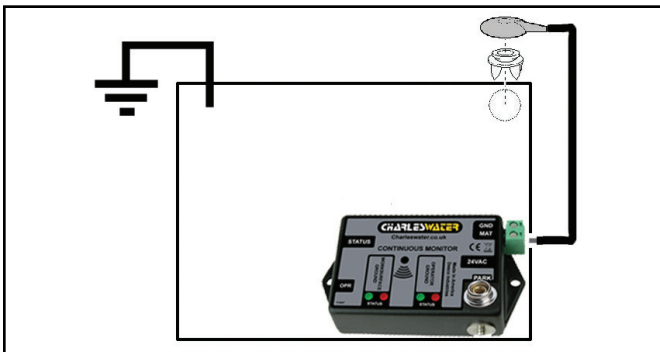


Figure 4. Installation method #2 of the Multi-Mount Continuous Monitor

## Operation

When the Multi-Mount Continuous Monitor is installed to an ESD protective worksurface and grounded via a power cord, the green WORKSURFACE GROUND LED and red OPERATOR GROUND LED should be illuminated. The monitor takes 6 seconds to activate its alarm circuitry when the operator is first plugged in.

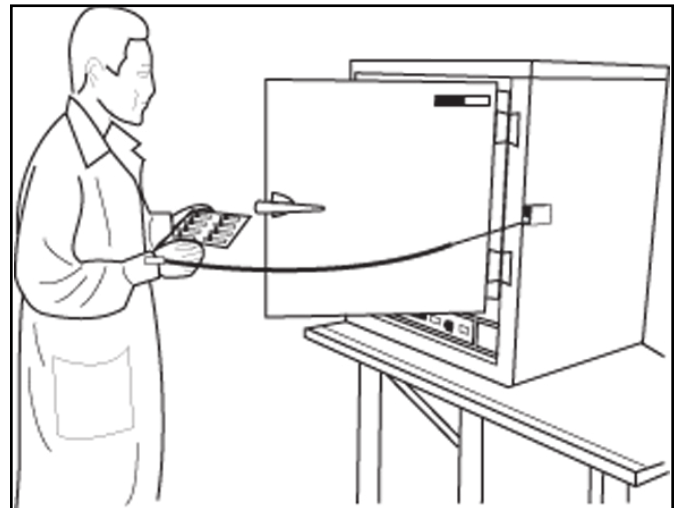
The worksurface resistance is measured between the two cords installed to the mat worksurface.

### USING THE MONITOR

1. Plug a wrist strap cord banana plug into the monitored banana jack on the front of the unit. This automatically activates the selected operator channel. The red operator LED should turn on.
2. Remove the charges from your body by making contact with a properly grounded ESD worksurface. Snap the cord to the wristband, and fit it snugly onto the wrist. This should silence the audio and cause the LEDs to switch from red to green. If this does not happen, check the coil cord for continuity or damage. Examine the wrist strap and confirm that it has a secure fit. If you have dry skin, apply an approved dissipative hand lotion such as Menda [35666](#) Reztore™ ESD Hand Lotion. When leaving the area, a person can take the coil cord along or leave it attached to the monitor in park position.

**NOTE:** Removing the banana plug from the monitor's operator jack will disable the audio alarm.

It is recommended that you use the Park Snap rather than continuously removing the banana plug from its jack. Doing so will increase the life span of the operator jack. If your process requires the constant insertion and removal of the banana plug, please contact your Charleswater Representative for alternate solutions.



## Maintenance and Calibration

The Multi-Mount Continuous Monitor is solid state and designed to be maintenance free. It is calibrated to NIST traceable standards. There are no user adjustments necessary. Because of the wave distortion sensing nature of the test circuit, special equipment is required for calibration. We recommend that calibration be performed using the EMIT [50512](#) Single-Wire Monitor Calibration Unit. It is a convenient product which allows the customer to perform NIST traceable calibration on continuous monitors. The [50512](#) is designed to be used on the shop floor at the workstation, virtually eliminating downtime, verifying that the continuous monitor is operating within tolerances.

## Specifications:

Test range of monitored circuit	500 kilohm to 10 megohm†
Operating Voltage	24 VAC, 50/60 Hz
Worksurface Range	10 Megohms
Wrist strap open circuit voltage	1.2 volts peak to peak @ 1-2 MicroAmps
Mat test open circuit voltage	5 to 7.5 volts
Response time to alarm	<50 ms
Operating Temperature	0 - 40°C
Size	98.3 mm L x 52.8 mm W x 22.9 mm H

† This cannot be verified with standard DC test equipment. The continuous monitor is an impedance sensing device and the limits are determined by the magnitude and angle of the impedance.

**NOTE:** Worksurface must have a conductive layer such as Dual Layer Rubber or Dissipative 3-Layer Vinyl or Micostat® Dissipative Laminate with conductive buried layers. Charleswater Continuous Monitors are not recommended for use with homogeneous matting.

## Limited Warranty

Charleswater expressly warrants that for a period of one (1) year from the date of purchase, Charleswater Continuous Monitors will be free of defects in material (parts) and workmanship (labour). Within the warranty period, a unit will be tested, repaired or replaced at Charleswater's option, free of charge. Call Customer Service at 00 44 (0) 1892-665313 for a Return Material Authorisation (RMA) and for proper shipping instructions and address. Any unit under warranty should be shipped prepaid to the Charleswater factory. You should include a copy of your original packing slip, invoice, or other proof of purchase date. Warranty repairs will take approximately two weeks.

If your unit is out of warranty, Charleswater will quote repair charges necessary to bring your unit to factory standards. Call Customer Service at 00 44 (0) 1892-665313 for a Return Material Authorisation (RMA) and proper shipping instructions and address.

## 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 Charleswater 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.