Title:

Electrostatic Discharge Control (ESD)

Revision	Description of Change	Date Effective	Author
A	Initial Release	05/25/98	Dior Wu
B	Deleted section 6.5. Renumbered 6.0.	08/26/99	S. Gomez
C	Changed section 5.5.	08/18/03	Peter Fang
D	Added use of PQAP0177 REV .B In section 8.3 & 9.5.1	08/06/04	Imtiaz Sheikh
E	Changed section 9.2 and added Office Staff for use of Heel/Toe/ Wrist strap. Changed the Singe Titles on the cover page.	11/27/07	Anjum Malik
F	-Clause 5.5 revised to have ESD floor checks and work tables check on a quarterly basis instead of monthly. Modified Signatories for approvers	10/01/2010	Ray Ung
G	Revised 5.5, 8.2 and 9.5.1, add new 6.8	03/02/17	Kiet Pham
H	Modified/added clauses to be in compliance with ISO 9001:2015 and ISO 13485:2016	10/26/17	Kiet Pham

Originator

VP of Quality

VP Operations

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Title:

Electrostatic Discharge Control (ESD)

1.0 Purpose

1.1 The purpose of this procedure is to describe the requirements for Electrostatic Discharge (ESD) Control at Meritronics. It defines Maintenance & Facilities, equipment, materials, training, monitoring, applicable specifications and standards, publications and special considerations.

2.0 Scope

2.1 The content of this document provides the instructions and procedures required to implement the ESD control program.

3.0 References

3.1 IPC-A-610 - Acceptability of Printed Board Assemblies.

4.0 Definitions

4.1 Electrostatic Discharge (ESD) it is the sudden transfer (discharge) of electricity from one object or body to another.

4.2 ESD Protective Materials are capable of one or more of the following: Limiting the generation of static electricity, rapidly dissipating electrostatic charges over its surface of volume, providing shielding from ESD spark discharge or electrostatic fields and any combination thereof. Per IPC-A-610 materials are classified in accordance with their surface resistivity (or conductivity) as Conductive, Static Dissipative or Insulating.

4.3 Anti-static Material is material which does not generate charge through friction with other materials. The anti-static property is independent of surface resistivity.

4.4 Hard Ground is a conductive connection which ultimately terminates in a conductor driven into at least three feet of earth. A cold water pipe (including sprinkler) which is conductivity connected to cold water building supply is acceptable. A local power ground is acceptable.

4.5 Soft Ground is a connection to hard ground through a resistance sufficiently high enough to limit a current flow to safe levels for personnel. The minimum acceptable total resistance for a soft ground is 1.0 Megohms; the maximum acceptable is 2.5 Megohms.

4.6 ESD Protected Area is an area which is equipped with the necessary ESD protective materials, equipment, and procedures to limit ESD voltage below the sensitivity level of all devices handled therein.

5.0 Responsibilities

5.1 All employees are responsible for following and ensuring compliance to this procedure.

5.2 This procedure must be followed by all personnel in ESD Protected Areas. This includes all employees, inspectors, visitors and contractors. For simplification, all of the above are herein referred to as "operators".

5.3 Manufacturing will ensure adherence to this procedure to minimize the effects of ESD events on new products and products returned to Meritronics for repair or upgrade.

5.4 The Production Manager/Supervisor are responsible for providing blank ESD Logs to manufacturing for sign-in, and for filing completed logs.

5.5 Floors and workbench will be checked once a month by Engineering or designee. Data shall be correlated and floors shall be treated with ESD wax as required (by Contractor) to maintain surface resistivity of floors at less than 1 Giga-ohms.

5.6 The host of any visiting customer or other party is responsible for explaining the Meritronics ESD Control program and providing smocks and or wrist straps as required.

5.7 It is the employee's responsibility to check the wrist strap and heel straps on a daily basis. Check logs are provided and filled out daily.

5.8 Engineering has responsibility to ensure that all table and work stations are grounded properly when installed. Each new table will be checked at each critical grounding spot with an ohmmeter before release to production. The ground wire for wrist strap, the table top, the frame of the table, the super strut or metal pipe, and ground must be connected. The table top or mat surface resistivity must be in the static dissipative range.

5.9 The supervisor of the area where ESD material is handled is responsible for total compliance with all ESD guidelines contained herein.

5.9.1 The employee's ground strap must be touching the person's skin to avoid possible shunting of the resistance.

5.9.2 The wrist strap must contain a quick release so the strap will release in case of an emergency without injury to the person wearing the strap.

6.0 Equipment

6.1 Wrist ground strap

6.2 Heel ground straps [2 per employee]

6.3 Conductive handling trays

6.4 Static dissipative smocks

6.5 Conductive table mat

6.6 Wrist/ Heel strap tester

6.7 Ohmmeter

6.8 Surface Megaohmmeter

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7.0 Materials

7.1 Static safe adhesive tape

8.0 Records

8.1 The total retention period for records generated from this document by Meritronics Inc. is as reflected on the Master Forms Listing under the column heading Record Retention. If the status is inactive, the records will be forwarded to Document Control and filed/maintained in accordance with SOP 29.

8.2 ESD Monthly Audit Report - PQAP023

8.3 ESD Wax Log-PQAP177

9.0 Procedure

9.1 Visitors, maintenance contractors, and construction personnel who are in the ESD protected area for a specific task are exempt from wearing a smock or straps. These people must not come in contact with components or assemblies. Maintenance technicians are exempt from wearing heel straps at all times.

9.2 The Executive Staff, Program Managers and Office Personnel must wear Heel/Toe or Wrist Straps at times when in contact with or handling assemblies or any other ESD sensitive item on the production floor, parts stock room, shipping and receiving area.

9.3 Smocks

9.3.1 Visitors should wear a company furnished smock around any ESD protected area only when they will be making contact with the assemblies. Smocks must be properly fastened; wearing unfastened smocks does not provide the proper protection. At least three buttons should be closed.

9.3.2 Smocks shall not be altered from manufacturer's design, e.g., no short sleeve smocks.

9.3.3 Personal clothing (hood, scarves, etc.) shall not touch the outside of the smock while being worn. No personal clothing is to be worn over the smock.

9.4 Carts are grounded by a chain which discharges to the floor.

9.5 Work Areas

9.5.1 Work tables are either painted with conductive paint or provided with an anti-static mat. Protective work surfaces shall be connected to a soft ground. The connection will typically be through a 1 Meg ohm resistor. Once a monthly the Engineering will be checking the workbenches, floor and carts for ESD Protection (the surface resistivity and grounding) and will record the results on PQAP0023

9.5.2 Areas which are never to be used as grounded work stations include: Office desks, any work area that is specifically labeled as not a grounded work area, any form of plastic or wood topped work station.

9.5.3 Tubes, anti-static trays of devices or assemblies may not be placed on insulating surfaces such as plastic or wood.

9.6 Packaging Materials - The following shall be considered as acceptable ESD protective packaging alternatives within Meritronics or at subcontractors:

9.6.1 Finished goods are packaged as designated by the customer or Meritronics which can include, but is not limited to, anti-static or static dissipative bags, pink poly bubble wrap, or static dissipative boxes.

9.6.2 Purchased ESD sensitive materials must be packaged in static dissipative or anti-static packaging and properly labeled per IPC-A-610.

9.6.3 All protective packaging or containers shall be labeled or otherwise identified, denoting ESD Sensitive items within, and specifying that ESD protection procedures must be observed.

9.6.4 Devices and assemblies must be in conductive, dissipative or anti-static container (tube, tray, box, etc.) whenever they are transported.

9.7 Transportation

9.7.1 All components and assemblies must be received in an anti-static or conductive container and must not be removed from the container except at an ESD protected workstation. Before removing components and assemblies from their containers, the operator should place the container on a static-free work surface. All operations on components and assemblies should be performed in contact with the static free work surface as much as possible.

9.7.2 Components and assemblies will not be shipped with clear plastic "Bubble Wrap".

9.7.3 Components may be moved in tubes on the manufacturing floor.

9.7.4 Devices or assemblies packaged in ESD shielding may be shipped to customers or transported within Meritronics or to subcontractors in non-ESD protective containers, such as cardboard boxes or plastic trays.

9.7.5 Where additional packing material is required to prevent motion of the contents by filling the container (padding), anti-static material must be used.

9.8 Heel/Toe and Wrist Straps

9.8.1 Employees may be issued a wrist and two heel/toe straps when they are hired. The employee is responsible for wearing the wrist and two heel/toe straps correctly.

9.8.2 It is the responsibility of the area supervisor and the operator using the wrist and heel straps to insure that the wrist and heel straps are tested before use.

9.8.3 The heel straps shall be worn over the shoe with the strap placed inside the sock for persons wearing regular socks, or for nylons the strap can be worn outside the nylon. The wrist and heel straps will be tested at the beginning of each shift prior to any production activities to verify that they work. Engineering, supervisory personnel: Prior to any activities involving the handling components or assemblies. The results of the check shall be logged into the ESD Log. The log shall contain the operators name, shift, date and strap check results.

9.8.4 The wrist and heel straps under test shall be worn by the person performing the test.

9.8.4.1 Wrist strap under test:
The clip/plug of the wrist strap shall be attached to the wrist strap tester. Ensure that the strap is snug around the wrist before testing. Press down on the metal contact plate and observe the Pass-Fail indicator lamps. If the Pass lamp is on, the resistance being measured is within the acceptable range and the strap passes. If a Fail lamp is on, the strap is outside the acceptable range and fails. Readjust the strap and re-test. The results are logged into the ESD Log including the operators name, shift, date, and results of the test.

9.8.4.2 Heel straps under test:
Ensure that the heel straps are worn properly before testing. Step on the test plate and press the test button with a bare finger. The tester will test the resistance from the finger to the plate. If the pass (green) lamp is on, the resistance being measured is within the acceptable range and the straps pass. If the Fail (red) lamp is on, the straps are outside the acceptable range and fail. Readjust the straps and re-test. If the tester is not available, an ohm meter can be used.

9.8.5 If a wrist and/or heel straps are found to be out of tolerance, it shall be replaced with a strap that is within tolerance. A new tested strap will be issued to replace it. The new strap must be tested and pass before work can be performed.

9.9 Handling

9.9.1 All employees handling product shall wear two tested Heel/Toe straps at all times.

9.9.2 In addition, when seated at a work station, all personnel shall wear a tested wrist strap.