

CARE AND HANDLING OF PC BOARDS AND ESD-SENSITIVE **COMPONENTS**

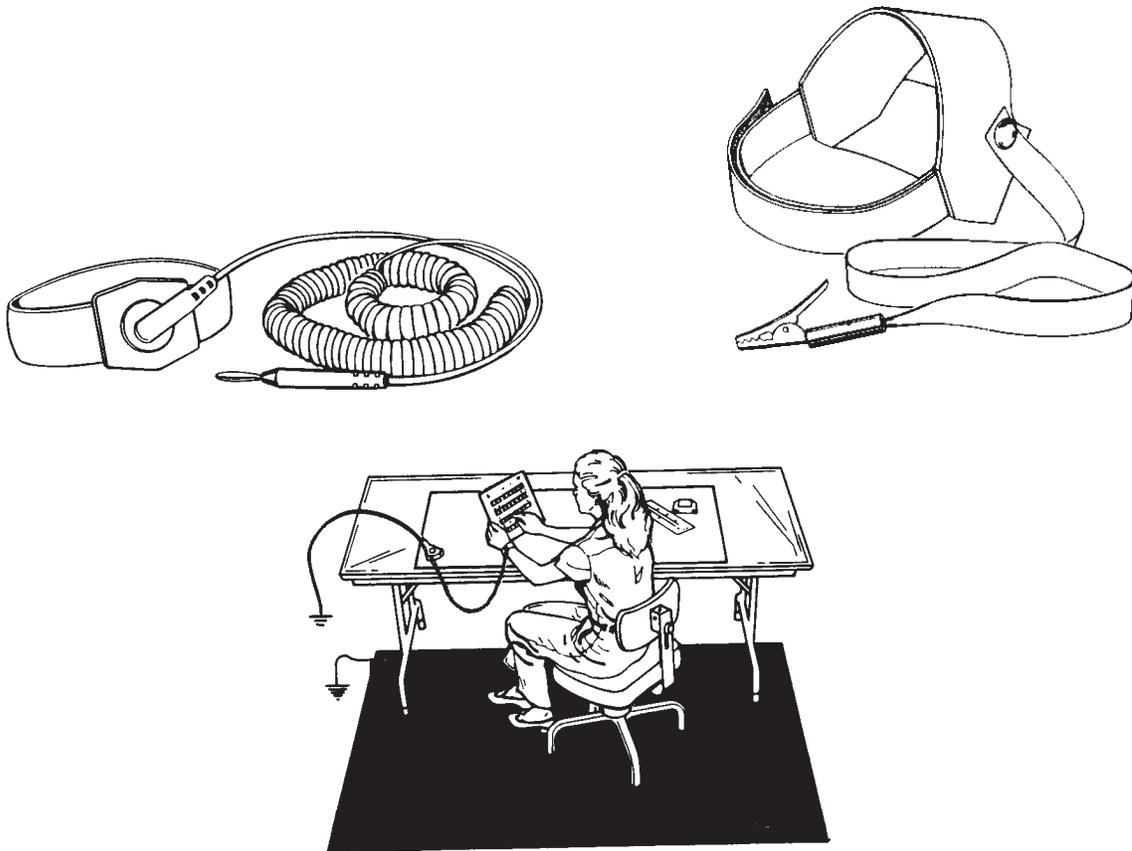


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TOOLS AND MATERIALS REQUIRED

1. Tools

Anti-Static Field kit. It is recommended that an anti-static field kit be kept on any site where solid-state printed circuit boards and other ESD-sensitive components are handled. These kits are designed to remove any existing static charge and to prevent the build-up of a static charge that could damage a PC board or ESD-sensitive components. The typical anti-static field kit consists of the following components:

1. A work surface (10mm conductive plastic sheet with a female snap fastener in one corner for ground cord attachment).
2. A 15-foot long ground cord for grounding the work surface.
3. Wrist strap (available in two sizes, large and small, for proper fit and comfort) with a female snap fastener for ground cord attachment.
4. A coiled ground cord with a practical extension length of 10 feet for attachment to the wrist strap.

Toothbrush (any standard one will do)

2. Materials

- Inhibitor (Texwipe Gold Mist ; Chemtronics Gold Guard, or equivalent)
- Cleaner (Chemtronics Electro-Wash; Freon TF, or equivalent)
- Wiping cloth (Kimberly-Clark Kim Wipes, or equivalent)

ESD-SENSITIVE COMPONENT HANDLING PROCEDURE

1. Introduction

Microelectronic devices such as PC boards, chips and other components are electrostatic-sensitive. Electrostatic discharge (ESD) of as few as 110 volts can damage or disrupt the functioning of such devices. Imagine the damage possible from the 35,000 volts (or more) that you can generate on a dry winter day by simply walking across a carpet. In fact, you can generate as much as 6,000 volts just working at a bench.

There are two kinds of damage that can be caused by the static charge. The more severe kind results in complete failure of the PC board or component. This kind of damage is relatively simple, although often expensive, to remedy by replacing the affected item(s). The second kind of damage results in a degradation or weakening which does not result in an outright failure of the component. This kind of damage is difficult to detect and often results in faulty performance, intermittent failures, and service calls.

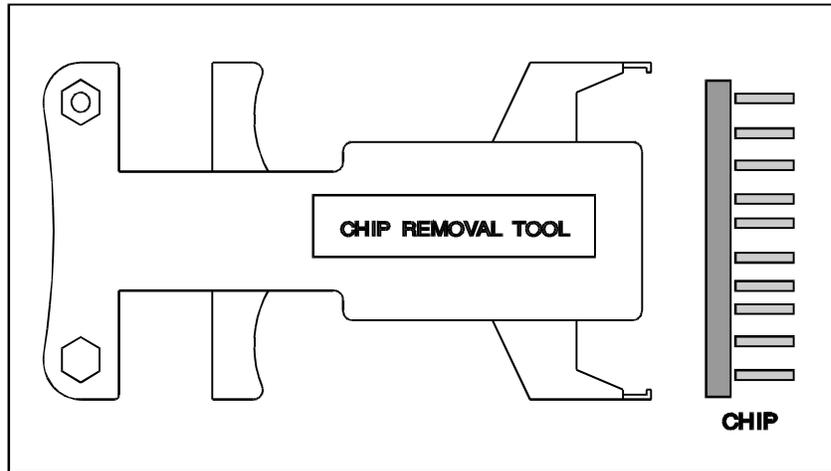
Minimize the risk of ESD-sensitive component damage by preventing static build-up and by promptly removing any existing charge. Grounding is effective, if the carrier of the static charge is **conductive** such as a human body. To protect components from **nonconductive** carriers of static charges such as plastic boxes, place the component in static-shielding bags.

This manual contains general rules to be followed while handling ESD-sensitive components. Use of the anti-static field kit to properly ground the human body as well as the work surface is also discussed.

Table 1		
Typical Electrostatic Voltages		
Electrostatic Voltages		
Means of Static Generation	10-20 Percent Relative Humidity	65-90 Percent Relative Humidity
Walking across carpet	35,000	1,500
Walking over vinyl floor	12,000	250
Worker at bench	6,000	100
Vinyl envelopes for work instructions	7,000	600
Poly bag picked up from bench	20,000	1,200
Work chair padded with poly foam	18,000	1,500

2. General Rules

- (1) ESD-sensitive components shall **only** be removed from their static-shielding bags by a person who is properly grounded.
- (2) When taken out of their static-shielding bags, ESD-sensitive components shall **never** be placed over, or on, a surface which has not been properly grounded.
- (3) ESD-sensitive components shall be handled in such a way that the body does not come in contact with the conductor paths and board components. Handle ESD-sensitive components in such a way that they will not suffer damage from physical abuse or from electric shock.
- (4) EPROMS/PROMS shall be kept in anti-static tubes until they are ready to use and shall be removed **only** by a person who is properly grounded.
- (5) When inserting and removing EPROMS/PROMS from PC boards, use a chip removal tool similar to the one shown in the figure following. Remember, all work should be performed on a properly grounded surface by a properly-grounded person.



Typical Chip Removal Tool

- (6) It is important to note when inserting EPROMS/PROMS, that the index notch on the PROM must be matched with the index notch on the socket. Before pushing the chip into the socket, make sure all the pins are aligned with the respective socket-holes. Take special care not to crush any of the pins as this could destroy the chip.
- (7) Power the system down before removing or inserting comb connectors/plugs or removing and reinstalling PC boards or ESD-sensitive components from card files or mounting hardware. Follow the power-down procedure applicable to the system being serviced.
- (8) Handle all defective boards or components with the same care as new components. This helps eliminate damage caused by mishandling. Do not strip used PC boards for parts. Ship defective boards promptly to Bristol Babcock in a static-shielding bag placed *inside* static-shielding foam and a box to avoid damage during shipment.

CAUTION

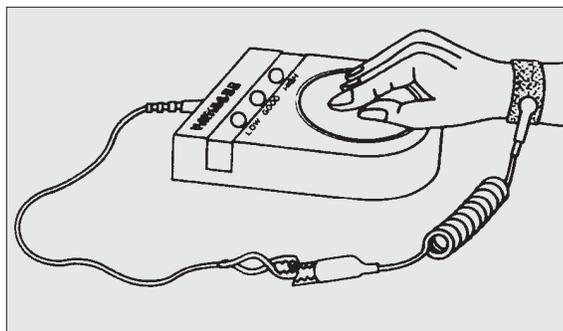
Don't place ESD-sensitive components and paperwork in the same bag.

The static caused by sliding the paper into the bag could develop a charge and damage the component(s).

- (9) Include a note, which describes the malfunction, in a *separate* bag along with each component being shipped. The repair facility will service the component and promptly return it to the field.

3. Protecting ESD-Sensitive Components

- (1) As stated previously, it is recommended that an electrically-conductive anti-static field kit be kept on any site where ESD-sensitive components are handled. A recommended ESD-protective workplace arrangement is shown on page 7. The anti-static safety kit serves to protect the equipment as well as the worker. As a safety feature, a resistor (usually of the one-megohm, 1/2-watt, current-limiting type) has been installed in the molded caps of the wrist strap cord and the ground cord. This resistor limits current should a worker accidentally come in contact with a power source. Do not remove the molded caps from grounded cords. If a cord is damaged, replace it immediately.
- (2) Be sure to position the work surface so that it does **not** touch grounded conductive objects. The protective resistor is there to limit the current which can flow through the strap. When the work surface touches a grounded conductive object, a short is created which draws the current flow and defeats the purpose of the current-limiting resistor.
- (3) Check resistivity of wrist strap periodically using a commercially-available system tester similar to the one shown in the figure below:

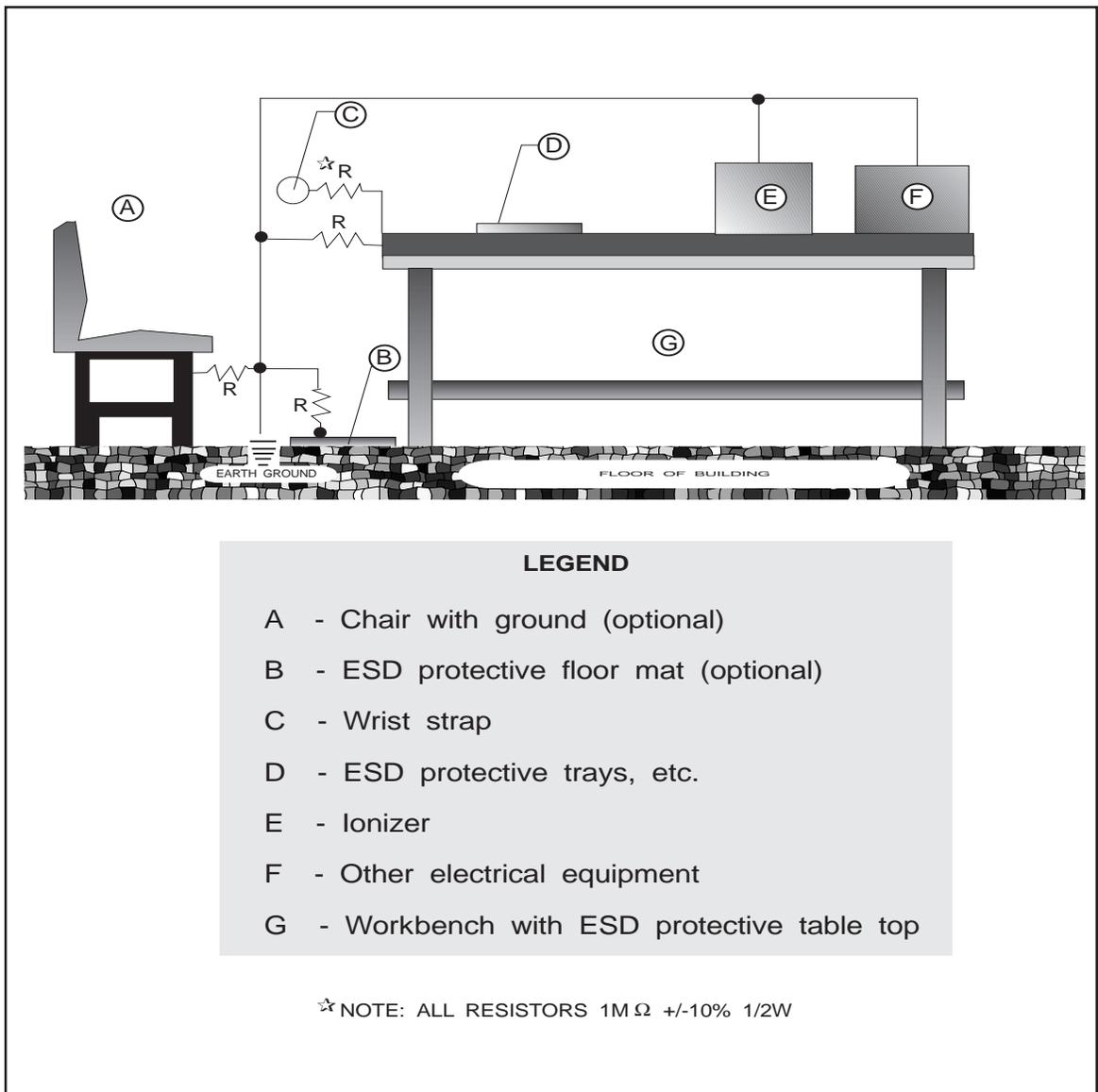


Note: If a system checker is not available, use an ohmmeter connected to the cable ends to measure its resistance. The ohmmeter reading should be **1 megohm +/- 15%**. Be sure that the calibration date of the ohmmeter has not expired. If the ohmmeter reading exceeds **1 megohm by +/- 15%**, replace the ground cord with a new one.

4. Static-safe Field Procedure

- (1) On reaching the work location, unfold and lay out the work surface on a convenient surface (table or floor). Omit this step if the table or floor has a built-in ESD-safe work surface.
- (2) Attach the ground cord to the work surface via the snap fasteners and attach the other end of the ground cord to a reliable ground using an alligator clip.
- (3) Note which boards or components are to be inserted or replaced.
- (4) Power-down the system following the recommended power-down procedure.
- (5) Slip on a known-good wristband, which should fit snugly; an extremely loose fit is not desirable.
- (6) Snap the ground cord to the wristband. Attach the other end of the ground cord to a reliable ground using the alligator clip.

- (7) The components can now be handled following the general rules as described in the instruction manual for the component.
- (8) Place the component in a static-shielding bag before the ground cord is disconnected. This assures protection from electrostatic charge in case the work surface is located beyond the reach of the extended ground cord.



- (9) If a component is to undergo on-site testing, it may be safely placed on the grounded work surface for that purpose.
- (10) After all component work is accomplished, remove the wrist straps and ground wire and place in the pouch of the work surface for future use.

5. Cleaning And Lubricating

The following procedure should be performed periodically for all PC boards and when a PC board is being replaced.

CAUTION

Many PC board connectors are covered with a very fine gold-plate.

Do not use any abrasive cleaning substance or object such as a pencil eraser to clean connectors.

Use only the approved cleaner/lubricants specified in the procedure following.

WARNING

Aerosol cans and products are extremely combustible.

Contact with a live circuit, or extreme heat can cause an explosion.

Turn OFF all power and find an isolated, and ventilated area to use any aerosol products specified in this procedure.

- (1) Turn the main line power **OFF**. Blow or vacuum out the component. This should remove potential sources of dust or dirt contamination during the remainder of this procedure.

- (2) Clean PC board connectors as follows:
- a. Review the static-safe field procedure detailed earlier.
 - b. Following the ESD-sensitive component handling procedures, remove the connectors from the boards and remove the PC boards from their holders.
 - c. Use cleaner to remove excessive dust build-up from comb connectors and other connectors. This cleaner is especially useful for removing dust.
 - d. Liberally spray all PC board contacts with Inhibitor. The inhibitor:
 - Provides a long lasting lubricant and leaves a protective film to guard against corrosion
 - Improves performance and reliability
 - Extends the life of the contacts
 - Is nonconductive, and is safe for use on most plastics
 - e. Clean the comb contacts using a **lint-free** wiping cloth.
 - f. Lightly mist all comb contacts again with Inhibitor.
- NOTE: Do not use so much Inhibitor that it drips.**
- g. Repeat the above procedure for the other PC boards from the device.

- (3) Cleaning PC edge connectors
- a. Use cleaner to remove excessive dust build-up from connectors. This cleaner is especially useful for removing dust.
 - b. Liberally spray the outboard connector with Inhibitor.
 - c. Lightly brush the outboard connector with a soft, non-metallic, bristle brush such as a toothbrush.

- d. Spray the connector liberally to flush out any contaminants.
- e. Remove any excess spray by shaking the connector or wiping with either a toothbrush, or a **lint-free** wiping cloth.

6. Completion

- (1) Replace any parts that were removed.
- (2) Make sure that the component cover is secure.
- (3) Return the system to **normal** operation.
- (4) Check that the component operates normally.