BOMBARDIER Toronto (de Havilland) **PROPRIETARY INFORMATION**	**PPS 9.14** **PRODUCTION PROCESS STANDARD**

Handling of Static Sensitive Electronic Components and Devices

Issue 11
- This standard supersedes PPS 9.14, Issue 10.
- Vertical lines in the left hand margin indicate technical changes over the previous issue.
- This PPS is effective as of the distribution date.
- Validation of issue status is the responsibility of the user.

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Core Methods - PPS

Issue 11 - Summary of Changes (over the previous issue)

The following summaries are not detailed and are intended only to assist in alerting PPS users to changes which may affect them; refer to the applicable sections of this PPS for detailed procedure and requirements.

- Added authorization to use an Ohm meter for checking wrist strap resistance in place of a wrist strap tester.

- Added a general safety precaution indicating that the safety precautions specified in this PPS are specific to Bombardier Toronto (de Havilland) and that suppliers, subcontractors and partners are responsible for ensuring that their own environmental, health and safety precautions satisfy the appropriate local government regulations.

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1 Scope

1.1 This Production Process Standard (PPS) specifies the procedure and requirements for the protection of static sensitive electronic components and devices during receipt verification, transport, storage, stores handling, assembly, assembly verification, installation and removal.

1.1.1 This PPS complements the engineering drawings that specify its use as an authorized instruction. The procedure specified in this PPS must be followed to ensure compliance with all applicable specifications. In general, if this PPS conflicts with the engineering drawing, follow the engineering drawing. The requirements specified in this PPS are necessary to fulfil the engineering design and reliability objectives.

1.1.2 Refer to PPS 13.26 for the subcontractor provisions applicable to this PPS.

1.1.3 Procedure or requirements specified in a Bombardier BAPS, MPS, LES or P. Spec. **do not** supersede the procedure or requirements specified in this PPS.

2 Hazardous Materials

2.1 Before receipt at Bombardier Toronto (de Havilland), all materials must be approved and assigned Material Safety Data Sheet (MSDS) numbers by the Bombardier Toronto (de Havilland) Environment, Health and Safety Department. Refer to the manufacturer's MSDS for specific safety data on any of the materials specified in this PPS. If the MSDS is not available, contact the Bombardier Toronto (de Havilland) Environment, Health and Safety Department.

3 References

3.1 General

3.1.1 Unless a specific issue is indicated, the issue of the reference documents specified in this section in effect at the time of manufacture shall form a part of this specification to the extent indicated herein.

3.2 Bombardier Toronto (de Havilland) Process Specifications

3.2.1 PPS 13.26 - General Subcontractor Provisions.

3.3 Bombardier Toronto (de Havilland) Internal Forms

3.3.1 DH Form #5349 - Static Free Work Station Verification Form.

4 Materials and Equipment

4.1 Materials

4.1.1 No specific materials specified.

4.2 Equipment

4.2.1 Static awareness labels, self-adhesive, as per JEDEC-14 standard (e.g., 3M No. 7101), as shown in Figure 1.

Figure 1 - Static Awareness Label

4.2.2 Static shielding bags, transparent plastic, 6” x 10”, capable of preventing static damage to static sensitive components or devices (e.g., 3M No. 2100-6-10).

4.2.3 Conductive foam, non-corrosive, high density, 1/4” thick (e.g., 3M No. 2910-1/4-12-12).

4.2.4 Static free cushioning material, plastic honeycomb cell construction to PPP-C-1842, Type III.

4.2.5 3M #8020 static free work station grounding kit, components as listed below. Set up static free work stations as shown in Figure 2. As an alternative to the set-up shown in Figure 2, static free work stations may be set up as shown in Figure 3. It is acceptable for the wrist strap ground cord to be connected to the same ground lug as the table mat ground cord or directly to an electrical connection to earth ground. As an alternative to the 3M #8020 static free work station grounding kit, it is acceptable to equip static free work stations with static dissipative table mats, floor mats, wrist straps and ground cords with a resistance of 10^6 - 10^9 ohms; it is **not** acceptable to use conductive (10^5 or less ohms) or insulative (10^{10} or more ohms) table mats, floor mats, wrist straps or ground cords.

- 8210 Series Static Control Table Mat
- 8220 Series Static Control Floor Mat
- 2066 CHARGE-GUARD Wrist Strap (with ground cord)
- 3040 Ground Cord
- 3043 Inter-Connecting Ground Cord

4.2.6 Foot grounders, also known as heel grounders or shoe grounders (e.g., 3M HGC1M-EC).

4.2.7 Tote-Boxes, conductive plastic.

4.2.8 Connector caps, conductive plastic.

4.2.9 Resistivity meter (e.g., ACL model 375 or ACL model 475).

4.2.10 Wrist strap tester (e.g., Bystat Strapcheck BSL-9010).

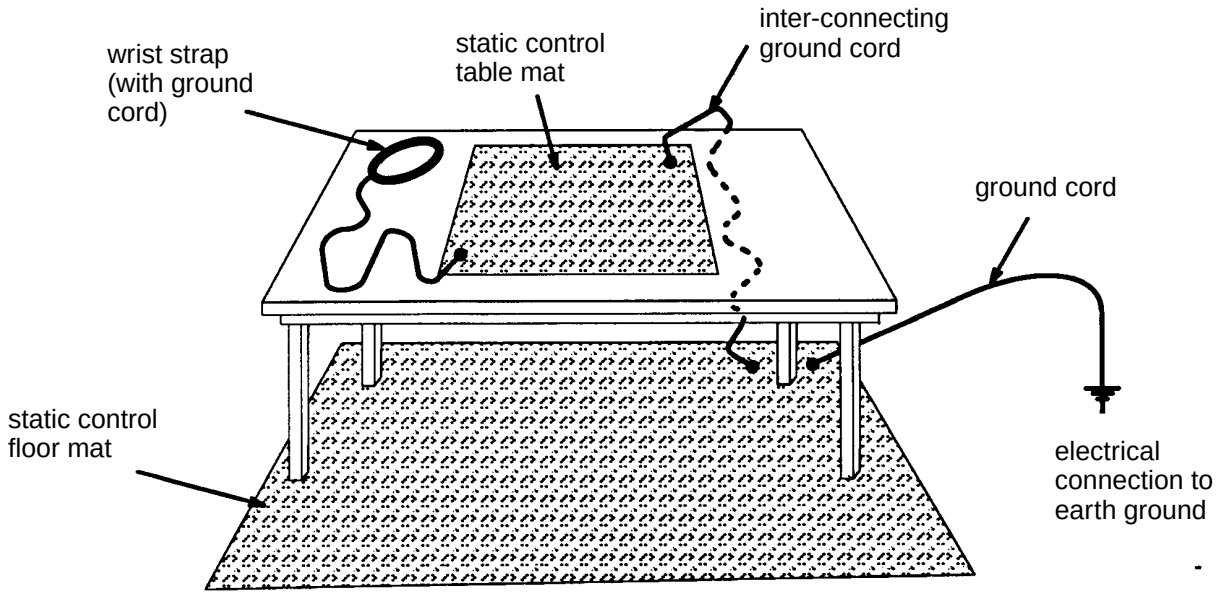

Figure 2 - Set-Up of Static Free Work Stations

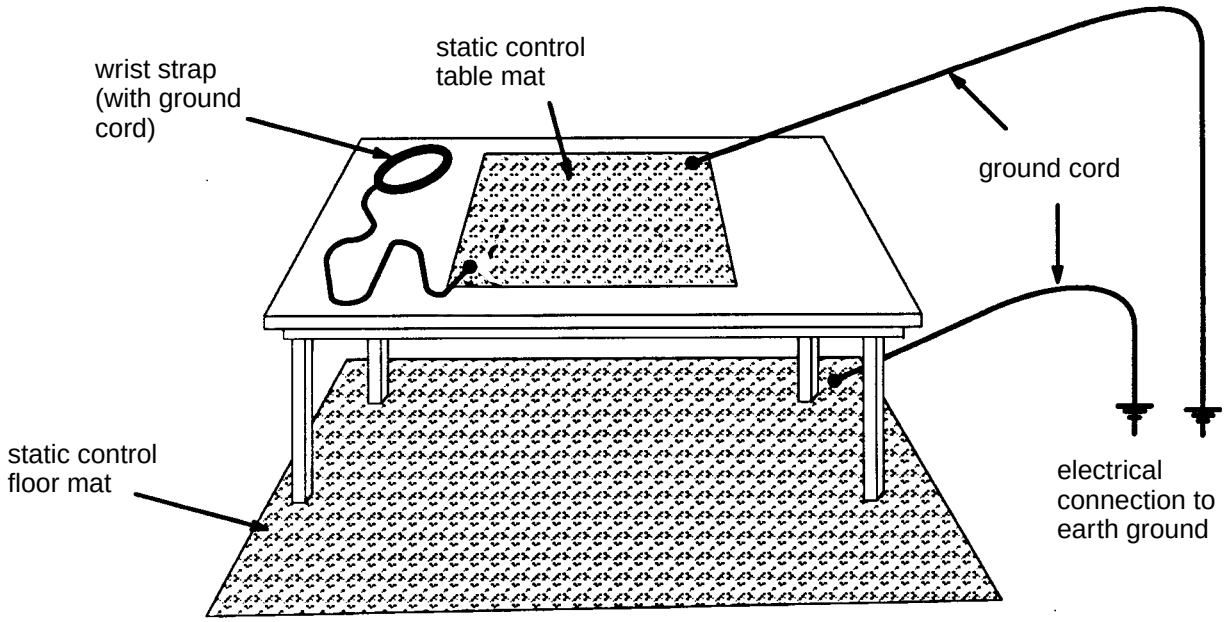

Figure 3 - Alternate Set-Up of Static Free Work Stations

5 Procedure

5.1 General

5.1.1 Components or devices which can be damaged or destroyed by an electrostatic discharge (ESD), or shock, are termed static sensitive. Consider all components which are to be assembled to printed circuit boards (transistors, integrated circuit (IC) chips, etc.) static sensitive **components**. Consider all completed or partially completed printed circuit boards and avionics black boxes as static sensitive **devices**. Printed circuit boards on which no components have been assembled are not considered static sensitive.

5.1.2 A static electric shock is caused by the instantaneous discharge of an electrostatic potential or voltage which is built through friction against a non-conducting surface, such as a nylon rug or a plastic chair. An ESD shock too small to even notice may be enough to destroy the electronic logic of an IC chip.

5.1.3 To prevent ESD damage to static sensitive components and devices it is necessary to protect from static shock at all times. During transport and storage, the static sensitive components and devices must be shielded from electrostatic fields by being packaged in ESD protective material. During receipt verification, stores handling, assembly and installation or removal of static sensitive components or devices, personnel must be grounded at all times by means of a conductive wrist strap. Before performing installation, assembly or removal of static sensitive components or devices (e.g., avionics boxes) in-situ on the aircraft, the aircraft must be grounded and personnel grounded to the aircraft structure by means of a wrist strap or other grounding equipment at all times.

5.1.4 Use of foot grounders provides additional anti-static protection and are recommended for use in areas equipped with grounded walking surfaces and for use at static free work stations where a high risk of static damage is possible. Foot grounders discharge static from a person to ground by connecting the person to a grounded walking surface or grounded floor mat. Note that foot grounders will not work except when in contact with a grounded walking surface or grounded floor mat. Foot grounders operate by means of a conductive ribbon placed insider the wearers shoe or sock which makes electrical contact with the skin through perspiration and contact with a grounded walking surface or grounded floor mat. The ribbon is joined to a resistor which limits current should accidental exposure to electricity occur. Foot grounders (if used) must be worn on both feet to maintain ground contact while walking. Static free work stations must include a static control floor mat even if foot grounders are not used. Use of wrist straps as specified herein (e.g., at static free work stations) is mandatory even if foot grounders are also used.

5.2 Receipt Verification

5.2.1 Perform receipt verification of components identified as static sensitive only at a static free work station with the verifying personnel grounded.

5.2.2 All static sensitive components or devices must be received packaged in the proper ESD protective material and identified as static sensitive by means of a self adhesive label placed on the package, or box, in a readily visible location. Printed circuit boards on which no components have been assembled do not require ESD protective packaging. Static sensitive components must be received packaged in suitable static protective shielding bags, protective foam pads, or static shielding tubes. Avionics black boxes identified as static sensitive must have all connectors capped with ESD protective caps. Refer static sensitive components or devices which have been received improperly packaged or identified to Bombardier Toronto (de Havilland) MRB or Bombardier Toronto (de Havilland) delegated MRB for disposition.

5.2.3 Visually check to verify quantities, part numbers and, if applicable, serial numbers. Do not remove components from the protective packaging in which they are received unless this is necessary to visually verify quantities, part numbers or serial numbers.

5.2.4 On completion of receipt verification, re-package components in the ESD protective material and packages in which they were received for transport. Ensure all packages containing static sensitive components are identified as such by means of a self adhesive label placed in a readily visible location.

5.3 Transport

5.3.1 Transport static sensitive components and devices within conductive plastic tote-boxes. The components and devices to be transported must be packaged in the applicable ESD protective material.

5.4 Storage

5.4.1 Store static sensitive components in their original boxes, bags or static shielding tubes, identified by a static awareness label.

5.4.2 Place completed or partially completed printed circuit boards to be stored within a suitable static shielding bag identified and sealed by means of a static awareness label.

5.4.3 Ensure all connectors are capped with ESD protective caps and package avionics black boxes to be stored in static free cushioning material. Identify the package as static sensitive by means of a static awareness label.

5.5 Stores Handling

5.5.1 Unless it is necessary to split a lot or batch of components or devices, static sensitive components or devices may be issued from stores with no special handling procedures, except that the package must not be opened. If it is necessary to split a lot or batch, re-package the components or devices for issue as follows.

Step 1. Place the original package of components or devices on a conductive table mat at a static free work station. Personnel filling the order must be grounded to the static free work station by means of a conductive wrist strap before opening the container in which the components or devices are packaged.

Step 2. Re-package static sensitive components and devices as follows:

- Individually re-package static sensitive components, other than IC chips, in a suitable static shielding bag.
- Transfer IC chips onto conductive foam pads by placing the chip onto the foam pad and gently pushing down to press the chip leads partially into the foam and then place the foam pad and chips in a static shielding bag. Take extreme care at all times when handling IC chips to avoid touching or bending the chip leads.
- Place printed circuit boards on which components have been assembled within a static shielding bag. Printed circuit boards on which no components have been assembled do not require ESD protective packaging.
- For avionics boxes, cap all connectors with ESD protective caps and package in static free cushioning material.

Step 3. Seal static shielding bags or static shielding material and identify as static sensitive by means of a static awareness label placed in a readily visible location.

Step 4. Place the identified static shielding bag or static cushioning material bag in a conductive plastic tote-box.

5.6 Assembly

5.6.1 Assembly of components to printed circuit boards must only be performed at a static free work station.

5.6.2 Personnel must be grounded to the work station by means of a conductive wrist strap before opening the package in which the components are delivered.

5.6.3 During assembly, components must only be handled by grounded personnel and must only be placed on the conductive table mat or on a conductive foam pad at the work station.

5.6.4 On completion of assembly, place printed circuit boards in a static shielding bag. Identify and seal the bag by means of a static awareness label.

5.6.5 On completion of assembly of avionics black boxes, fit conductive plastic caps over the connectors, package the avionics black box in a static free cushioning material and identify the package as static sensitive by means of a static awareness label.

5.6.6 Perform the application of encapsulation sealing to printed circuit boards within a fume extraction booth with the printed circuit board grounded to the booth. Grounding of personnel during encapsulation sealing is not required; however the personnel must be grounded when handling the printed circuit board before and after the application of encapsulation sealing.

5.7 Assembly Verification

5.7.1 Carry out assembly verification of static sensitive devices only at a static free work station.

5.7.2 Personnel verifying static sensitive devices must be grounded to the work station by means of a conductive wrist strap before removing any ESD protective packaging. Only grounded personnel are permitted to handle static sensitive devices at the static free work station.

5.7.3 On completion of verification, place printed circuit boards (acceptable or unacceptable) in a static shielding bag. Identify and seal the bag with a static awareness label. Forward unacceptable printed circuit boards to Bombardier Toronto (de Havilland) MRB or Bombardier Toronto (de Havilland) delegated MRB for disposition.

5.7.4 On completion of verification, package avionics boxes (acceptable or unacceptable) in static free cushioning material with conductive plastic caps fitted over the connectors and identify the package as containing a static sensitive device by means of a static awareness label. Forward unacceptable avionics boxes to MRCC for disposition.

5.8 Installation and Removal of Avionics Boxes

5.8.1 Take care to avoid touching the connector contact pins when installing or removing avionics boxes.

5.8.2 Immediately after removing installed avionics boxes, fit conductive plastic caps over the connectors and package the avionics boxes in static free cushioning material. Identify the static free cushioning material as containing a static sensitive component or device.

6 Requirements

6.1 Receipt verify, transport, store, handle, assemble, assembly verify, install or remove all electronic components and devices which are identified as being static sensitive according to the procedures specified herein.

7 Safety Precautions

7.1 The safety precautions specified herein are specific to Bombardier Toronto (de Havilland) to meet Canadian Federal and Provincial government environmental, health and safety regulations. It is recommended that other facilities consider these safety precautions; however, suppliers, subcontractors and partners are responsible for ensuring that their own environmental, health and safety precautions satisfy the appropriate local government regulations.

7.2 Observe general shop safety precautions when performing the procedure specified herein.

8 Personnel Requirements

8.1 Personnel must have a good working knowledge of the applicable procedure and requirements as specified herein and must have exhibited their competency to their supervisor.

9 Maintenance of Equipment

9.1 Keep static free work stations functionally clean and check all grounding connections, (including foot grounders, if used) on a monthly basis.

- Use a resistivity meter to check the resistance between each of the points indicated in Figure 4 or Figure 5, as applicable. The measured resistance should be 10^6 - 10^9 ohms. If the measured resistance is less than 10^6 ohms, an alternate path to ground exists which must be traced down and corrected. If the measured resistance is greater than 10^9 ohms, the ground connection is interrupted and must be repaired. A resistance measurement greater than 10^9 ohms when checking the resistance between two points on either the table or floor mat indicates that the mat surface needs to be cleaned.
- Check the wrist strap resistance using a wrist strap tester or an ohm meter.
- check the resistance of foot grounders, if used, using a suitable foot grounder tester.
- Keep a record (e.g., DH Form #5349) of all monthly checks for a minimum of one year.
- For every work station which has passed 6 consecutive monthly checks, it is acceptable to perform checks every 6 months instead of monthly. If a failure occurs, checks must again be performed monthly. As long as checks are being performed at 6 month intervals, the check records justifying the increase must be maintained.

Measure resistance between points:
A & B, B & C, C & D, D & E, and E & F

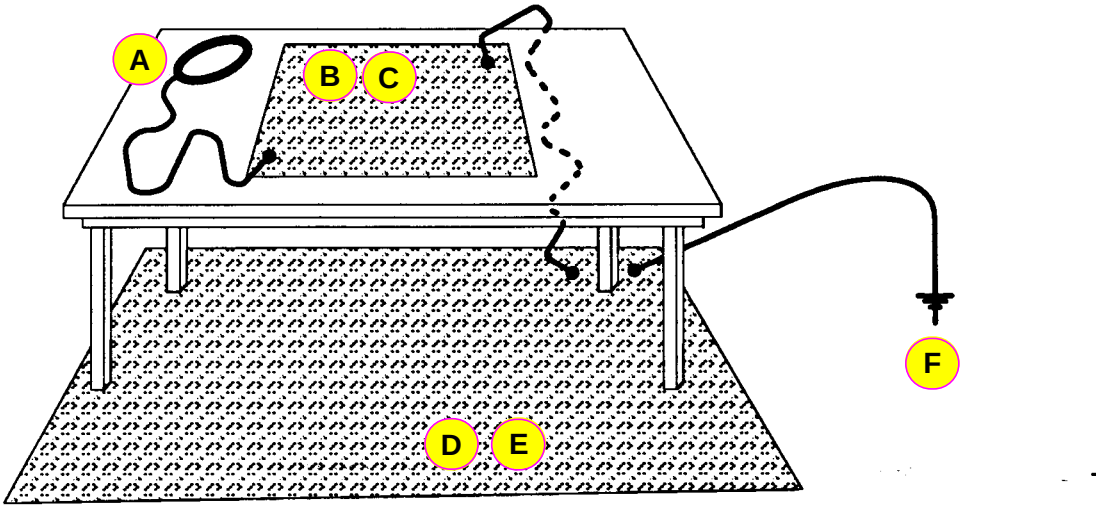

Figure 4 - Resistivity Measurement Points

Measure resistance between points:
A & B, B & C, C & D, E & F, and F & G

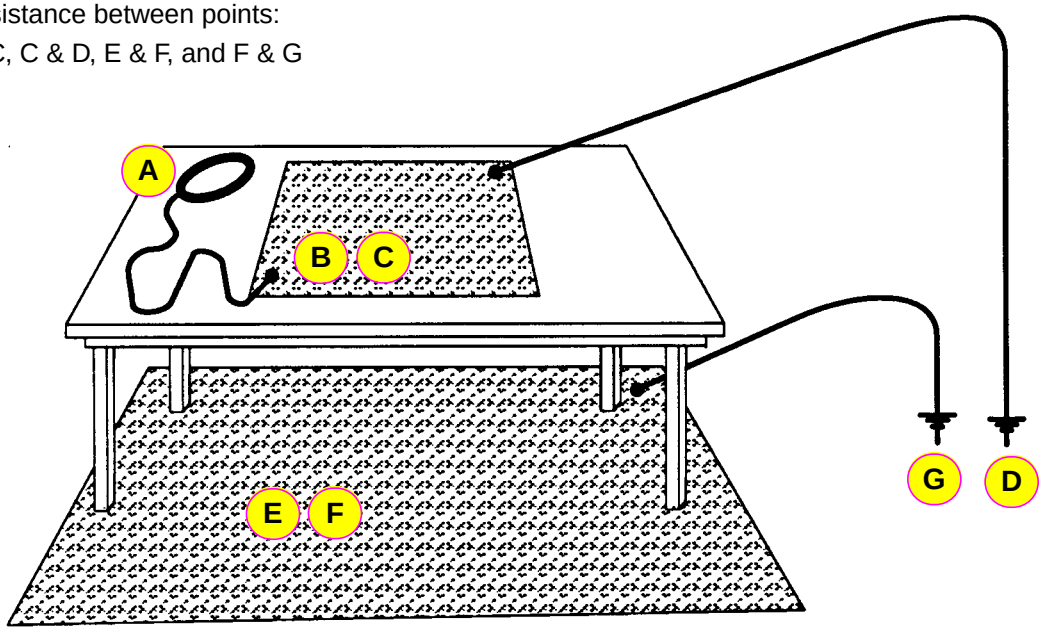

Figure 5 - Resistivity Measurement Points for Alternate Work station Set-Up