BOMBARDIER
Toronto (de Havilland)
Proprietary Information

PPS 15.06

PRODUCTION PROCESS STANDARD

Electrochemical Etch Marking of Aircraft Parts and Assemblies

Issue 8 - This standard supersedes PPS 15.06, Issue 7.
- 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.

Approved By: K-C for (Bruce Campbell) Oct. 5, 2017
Materials Technology

(Davor Filipovic) Oct. 10, 2017
Quality

Prepared By: (Michael Wright) October 4, 2017
Core Methods - PPS

Issue 8 - 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 section(s) of this PPS for detailed procedure and requirements.

- Added new sub-section 3.1 and para. 3.1.1, to ensure correct usage of reference specifications.
- Created new sub-section 3.2, to identify PPS document references as Bombardier Toronto (de Havilland) process specifications.
- Created new sub-section 3.3, to identify government specifications.
- Revised MIL-STD-792 title to match current title of MIL-STD 792 Rev. F.
- Added new para. 4.1.1, to prevent inappropriate material substitution.
- Reclassified stencils, gloves and wiping cloths as equipment instead of materials.
- Replaced reference to use of F13 Type 3 for protection of carbon and low allow steels with reference to use of F13 Grade 3 Type I (ref. para. 5.7.1).
- Clarified references to use of hot air guns in the Procedure (section 5) to specify setting of the hot air gun to 160°F maximum (ref. para. 5.6.1 Step 5 and para. 5.6.2).
- Added para. 7.1, to clarify applicability of the safety precautions specified herein.
- Added para. 7.5, to advise turning off hot air guns when not in use.
- Added para. 7.6, to advise use of a hot air gun which includes a power interrupt feature and add provisions to be followed if the hot air gun doesn't have a power interrupt feature.
- Rounded up the lower limit for storage temperature from 15.5°C to 16°C in para. 9.1 and para. 9.2.

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1 Scope

1.1 This Production Process Standard (PPS) specifies the procedure and requirements for electrochemical etch marking of steel, stainless steel, aluminum and titanium aircraft parts, tools and equipment.

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.

3.2.2 PPS 15.01 - Part Marking of Aircraft Parts and Assemblies.

3.2.3 PPS 16.01 - Application of Hard and Soft Film Corrosion Preventive Compound.

3.2.4 PPS 31.17 - Solvent Usage.

3.3 **Government Specifications**

3.3.1 MIL-STD 792 – Identification Marking Requirements for Special Purpose Components.

4 Materials and Equipment

4.1 Materials

4.1.1 Unless otherwise specified in this section, use only the materials specified; use of superseding or alternative materials is not allowed.

4.1.2 Electrolytes to MIL-STD-792, for use on aluminum, steel, stainless steel and titanium. In particular, ensure that electrolyte used for electrochemical etch marking of titanium does not contain chlorides.

4.1.3 Ferrous metal cleaner (e.g., Lectroetch No. 2).

4.1.4 Non-ferrous metal cleaner (e.g., Lectroetch No. 3).

4.2 Equipment

4.2.1 Electrochemical etch marking kit, (e.g., Lectroetch Portable). The Lectroetch Portable electrochemical etch marking kit consists of:

- Electrochemical etch marking power unit, Lectroetch V-10A.
- Universal cord set, Lectroetch Type U.
- Bench fixture, Lectroetch Type MU.
- Cartridge hand pad, Lectroetch 1525 CHP.

4.2.2 Finger ground, (e.g., Lectroetch FG).

4.2.3 Stencils, die impression type, 2 1/2" x 20’ roll, (e.g., Lectroetch RS).

4.2.4 Stencil marker, (e.g., Varityper Corp. Model DS 2).

4.2.5 Cleaner tray, (e.g., Lectroetch C).

4.2.6 Protective rubber gloves (e.g., DSC 422-2).

4.2.7 Wiping cloths (e.g., DSC 378-2).

4.2.8 Hot air gun (e.g., Steinel HG 2520E or Steinel STEI-HG2310-BB) with interchangeable heat-deflector attachments. For the purposes of this PPS the hot air gun must not be set above 160°F maximum.

5 Procedure

5.1 General

5.1.1 Electrochemical etching is a process which involves passing a low voltage current via an electrolyte solution through a pattern cut in a stencil to etch the metal beneath it. Etch marking with an Alternating Current (AC), alternately etches out and re-deposits back a combination of the metal and electrolyte salts producing a dark mark. Etch marking with Direct Current (DC) etches out black oxide or phosphate coatings on heat treated steel parts to produce a light mark.

5.1.2 Cleaning of parts **after** electrochemical etch marking is necessary to remove electrolyte remaining on the part, as well as excess oxides from the mark itself to prevent corrosion. It will **not** remove the electrochemically etched mark.

5.1.3 Only use the electrochemical marking process for part marking if specified on the engineering drawing or PPS 15.01.

5.1.4 It is acceptable to electrochemically etch part marks on straight shank terminal ends of swaged cable assemblies after swaging.

5.1.5 Electrochemical etch marking may be used to identify tools and equipment used in-house if a permanent legible mark is required.

5.2 Preparation of Parts

5.2.1 Before the application of electrochemical etch marks, ensure the surfaces to be marked are clean and free from dirt, oil or fingerprints. If necessary, solvent clean according to PPS 31.17.

5.3 Preparation of Stencils

5.3.1 Prepare stencils (ref. para. 4.2.3) using a Varityper (ref. para. 4.2.4) or other equivalent stencil marking machine according to the manufacturers' operating instructions.

5.3.2 After the impression has been cut into the stencil, remove the backing paper and examine the stencil. A good stencil will show an impression that is uniform and completely white and clear when held up to a light. Discard stencils whose impressions are not clear or uniform.

5.4 Set-Up of Equipment (see Figure 1)

5.4.1 For each new stencil, set-up the electrochemical etch marking kit as follows:

Step 1. Prepare a test piece of the same material as that of the parts to be marked.

Step 2. Plug the universal cord set into the receptacle in the power unit.

Step 3. Ground the test piece by attaching the red wire of the cord set to the test piece, the finger ground or a ground plate against which the test piece will rest.

Step 4. Attach the black wire to the cartridge hand pad or to the bench fixture, as applicable.

Step 5. Set the power unit's variable voltage control to 50% and turn the power ON.

Step 6. For steel, stainless steel, or titanium parts, set the CURRENT SELECT switch to AC (dark etch) or DC (light etch), as required for the type of part to be marked. For aluminum or aluminum alloy parts, set the CURRENT SELECT switch to DC.

Step 7. Mark the test piece according to section 5.5.

Step 8. Examine the mark on the test piece to ensure that the impression in the stencil is clear and legible.

Step 9. Adjust the voltage and dwell time (3 seconds maximum) until the marks on the test piece are sharp and distinct. Keep the voltage and dwell time to the minimum level necessary to achieve a satisfactory mark.

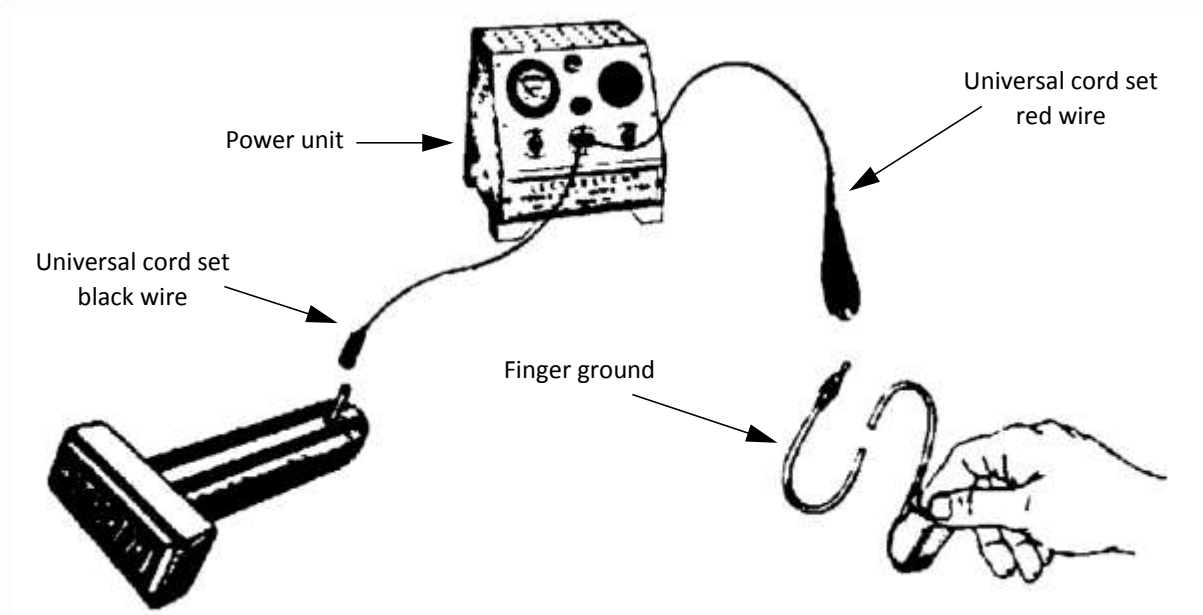

Figure 1. **Marking Kit Set-Up (typ.)**

5.5 Application of Electrochemical Etch Marks

5.5.1 Apply electrochemical etch marks using the bench fixture as follows:

Step 1. Fill the bench fixture reservoir with the appropriate electrolyte (as specified in the Materials section), making sure the screen cloth and wick are completely wet.

Step 2. Position the cut stencil on the screen cloth and secure with the locating plate (see Figure 2).

Step 3. Rub the stencil lightly to ensure that electrolyte is coming through the mark cut in the stencil.

Step 4. Place the grounded part squarely on the cut stencil and, using light pressure, hold steady for the dwell time established in section 5.4.

Step 5. On completion of marking each production batch of parts discard the stencil.

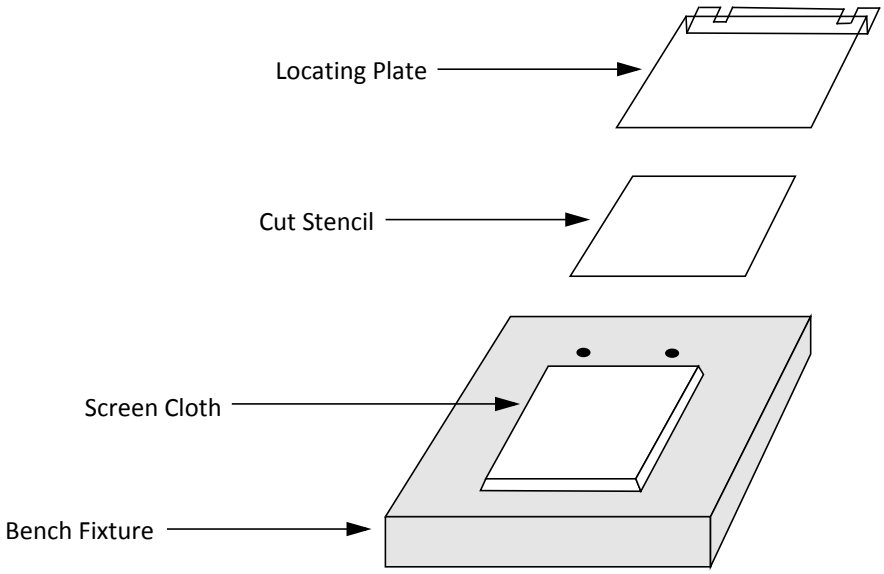

Figure 2. **Bench Fixture Assembly**

5.5.2 Apply electrochemical etch marks using the hand pad as follows (see Figure 3):

Step 1. Soak the hand pad wick with the appropriate electrolyte (as specified in the Materials section).

Step 2. Position the cut stencil on the shank end of the part to be marked.

Step 3. Ground the part by attaching the red wire of the cord set to the part, finger ground or a ground plate against which the part will rest.

Step 4. Place the wick of the hand pad squarely on the cut stencil and, using light pressure, hold steady for the dwell time established in section 5.4.

Step 5. On completion of marking each production batch of parts, discard the stencil.

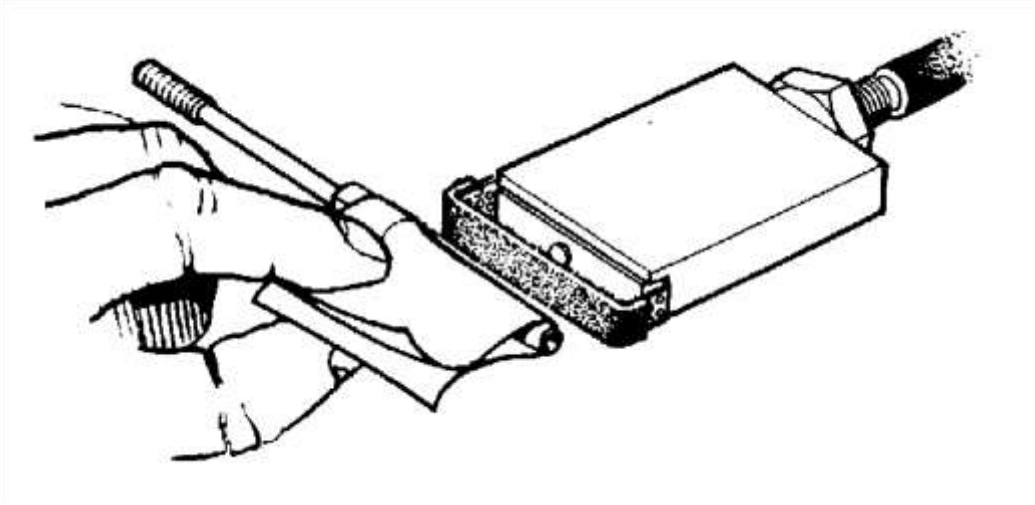

Figure 3. **Hand Pad Assembly**

5.6 **Post Marking Procedure**

5.6.1 Except as noted in para. 5.6.2, after electrochemical etch marking remove residual electrolyte and excess oxides from the part as follows:

Step 1. Saturate the wicking pad of the cleaner tray assembly with the appropriate cleaner (as specified in the Materials section).

Step 2. Wipe the part using a clean dry cloth (ref. para. 4.2.7) to remove residual electrolyte fluid.

Step 3. Draw the part across the cleaner tray assembly, concentrating on the marked area. If, due to size or shape, the marked part cannot be cleaned properly using the tray assembly, wipe the part with a clean tissue or cloth saturated with cleaner (dispense cleaner from the container to the cloth, do not dip the cloth in the cleaner).

Step 4. Rinse the part thoroughly with clean water.

Step 5. Dry the part by wiping with a clean cloth or by using a hot air gun (ref. para. 4.2.8) set to 160°F maximum. Parts must be **completely** dried.

5.6.1.1 Always use clean tissues or cloths for each step and change cloths frequently to prevent contamination of the parts.

5.6.2 As an alternative to the procedure specified in para. 5.6.1, it is acceptable to remove electrolyte by **thoroughly** wiping with a clean damp cloth until **all** trace of electrolyte residue has been removed. After removing electrolyte, dry the part by wiping with another clean cloth or by using a hot air gun (ref. para. 4.2.8) set to 160°F maximum. Parts must be **completely** dried.

5.7 **Corrosion Protection**

5.7.1 Protect carbon and low alloy steel parts which are to be placed in stores or shipped after electrochemical etch marking with F13 Grade 3 Type I corrosion preventive compound according to PPS 16.01.

6 **Requirements**

6.1 Electrochemically etched marks must be sharp, clear and legible.

6.2 Marked parts must be clean and free of electrolyte, oxides and other contaminants.

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.

7.3 Avoid eye contact with electrolyte and cleaner. If eye contact occurs, immediately flush your eyes with large quantities of water (15 minutes minimum) at an eye wash station and report to the health center.

7.4 Avoid skin contact and ingestion of electrolyte or cleaner. Wash hands thoroughly with soap and water after using electrolyte and apply lubricating lotion; prolonged contact with electrolyte may result in skin irritation. Wear protective gloves (ref. para. 4.2.6) when using cleaner and wash hands with soap and water after each use.

7.5 Turn hot air guns off when not in use.

7.6 It is recommended to use hot air guns which include a power interrupt reset feature which will prevent an unattended heat gun from resuming heat (e.g., after a power failure); for hot air guns which are not equipped with a power interrupt reset feature, take care to ensure turning the gun off immediately in the event of a power interruption.

8 **Personnel Requirements**

8.1 Personnel responsible for electrochemical etch marking of aircraft parts or assemblies must have a good working knowledge of the procedure and requirements as specified herein and shall have exhibited their competency to their supervisor.

9 Storage

9.1 Keep bottles of electrolyte and cleaner tightly capped and stored at 60 - 90°F (16 - 32°C).

9.2 Store stencil paper at 60 - 90°F (16 - 32°C).