DE HAVILLAND AIRCRAFT
OF CANADA LIMITED

PPS 9.19

PRODUCTION PROCESS STANDARD
PROPRIETARY INFORMATION

AUTOMATIC CRIMPING OF SIZE 16 - 22 ELECTRICAL CONTACTS

Issue 13
- This standard supersedes PPS 9.19, Issue 12.
- Vertical lines in the left hand margin indicate technical changes over the previous issue.
- Direct PPS related questions to christie.chung@dehavilland.com or (416) 375-7641.
- This PPS is effective as of the distribution date.

Prepared By:	(Christie Chung)	September 13, 2019
	PPS Group	
Approved By:	(Stephen Mabee)	September 13, 2019
	Materials Technology	
	(Roger Moore)	September 19, 2019
	Quality	

Issue 13 - 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.

- Replaced throughout PPS where “Bombardier” is specified with “De Havilland Aircraft of Canada Limited” or “De Havilland Canada” as the DASH 8 program is under new ownership.
- For Facility Approval section, replaced Bombardier Toronto Materials Technology with De Havilland Canada Engineering.
- Replaced procedure and requirements for qualification of crimp tools with cross-reference to PPS 9.55 (Qualification of Crimp Tools).
- Specified testing for qualification of crimp tools shall be performed at a BAERD GEN-018 approved lab only.

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1 SCOPE

1.1 This Production Process Standard (PPS) specifies the procedure and requirements for automatic crimping of size 16 - 22 electrical connector pin and socket contacts to electrical wires.

1.1.1 This PPS complements the engineering drawings that specify its use as an authorized instruction. The procedure specified in this PPS shall 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.

2 HAZARDOUS MATERIALS

2.1 Before receipt at De Havilland Canada, all materials shall be approved and assigned Material Safety Data Sheet (MSDS) numbers by the De Havilland Canada 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 De Havilland Canada Environment, Health and Safety Department.

3 REFERENCES

3.1 BAERD GEN-018 - Engineering Requirements for Laboratories.

3.2 PPS 9.24 - Wire and Cable Stripping.

3.3 PPS 9.55 - Qualification of Crimp Tools.

3.4 PPS 13.26 - General Subcontractor Provisions.

3.5 PPS 13.39 - Bombardier Toronto Engineering Process Manual.

4 MATERIALS, EQUIPMENT AND FACILITIES

4.1 Materials

4.1.1 Crimp style electrical connector pin and socket contacts as specified on the engineering drawing or wiring list. Refer to Figure 1 for a general description of crimp style pin and socket contacts.

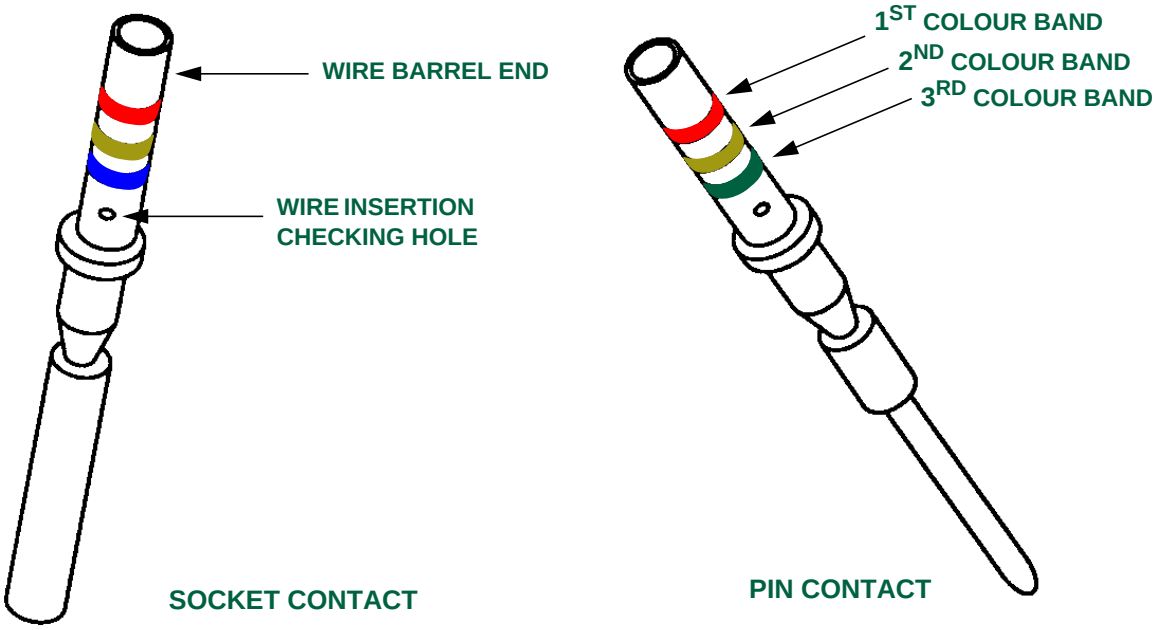


FIGURE 1 - GENERAL DESCRIPTION OF CRIMP TYPE CONTACTS

4.2 Equipment

4.2.1 Astro Automatic Feed Crimping Tools, model numbers 614019-1 and 620472.

4.2.2 Astro colour coded reels and carriers.

4.2.3 Regulated source of clean, lubricated compressed air 80 - 90 psi.

4.2.4 Astro crimp depth blocks.

4.2.5 Pico Automatic Feed Crimping Machine, Model 600.

4.2.6 Daniels WA22 Vibratory Feed Crimper.

4.3 Facilities

4.3.1 This PPS has been categorized as a Controlled Special Process according to PPS 13.39 and as such only facilities specifically approved according to PPS 13.39 are authorized to perform automatic crimping of size 16 - 22 electrical connector pin and socket contacts to electrical wires according to this PPS.

4.3.2 Subcontractors shall direct requests for approval to De Havilland Canada Supplier Quality Management.

4.3.3 Facility approval shall be based on a facility report, a facility survey and completion of a qualification test program, if required. The facility report shall detail the materials and equipment to be used, the process sequence to be followed and the laboratory facilities used to show compliance with the requirements of this PPS. Any deviation from the procedure or requirements of this PPS shall be detailed in the facility report. Based upon the facility report, De Havilland Canada Engineering may identify additional qualification and/or process control test requirements. During the facility survey, the facility requesting qualification shall be prepared to demonstrate their capability. Once approved, no changes to subcontractor facilities may be made without prior written approval from De Havilland Canada Supplier Quality Management.

4.3.3.1 Unless otherwise specified by De Havilland Canada Supplier Quality Management, for approval of subcontractor facilities to perform automatic crimping of size 16 - 22 electrical connector pin and socket contacts to electrical wires according to this PPS, completion of a test program and submission of suitable test samples representative of production parts is required. Test samples shall meet the requirements specified in section 6 (i.e., visual examination requirements as specified in section 6.2 **and** tensile testing as specified for qualification of crimping tools as specified in PPS 9.55).

4.3.3.2 All testing and evaluation specified herein shall only be performed by De Havilland Canada Materials Laboratory or by laboratories accredited according to BAERD GEN-018.

5 PROCEDURE

5.1 General

5.1.1 Automatic feed crimping machines are designed to provide a high speed method of crimping electrical connector contact pins and sockets onto electrical wires. Refer to Flow Chart 1 for the set-up and operation of Astro crimping machines and to Flow Chart 2 for the set-up and operation of Pico crimping machines.

5.1.2 It is acceptable to use automatic crimping tools other than those specified herein provided that the crimped assemblies meet the requirements of section 6.2.

5.1.3 The Astro automatic feed crimping machine consists of two basic components, a loaded colour coded reel and the pneumatic crimping machine. A colour coded crimp depth block fitted to each Astro crimping machine will identify what contact size is to be used on each machine.

5.1.4 The Pico Model 600 and Daniels WA22 automatic feed crimping machines consist of a vibratory feeder bowl and a crimping head all mounted on a single base and controlled by pneumatic and electrical logic.

5.1.5 Crimping tools shall be qualified according to PPS 9.55 before use on Production parts (including alternative tools allowed in paragraph 5.1.2). For additional details regarding tool operation, refer to the manufacturers' instructions.

5.2 Carrier and Contact Loading - Astro Machines

5.2.1 Reels and carriers for the Astro machines are pre-loaded. They are identified by a colour code which matches the crimp depth block colour.

5.2.2 Each contact carrier and reel is dedicated to a specific size of contact.

5.3 Stripping Wire Insulation

5.3.1 Before crimping, strip the wire insulation from the end of the wire to expose the bare conductor according to PPS 9.24.

5.4 Set-Up and Operation of Astro Crimping Machines

5.4.1 Set-up and operate Astro crimping machines as follows:

Step 1. Install the correct crimp depth block as specified in Table I.

Step 2. Connect the air supply (80 to 90 psi, lubricated air).

Step 3. Remove the first three contacts from the contact carrier belt.

Step 4. Manually feed the carrier belt through the upper and lower guides. Trip and release the trigger until the machine cycles the blank contact holders through the crimping dies. Observe the crimping chamber until the first contact is centered in the crimping area.

Step 5. Insert the stripped end of the wire into the centered contact, ensuring that all of the wire strands are inside the contact wire barrel and activate the crimp head.

Step 6. Pull the crimped assembly from the machine. A new contact will be automatically located in the crimping area. The spent carriers feed through the tool and can be cut or twisted off. If the tool crimps a contact which is without a conductor, the crimped contact shall be removed manually with pliers or tweezers. Failure to remove the contact will result in the tool jamming.

TABLE I - ASTRO CRIMP DEPTH BLOCK SELECTION

MODEL NUMBER	CONTACT SIZE	WIRE SIZE	CRIMP DEPTH BLOCK
620472	20	20, 22, 24	RED
	22	20, 22, 24, 26	BLUE/GREEN
	22	22, 24, 26, 28,30	GREEN
614019	20	20, 22, 24	RED
	16	16, 18, 20	BLUE
	12	12, 14, 16, 18, 20, 22, 24	YELLOW

5.5 Set-Up and Operation of the Pico Automatic Feed Crimping Machine

5.5.1 Set-up and operate Pico Automatic feed crimping machines as follows (see Figure 2):

Step 1. Check that no foreign matter or contacts are jammed in the crimp head or the in-line track. Remove contacts jammed in the crimping head with pliers.

Step 2. Ensure that the correct size of contact has been loaded into the feeder bowl.

Step 3. Set the power switch, located on the front left of the machine, to the on position. Check that all switches are off before applying power to the machine.

Step 4. Set the air on/off switch, located on the front right of the machine, to the on position.

Step 5. Set the test/run switch, located on the front middle of the machine, to the run position.

Step 6. Set the feeder bowl driver toggle switch, located on the side of the machine, to the on position.

Step 7. Set the in-line track driver toggle switch, located on the side of the machine, to the on position.

Step 8. Slowly increase the amplitude to the bowl driver until the contacts are moving up the spiral track and are entering the track correctly oriented. Remove incorrectly oriented contacts.

Step 9. Slowly increase the amplitude to the in-line track driver until the contacts are moving along the in-line track at a rate sufficient to accommodate the bowl feed rate.

Step 10. Allow sufficient time for the contacts to line up against the escapement shuttle face at the end opposite to the bowl.

Step 11. Insert a stripped wire end into the contact located inside the crimping head, taking care not to splay or birdcage the wire strands.

Step 12. When the wire has bottomed in the contact crimp barrel, depress the foot pedal once to cycle the machine and form the crimp.

Step 13. Remove the crimped wire/contact assembly from the crimping head.

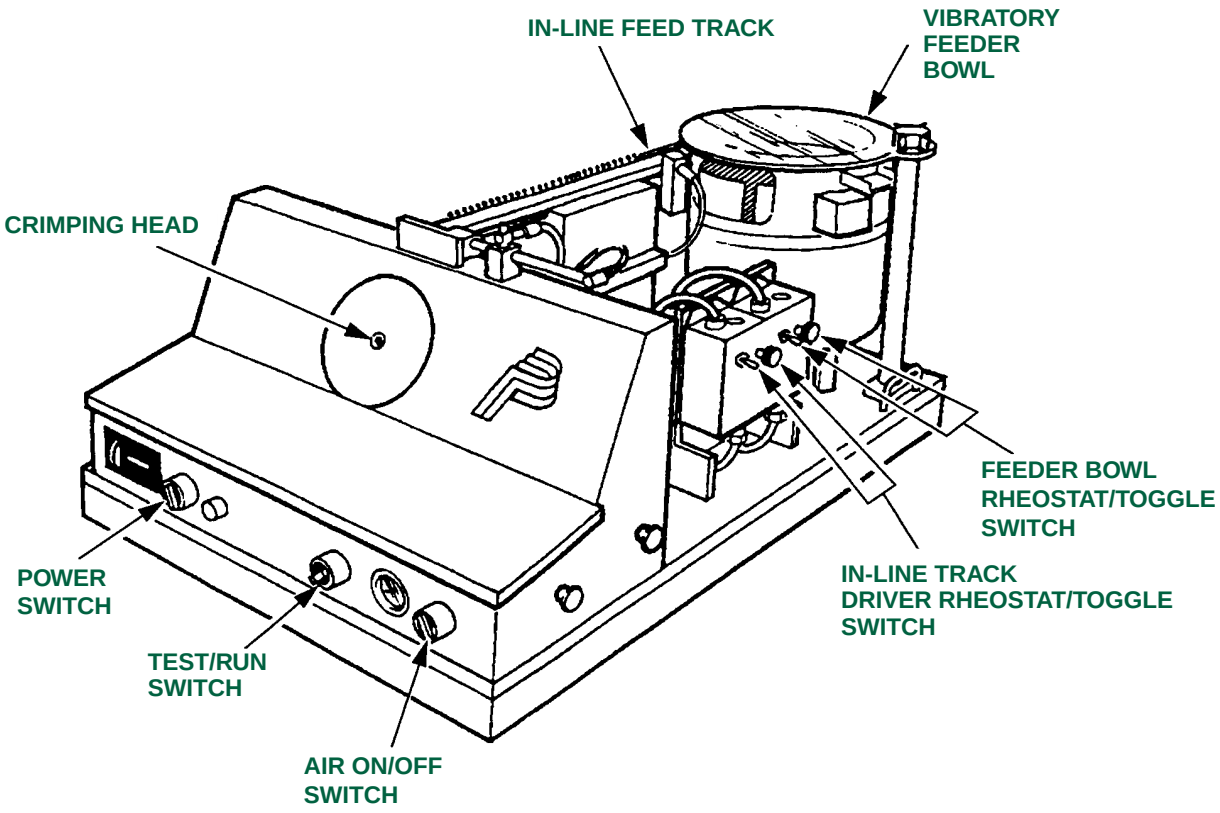


FIGURE 2 - PICO MODEL 600 AUTOMATIC FEED CRIMPING MACHINE

5.6 Set-Up and Operation of the Daniels WA22 Vibratory Feed Crimping Machine

5.6.1 Set-up and operate the Daniels vibratory feed crimping machine as follows:

Step 1. Ensure that the crimp tool setscrew (selector valve) is turned in.

Step 2. Energize the line pressure and adjust the system air regulator control knob to 90 psig.

Step 3. Adjust the lift cylinder air regulator control knob to 15 to 25 psig. Use the lowest setting that gives fast enough machine operation.

Step 4. As required, fill the air line lubricator with Boelube or another equivalent non-petroleum based oil.

Step 5. Adjust the oiler to give one drop every 80 to 100 cycles.

Step 6. If necessary, adjust the time delay air valve. If the time interval is set too long the machine will operate too slow. If the time delay is set too short the crimp head will not receive enough air to complete the crimp and the crimp head will jam in the closed position. If the crimp head jams in the closed position cycle the RUN-TEST switch one or more times to free the contact.

6 REQUIREMENTS

6.1 General

6.1.1 All testing and evaluation specified herein shall only be performed by De Havilland Canada Materials Laboratory or by laboratories accredited according to BAERD GEN-018.

6.2 Visual Examination

6.2.1 Crimped contacts shall be subjected to periodic visual examination as follows (see Figure 3):

- Ensure that the wire strands are visible through the wire barrel verification hole.
- Ensure that the insulation gap is no more than 1/16".
- On contacts equipped with an insulation support cup, ensure that the wire insulation is fully inserted into the support cup.
- Ensure that the crimp indentations are equally spaced, uniform in appearance, approximately centered on the wire barrel and are no closer than 0.030" from the contact shoulder or 0.010" from the end of the wire barrel.
- Ensure that all wire strands are included in the contact wire barrel with no splayed or bird-caged strands.

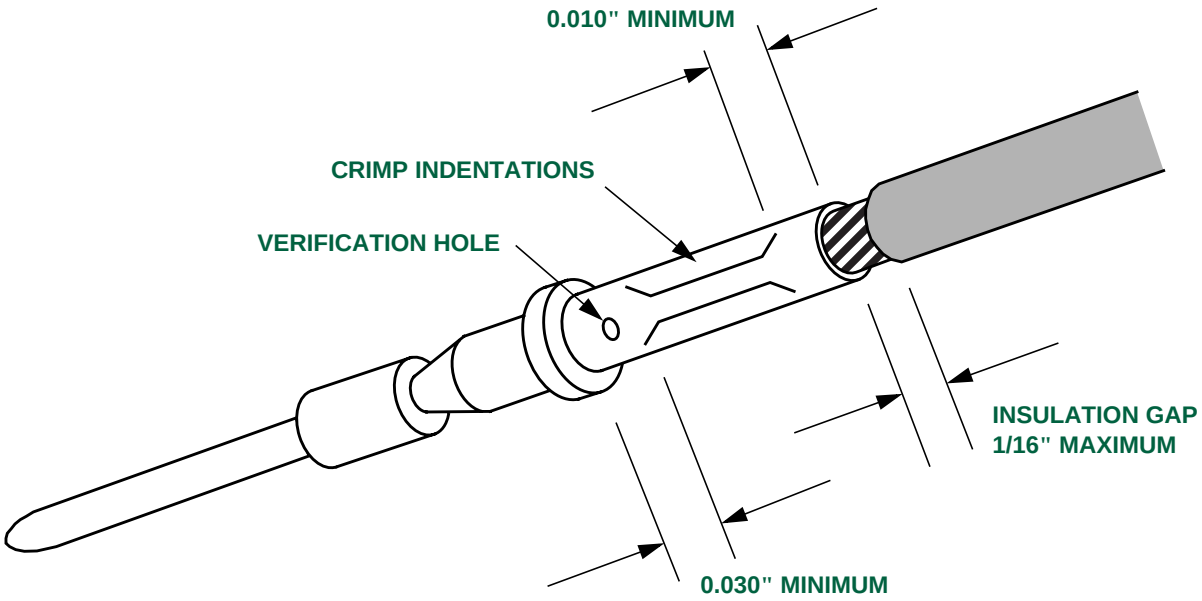


FIGURE 3 - VISUAL EXAMINATION OF CRIMPED CONTACTS

7 SAFETY PRECAUTIONS

7.1 The safety precautions specified herein are specific to De Havilland Canada 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 standard plant safety precautions when performing the procedure specified herein.

7.3 Disconnect all inlet air lines from crimping machines when inserting or replacing contact transfer tips and guides inside the machines.

8 PERSONNEL REQUIREMENTS

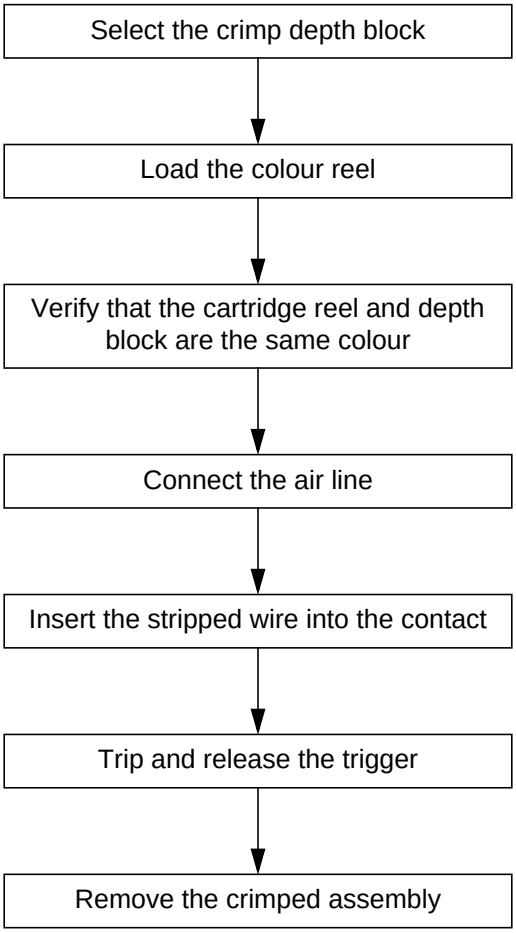
8.1 This PPS has been categorized as a Controlled Special Process by PPS 13.39. Refer to PPS 13.39 for personnel requirements.

9 MAINTENANCE OF EQUIPMENT

9.1 Adjustment or repair of automatic crimping tools shall be carried out by authorized personnel only.

9.2 Empty the air line filter water traps on Astro automatic crimping machines as required.

FLOW CHART 1 - SET-UP AND OPERATION OF ASTRO CRIMPING MACHINES



FLOW CHART 2 - SET-UP AND OPERATION OF PICO CRIMPING MACHINES