BOMBARDIER
Toronto (de Havilland)
PROPRIETARY INFORMATION

PPS 9.40

PRODUCTION PROCESS STANDARD

Testing of Electrical Panel and Harness Assemblies

Issue 8
- This standard supersedes PPS 9.40, Issue 7.
- Vertical lines in the left hand margin indicate technical changes over the previous issue.
- Direct PPS related questions to PPS.Group@aero.bombardier.com or (416) 375-4365.
- This PPS is effective as of the distribution date.

Prepared By:	(Michael Wright) Production Process Standards (PPS)	March 7, 2014
Approved By:	(L.K. John) Materials Technology	March 7, 2014
	(Adam Gordon) Quality	March 10, 2014

Table of Contents

Sections **Page**

Tables

1 Scope

1.1 This Production Process Standard (PPS) specifies the procedure and requirements for testing electrical panels and harness assemblies before installation on the aircraft.

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 PPS 13.26 - General Subcontractor Provisions.

4 Materials and Equipment

4.1 Materials

4.1.1 No materials required.

4.2 Equipment

4.2.1 Automatic test equipment (e.g., DIT-MCO International model 9500.T81, DIT-MCO International 2500 series, TKD ACT-4000 or Cirris Signature 1000R+). Automatic test equipment must be capable of reliably performing the tests specified herein.

4.2.2 Remote continuity probe suitable for the automatic test equipment used.

4.2.3 Multimeter, minimum 0.1 ohm resolution (e.g., Fluke series 80).

4.2.4 Insulation multimeter (e.g., Fluke 1587).

5 Procedure

5.1 General

5.1.1 For the purposes of this PPS, the following definitions apply.

Test String - A combination of wires and/or components which are electrically connected to one another. Each test string is electrically independent from all other test strings in the assembly being tested.

Insulation - Any material, including air, which maintains wire separation.

5.1.2 The tests included in this PPS are as follows:

Continuity Test - The continuity test is used to verify that two points in a test string are electrically connected.

Probe Test - The probe test is similar to the continuity test. It is used when one end of a wire is either not testable or has not yet been terminated (i.e. a wire which will not be terminated until the harness is installed on the aircraft). Test this wire by placing a probe at an accessible point on the wire.

Component Test - The component test is used to verify the proper installation of a component.

Isolation Test - The isolation test identifies unwanted short circuits anywhere in the assembly being tested.

Insulation Test - The insulation test identifies any weakness in the harness insulation, including damage caused during the manufacture and assembly of the harness.

5.2 Automated Testing

5.2.1 Refer to Table 1 for the test parameters.

5.2.2 During automated testing, it is sometimes necessary to test a wire which will not be terminated until the harness is installed on the aircraft. If this situation occurs, the program will instruct the user to touch a probe (ref. para. 4.2.2) to an accessible point on that wire before continuing with the test.

5.2.3 Use the automatic test equipment (ref. para. 4.2.1) to test electrical panels or harness assemblies as follows:

Step 1. Type the part number of the assembly into the automatic test equipment. Verify that the aircraft number is correct.

Step 2. Select the appropriate layout board or patch chord, as specified in the build file or on the screen of the automatic test equipment. Layout boards are used for complex assemblies and patch chords are used for simple assemblies.

Step 3. Connect the assembly to the layout board or patch chord as specified by the build file.

Step 4. Connect the EDAC (blue) connectors on the layout board or patch chord to the automatic test equipment.

Step 5. Follow the instructions given by the test program. If the assembly fails any part of the test, the program will list:

- which test was failed (refer to Table 2 for a list of abbreviations used by the automatic test equipment)
- the failed connector number and pin number
- the address assigned to the failed pin by the automatic test equipment
- the target value of the test
- the actual value of the test

Step 6. Repair all parts of the assembly which failed the test and re-test according to this section. Refer any failures which cannot be repaired to Liaison Engineering.

5.2.4 For all automated tests, the minimum dwell time per test point is 0.09 seconds and the maximum dwell time is 2.0 seconds.

Table 1 - Test Parameters for Automated Testing

TEST TYPE	RESISTANCE	CURRENT	VOLTAGE
Continuity	< 5 ohms	1 amps	---
Probe	< 5 ohms	0.15 amps	---
Component	(Note 1)		
Isolation	> 699 x 10^6 ohms	---	1500 volts
Insulation	---	< 0.0005 amps	1500 volts

Note 1: Refer to engineering for component test parameters.

Table 2 - Automatic Test Equipment Abbreviations

ABBREVIATION	TEST DEFINITION
A	Lamp Test - To verify that lamp turns on
B	Coil Resistance Measurement
C	Continuity Test
D	Continuity Test with Probe
E	Voltage Measurement
F	Lower Order Bulk Scan (i.e. Scanning all addresses below current one)
FC	Two-point isolation test for reverse bias of a diode
G	Resistance Measurement
H	Lamp Resistance Measurement
S	Higher Order Bulk Scan (i.e. Scanning all addresses above current one)
T	An all points bulk test used to ascertain the immediate isolation status of a given point (i.e., opens test)
U	Diode Forward Bias (i.e. A continuity test with a diode between the two points)

5.3 Manual Testing

5.3.1 It is not feasible to perform the isolation test manually. Use automatic test equipment to perform this test.

5.3.2 The insulation test may be performed manually using an insulation multimeter (ref. para. 4.2.4).

5.3.3 If it is necessary to manually perform a component test, refer to Engineering for the appropriate test method.

5.3.4 If automatic test equipment is not available, use a multimeter (ref. para. 4.2.3) to manually perform the continuity and probe tests as follows:

Step 1. Place a multimeter probe at each of the two points on the string specified by the Ring Out Sheet.

Step 2. Apply a current of 0.001 amps across the two points.

Step 3. Wait until the multimeter stabilizes and read the resistance between the two points from the multimeter. Unless otherwise specified by the Ring Out Sheet, the maximum allowable resistance between the two points is 5 ohms (the resistance is increased if a component is located between the two points and this is reflected by a higher acceptable value on the Ring Out Sheet).

Step 4. If the measured resistance is greater than the maximum allowable, attempt to rectify the problem and re-test the assembly according to this section. Refer any failures which cannot be repaired to Liaison Engineering.

5.4 Post-Testing Trimming of Un-Terminated Wires

5.4.1 After completing all ATE testing, trim any stripped, un-terminated wires so that the end of the wire is flush with the insulation. Do not trim more wire than is necessary.

5.5 Testing of Re-Worked Harnesses

5.5.1 If re-work is required on a harness that had already been previously tested, perform continuity and insulation testing on any new or replaced wires.

5.5.2 It is not necessary to repeat the isolation test on re-worked harnesses.

6 Requirements

6.1 All electrical panels and harness assemblies must pass the tests specified by this PPS.

7 Safety Precautions

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

7.2 During insulation testing, a voltage of 1500V is applied to the assembly. Do not touch or go near the assembly during automatic testing unless otherwise instructed by the automatic test program.

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.