Circuit Card Assembly

TABLE OF CONTENTS

PURPOSE & SCOPE

This Workmanship Standard supplements the IPC-A-610 Acceptability of Electronic Assemblies and/or other specified documents. It provides requirements and acceptance criteria applicable to the assembly of circuit cards that are not currently addressed in IPC-A-610 (in some cases may be outside its' scope) or may be unique to L3 Communication Systems - West (CSW) products or processes.

WORKMANSHIP STANDARD

1. CONNECTOR CONTACTS – BRUSH TYPE

1.1. Brush Contacts

This section describes the acceptance criteria necessary to inspect connectors with brush contacts after the connectors are assembled in the end application. The contacts illustrated are made up of seven (7) gold plated wires (bristles) 0.007 inches in diameter. The brush contact is either sleeved or non-sleeved depending on the connector type. These bristles are supported and crimped into a holder. The holder has the termination tail attached to it. There are various tail types; compliant pin, PC through-hole and surface mount are common types. The only difference in the mating interfaces of the contact types is the sleeved contact has the addition of a stainless-steel sleeve.

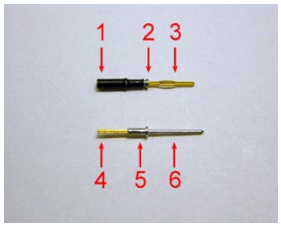
Discoloration (patina) of the brush (bristles) wire tips is an **acceptable Condition**. This condition is nothing out of the ordinary that will affect performance. The seven (7) brush wires are cut/cleaved prior to assembly into the main contact body therefore exposing the base alloy BeCu. By mil-spec, the brush wire tips need not be plated (Ref. MIL-DTL-55302/166 thru 170). Due to the self-cleaning ability of the brush contact and multiple points of electrical engagement there will be no effect on reliable performance through environments.

Warning:
Severe Damage can result if a brush contact is mated (probed) with anything other than a special brush contact probe or a mating brush contact.

The figure below identifies the component parts of typical brush contacts. The top contact illustrates a typical sleeved contact with a compliant tail and the bottom contact illustrates un-sleeved contact with a through-hole tail.

Note: All photos in this document are examples and intended to provide visual directive and are not specific to any part or program.

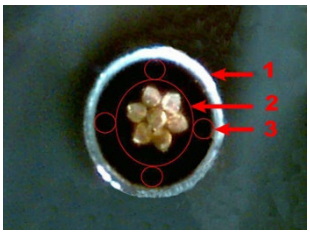
1. Sleeve (Brush inside)
2. Holder
3. Compliant Tail
4. Contract Brush
5. Holder
6. Through-Hole Tail



1.2. Brush Contacts – Sleeved – Sleeve Damage

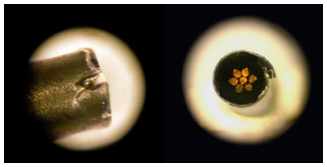
1.2.1. Target

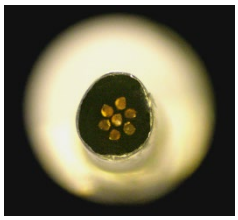
- Sleeve (1) not damaged
- Sleeve
- Imaginary Circle
- Wire (bristle) Diameter



1.2.2. Defect

- Sleeve is nicked, chipped, or marred.
- Sleeve is bent or smashed.

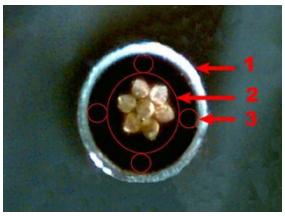




1.3. Brush Contacts – Sleeved – (Bristle) Positioning

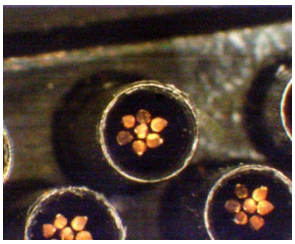
1.3.1. Target

- Brush contact is approximately centered in the contact sleeve.
- Bristles of the brush are not bent splayed or crushed.
- Bristles of the brush are within the imaginary circle located one wire diameter from the inner sleeve wall.



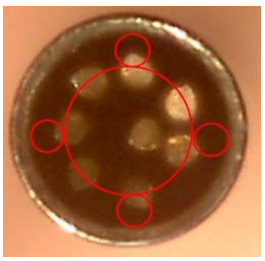
1.3.2. Acceptable

- Four (4) bristles are within the imaginary circle, located one wire diameter from the inner sleeve wall.
- The other three (3) bristles may be located anywhere else within the sleeve but may not contact the inner sleeve wall.



1.3.3. Defect

- Poor bristle centering, more than three (3) wires are located closer that one (1) bristle to the sleeve inner wall.
- Any bristle in contact with the sleeve inner wall.

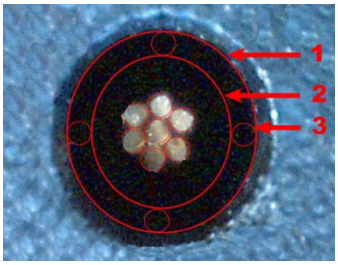


1.4. Brush Contacts – Un-sleeved – (Bristle) – Positioning

1.4.1. Target

- Brush contact is approximately centered in the cavity opening (not shown).
- Bristles of the brush are not bent, splayed, or crushed.
- Bristles of the brush are within the imaginary circle located one bristle diameter from the inner cavity wall.

1. Cavity Hole
2. Imaginary Circle
3. Wire Brush Diameter

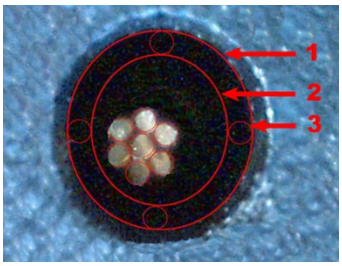


1.4.2. Acceptable

- Brush not centered in cavity.
- Bristles are splayed (separated) but are no closer than one bristle diameter to the inner cavity wall.

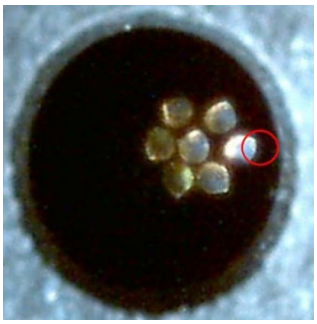
1. Cavity Hole
2. Imaginary Circle
3. Wire Brush Diameter

Note: Bristles closer than one bristle diameter to the cavity wall may cause damage to the mating sleeve or contact brush.



1.4.3. Defect

- Poor bristle centering, any bristle that is closer than one bristle diameter to the inner cavity wall.
- Any bristle in contact with the inner cavity wall.

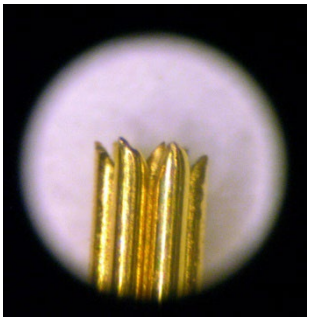


1.5. Brush Contacts – (Bristle) End Damage

Note: Criteria apply to both sleeved and un-sleeved brush contacts.

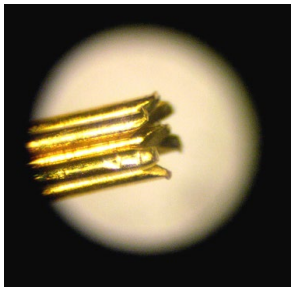
1.5.1. Target

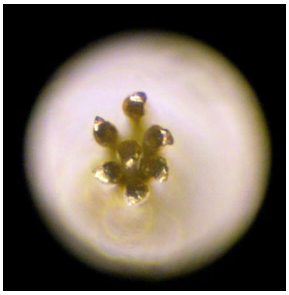
- No damage to bristle ends.
- No damage to pins, exposing base metal.



1.5.2. Defect

- Blunt or burred bristle end.
- Damage to pins exposing base metal.





2. EXPENDABLE FEATURES

This section addresses certain features found on components and PCBs, printed circuit boards that serve a purpose prior to, or during CCA, circuit card assembly build and or test but have little value once the component is installed or the CCA has passed functional testing.

When fit, function and reliability are not impacted, the feature is deemed expendable and as such its absence is not a defect.

Note: all photos in this section are examples and intended to provide visual directive and are not specific to any part or program.

2.1. Components

- Components may have features that aid or enhance storage and handling, including automated placement equipment. However, these features once the component is installed on a CCA have little or no usefulness. In fact, they become a detriment if they are missing as this may appear as a defect receiving attention and rework labor that is not required.
- Other components not specifically addressed in this section having similar type features or characteristics may be considered expendable after installation on the CCA.

2.2. PCBs

- PCBs may have additional circuitry or pads designed to facilitate RF, radio frequency tuning. These pieces of circuitry sometimes referred to as “confetti” are used to tune RF circuits but are often unused or have material soldered to them only to be later removed during the tuning process. Given the size and bond strength between these small pieces of circuitry and the dielectric material, (laminate) they can be easily lifted from the PCB surface when heated or stressed. At times a CCA

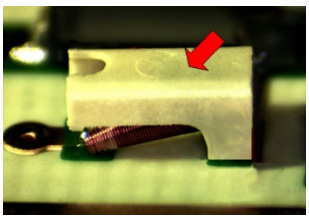
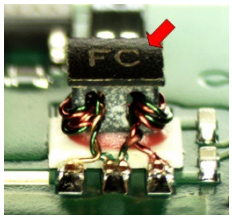
with these missing pieces of circuitry can still be tuned and function properly. When this is the case and the CCA has passed functional test, the absence of this circuitry is not considered a defect.

- BGA, Ball Grid Array sites may have nonfunctional, unsupported/unconnected pads. These pads serve as a point for solder attach for the nonfunctional or otherwise not used solder balls on the BGA. Since these pads are not connected to any circuit traces or via holes they can easily lift from the laminate if the BGA is replaced as part of a rework process. When some of these nonfunctional pads become lifted it shall not be considered a defect.

2.3. Component Expendable Features Pick and Place Aids

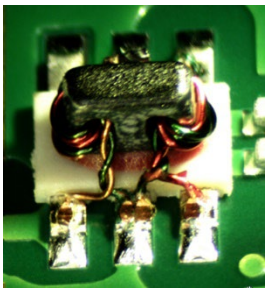
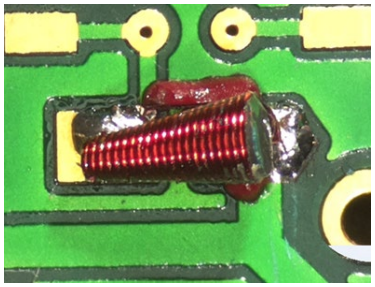
2.3.1. Target – General

- Covers and housing on components that facilitate pick and place equipment are securely fastened to the component and exhibit no cracks or missing pieces.

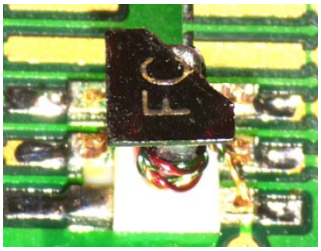
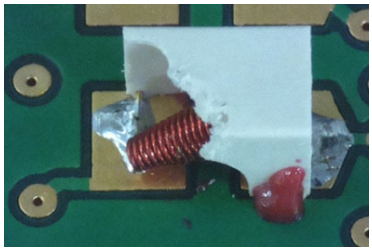
2.3.2. Acceptable – Pick and Place Covers Completely Missing

- After solder attachment of the component, the cover or housing is completely missing with no residual materials left on the CCA and no damage to the component body, core, or windings, etc.
- Adhesives, if used to secure the cover are missing completely or are securely bonded to the component or PCB surface.

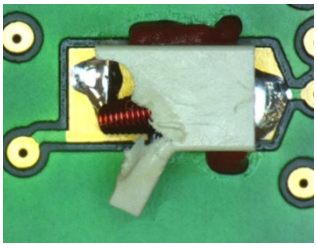
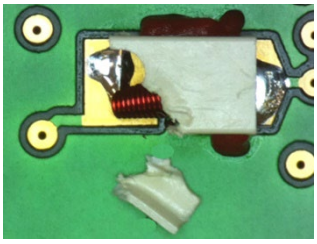
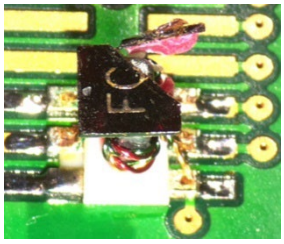
2.3.3. Acceptable – Pick and Place Cover Partially Missing

- After solder attachment to the PCB, the cover or housing is partially missing but the remaining portion is firmly attached to the component with no residual materials left on the CCA and no damage to the component body, core, or windings, etc.
- Cover or housing may or may not be bonded to the PCB surface.

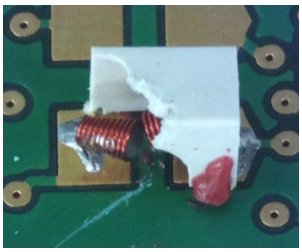



2.3.4. Defect

- Loose cover or partially attached cover.
- Cover debris left on the CCA.

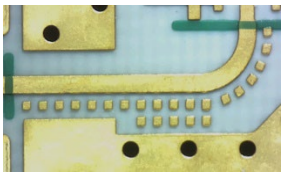
- Component or PCB surface damage beyond limits (Ref WS-002, IPC-A-610 Acceptance of Electronic Assemblies).



2.4. PCB Expendable Features RF Tuning Circuitry

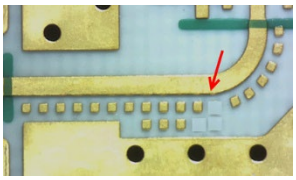
2.4.1. Target

- RF tuning circuitry (confetti) is attached to the PCB dielectric.
- No loose or missing circuitry.



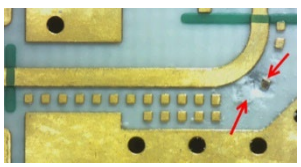
2.4.2. Acceptable

- Pieces of RF tuning circuitry (confetti) are missing.
- No PCB surface damage beyond limits (Ref WS-002).
- No loose pieces of RF tuning circuitry (confetti) present on the PCB.
- The CCA is properly tuned and passes test.



2.4.3. Defect

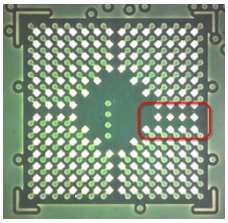
- Damage to base laminate beyond limits (Ref WS-002).
- Loose piece(s) of RF tuning circuitry (confetti) present on the PCB.
- Regardless of CCA is properly tuned and passes test.



2.5. PCB Expendable Features Nonfunctional BGA Pads

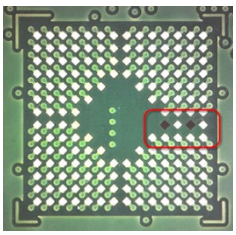
2.5.1. Target

- All nonfunctional BGA pads are attached to the PCB.



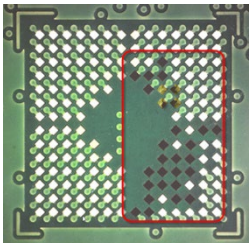
2.5.2. Acceptable

- Nonfunctional BGA pads are lifted.
- Lifted nonfunctional BGA pada do not exceed 10% of the total BGA pad count.
- PCB surface damage is not beyond limits (Ref WS-002).
- No loose pad material present.



2.5.3. Defect

- Damage to base laminate beyond limits (Ref WS-002).
- Functional BGA pads lifted.
- Lifted nonfunctional BGA pads exceed 10% of the total BGA pad count.
- Loose piece(s) of BGA pads present on the PCB (not shown).



3. SMPM (SUB MINIATURE PUSH-ON MINIATURE) CONNECTOR ACCEPTABILITY CRITERIA

3.1. Purpose and Scope: This section describes the acceptance criteria for SMPM (Sub Miniature Push-on Miniature). (May also be known as GPPO® or SSMP® connectors, example part number: 40012161-000 & 40011782-000.) SMPM interface defined in MIL-STD-348, GPPO® is a registered trademark of Corning (Gilbert) and SSMP® is a registered Trademark of Carlisle (Tensolite).

3.2. Magnification: SMPMs shall be inspected at the appropriate magnification for the wire size of the SMPM's pin (see IPC-610 Table 1-3 or IPC/WHMA-A-620 Table 1-1).

3.3. Product Features/Conditions:

Knit Lines (also known as weld lines/meld lines) can occur during the manufacturing of these connectors depending on the manufacturing method used.

3.3.1. Acceptable (see Figure 1)

- Knit line is visible but does not have a gap.
- Center contact is fully restrained.

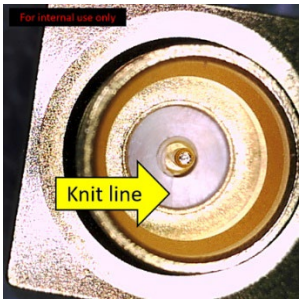


Figure 1: Acceptable Knit Line Example

3.3.2. Defect

- Knit line has a gap.
- Center contact is not being held in place (is not concentric or titled at an angle) due to a knit line gap.

3.4. FOd (Foreign Object Debris)

3.4.1. Acceptable

- Dielectric burr is attached (see Figure 2).
- Burr does not interfere with the electrical ground path (see Figure 2 for an example of this type of burr, the electrical ground path is shown in red in Figure 3).

3.4.2. Defect

- Dielectric burr is loose/not attached.
- Burr is in/interferes with the electrical ground path (the electrical ground path is shown in red in Figure 3).

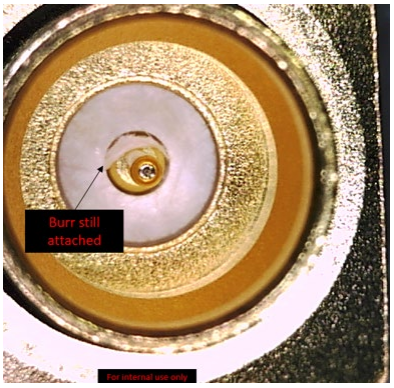


Figure 2: Dielectric Burr

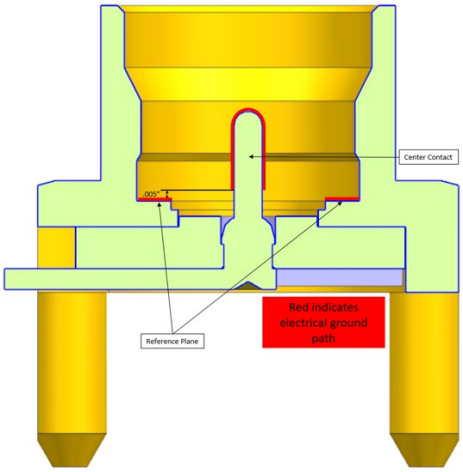


Figure 3 Electrical Ground path (shown in red)

4. PRESSFIT CONNECTOR CONTACTS

4.1. Pressfit Ground Contacts

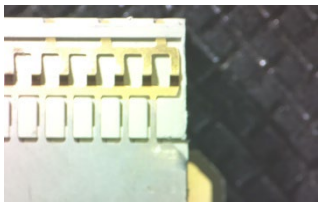
This section describes the acceptance criteria necessary to inspect pressfit connectors with ground contacts after the connectors are installed onto the PCB. The pressfit connector ground contacts contain a bend to allow for a spring effect. This bend is susceptible to damage through handling or processing of the CCA or during test where mating connectors are installed for functional evaluation.

Minimal to light damage to these ground contacts is an **acceptable condition**. These conditions provide full contact to the mating connector.

Note: All photos in this document are examples and intended to provide visual directive and are not specific to any part or program.

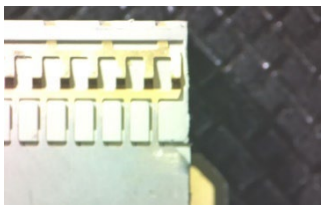
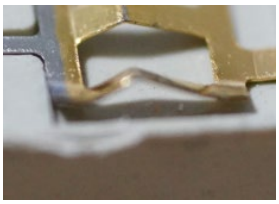
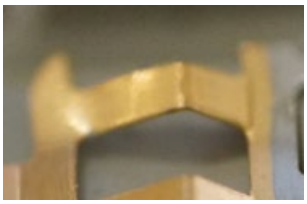
4.1.1. Target

- No damage to the ground contacts of pressfit connectors



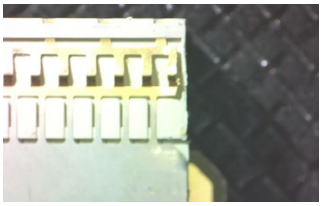

4.1.2. Acceptable

- Slight to moderate bending of the ground contact
- Allows for mating at test/NHA

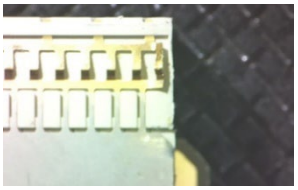
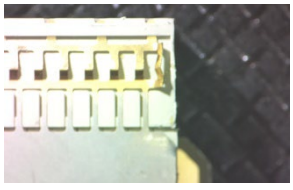
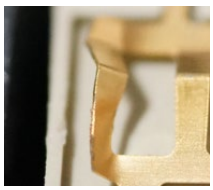
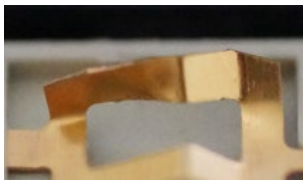
4.1.3. Process Indicator

- Contact is moderately bent.




4.1.4. Defect

- Severe or extreme damage to the ground contact likely causing damage at test/NHA.

5. CONFORMAL COATING OF PIECE MARK LABELS AND HARDWARE

5.1. Conformal Coating of Piece Mark Labels

5.1.1. Purpose and scope of this section is to discuss L3Harris standard practices when it comes to the conformal coating of piecemark labels on CCAs.

5.1.2. Industry documentation

- IPC HDBK-830A states: “Bare board areas with no traces or joints are not necessary to coat, but may be considered optional, if for cosmetic purposes only.”

- IPC-A-610J states: “Coating only in those areas where coating is required [A1,A2,A3].”
- J-STD-001 states: “Coating shall [D1,D2,D3] be applied only to areas designated for coverage on the engineering documentation.”

5.1.3. Taking the above documentation into account. It is the standard to not conformally coat any piece mark label in the CCA area in Salt Lake City. However, it is not a defect if any piece mark label is conformally coated unless there is other documentation (ie: drawing) that states it is so.

RECORDS

There are no records associated with this document.

END OF DOCUMENT

DOCUMENT INFORMATION

Responsible Organization:	Operations
Function/Sub-function:	Workmanship Standards
Governing Document(s):	IPC-A-610, Acceptability of Electronic Assemblies
Subordinate Document(s):	J-STD-001, Requirements for Soldered Electrical; and Electronic Assembly
Related Document(s):	IS-003, Workmanship Acceptability of Electronic Assemblies P-047, Inspection WS-000, Workmanship Standards Introduction WS-002, IPC-A-610 Acceptance of Electronic Assemblies
Related Training:	N/A
Approval Requirements:	Associate Manager, Manufacturing Engineering
Review Requirements:	Supervisor, Quality Management Associate Manager, Mechanical Engineering

Revision History Summary

Revision #	Description of Change	Date
New	Initial release. (20.1 replaces QB-153)	05/26/2011
01	Added a paragraph to 20.1.1, allowing discoloration (patina) to the brush wire ends.	02/09/2015
NA	Added records section. No revision upgrade necessary.	03/16/2017
NA	Reformatted in accordance with new template format. Update L3 naming throughout. No revision upgrade necessary.	05/23/2017
02	Added expendable features section. Reformatted by adding links to various sections instead of defining criteria in this document.	12/05/2018
03	Added new section 4.3, Material Military Interface.	04/05/2021
04	Incorporated subsections (separate files) into this single document. Removed reference to wire (bristle) ends illustrations from second paragraph in section 1.1.	11/10/2022
05	Added section 4, accept/reject criteria for pressfit connector ground contacts.	9/12/2023
06	Added new section 5 for Conformal Coating of Piece Mark Labels and Hardware.	01/02/2025