Supplier Quality Requirements – Circuit Card Assemblies

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TABLE OF CONTENTS

1. WORKMANSHIP AND SPECIFICATION MANUAL

The L3 Communication Systems-West (CSW) Workmanship and Specifications Manual is applicable to all CSW procurements unless otherwise specified in the Purchase Order, Drawing, or Subcontractor Statement of Work. The Manual may be identified on the L3 drawing as either the Workmanship and Specifications Manual, WSM-01, WSM, or S01.

It invokes CSW Workmanship Standards (WS-XXX), Internal Specifications (IS-XXX), and Specification 60083155 (Torque and Retention Requirements for Threaded Hardware), establishing design, manufacturing, and acceptance requirements. The manual may be accessed at BCS Supplier WSM / Internal Specifications | L3Harris Technologies, Inc.

The applicable Internal Specifications and Workmanship Standards for this commodity are the following:

- IS-003, Workmanship Acceptability of Electronic Assemblies
- IS-005, Printed Circuit Board Workmanship & Design Criteria
- WS-002, IPC-A-610 Acceptability of Electronic Assemblies
- WS-006, Microelectronics
- WS-019, Printed Circuit Board Workmanship Criteria
- WS-020, Circuit Card Assembly
- J STD-001, Requirements for Soldered Electrical and Electronic Assemblies
- SQR-PCB, Supplier Quality Requirements – Printed Circuit Boards

2. DESIGN AND WORKMANSHIP

The supplier's circuit card assembly (CCA) design and workmanship shall be in compliance with the most recent IPC-2220 series for printed circuit board design and IPC-A-610 Class 3 acceptability specifications. Manufacturing methods shall be in accordance with the current revision of J-STD-001 Class 3. Rigid and flex circuit card assemblies shall meet the requirements of the specified standards as applicable to specific board type.

3. PRINTED CIRCUIT BOARDS PERFORMANCE REQUIREMENTS

Printed Circuit Boards (PCBs), including rigid, rigid flex, flex and high density boards shall meet performance requirements specified in the current revisions of the IPC-6010 series as well as the acceptability requirements for IPC-600 class 3. Exceptions to Class 3 specifications must be approved in writing and the following minimum requirements must be maintained for critical features within the PCB design.

Refer to SQR-PCB, Supplier Quality Requirement – Printed Circuit Boards for general PCB quality, workmanship, packaging, and other CSW-specific information.

4. PCB INSPECTION

Suppliers must have inspectors certified to IPC-A-600 and the ability to validate PCB compliance including micro section evaluation. This process can also be accomplished by using a CSW approved third party test lab.

Supplier Quality Requirement SQR-PCB allows for acceptance of ENIG-plating surface finish based on vendor certification of nickel and gold thicknesses without XRF measurement/verification at the CCA subcontractor.

5. LEAD-FREE MITIGATION

This section establishes CSW's position on the use of lead-free (Pb-free) finishes in our products. CSW has analyzed the European Union's WEEE and RoHS directives as they relate to materials used in our products. Because of these directives, many companies are eliminating lead (Pb) from their products. The following summarizes what CSW generally considers acceptable and unacceptable:

- Lead-free tin finishes and solders are **not** acceptable
- CSW's definition of lead-free tin is any tin-based alloy that does not contain at least 3% lead (Pb) by weight.
- Bright tin finish shall not be used on products supplied to CSW.
- The only tin finishes which may be approved by CSW are "matte" tin in accordance with ASTM B545, "Standard Specification for Electrodeposited Coatings of Tin."
- CSW will continue to use lead-based solders and avoid lead-free tin finishes and solders in accordance with USAF Airworthiness Advisory AA-08-02, "Lead-Free Solder."
- This position statement does not modify any CSW technical requirements incorporated either directly or by reference in purchase orders awarded by CSW.
- When changes in product provided to CSW are planned that would incorporate unacceptable materials, suppliers are required to inform CSW in writing regarding:
    - Specifics of the change including technical rationale
    - Implementation schedule
    - Transition and traceability plan

5.1. Lead Finish

The use of lead-finished components is required unless otherwise authorized by the contract (SOW), drawing or parts list. The Supplier is responsible to characterize their manufacturing build process from the three choices identified below, with emphasis on the compatibility of the reflow profile and CCA (components/PCB). A compatible thermal profile means that the CCA is processed using the appropriate time, temperatures, ramp rates and dwell times during the reflow soldering process to ensure the solder is properly mixed (verified with cross-section microscopy). Cross section analysis of mixed technology assemblies is required and may be performed by the Supplier or at a reputable industry recognized company that provides such services.

Build Process:

- Mixed Technology: All components/PCB are a mix of lead and lead-free finishes.
- Pure-Lead: All components/PCB are lead-finished (>3% by wt.). If components are available with lead-free solder finish only, the components shall be refinished. Refinishing shall be per GEIA-STD-0006: "Requirements for Using Solder Dip to Replace the Finish on Electronic Piece Parts." Refinishing shall take place at a reputable industry recognized company that provides refinishing services.
- Lead-Free: All components/PCB are lead-free finished (<3% by wt.). If components are available with lead solder finish only, the components shall be refinished. Refinishing shall be per GEIA-

STD-0006: “Requirements for Using Solder Dip to Replace the Finish on Electronic Piece Parts.” Refinishing shall take place at a reputable industry recognized company that provides refinishing services.

5.2. Lead Free Control Plan

The Supplier shall provide a Lead Free Control Plan (LFCP) in accordance with GEIA-STD-0005-1 and GEIA-STD-0005-2. The LFCP shall describe policy for managing the transition of components from leaded to lead-free termination finish. The LFCP shall contain or reference policies, procedures, work instructions, etc. that demonstrate proactive, quality management of the introduction of lead-free solder in our supply chain. The Supplier shall actively employ measures to mitigate the effects of the commercial industry migration to lead-free parts. CSW complies with Level 2B requirements of GEIA-STD-0005-2 (Standard for Mitigating the Effects of Tin Whiskers in Aerospace and High Performance Electronic Systems). Suppliers are expected to comply to GEIA-STD-0005-2 Level 2B or above (above meaning risk due to the introduction of lead-free products is further reduced, e.g., Level 3 implies lead-free solder is not allowed). Suppliers shall submit a copy of their LFCP for CSW review.

5.3. X-Ray Fluorescence (XRF)

All CCA components purchased for CSW products are recommended to undergo XRF (x-ray fluorescence) analysis to accurately determine component lead finish. In most cases, if the proper XRF equipment is utilized, XRF can provide composition and thickness determinations.

XRF is mandatory for all BGAs and bottom termination components. Suppliers shall ensure that proper processing parameters and proper material controls take place to ensure reliability and a robust process.

5.4. Flux Type

The use of a rosin based flux meeting the requirements of J-STD-004, ROL0 (approximate equivalent of Type R flux) or ROL1 (approximate equivalent of Type RMA flux) is required on all CCAs listed in the SOW, along with the applicable wash process.

Note: ROL1 flux contains a small amount of additional activator to enhance cleaning and de-oxidation, leaving only a minimum amount of inert residue behind. A characteristic of ROL1 fluxes is that the remaining residue be noncorrosive, tack free, and exhibit a high degree of freedom from ionic contamination after cleaning. ‘No clean’ flux cannot be used due to the adverse impact on the radio frequency (RF) designs. ‘Water soluble’ flux is considered high risk because several hand installed components cannot be processed through an automated wash line.

6. ELECTRO-STATIC DISCHARGE CONTROL

Suppliers that handle ESD sensitive items shall have an Electrostatic Discharge (ESD) control program in effect to protect parts during manufacturing, inspection/test, packaging, shipping, rework, and/or failure analysis. The ESD control program shall conform to ANSI/ESD 20:20. Packaging shall conform to the requirements of MIL-PRF-81705 and must be marked with the MIL-STD-129N ESD caution label, “CAUTION - OBSERVE PRECAUTIONS FOR HANDLING ELECTROSTATIC SENSITIVE ITEMS”. The packaging shall be marked to assure static awareness upon receipt at CSW.

7. SOFTWARE REQUIREMENTS

The requirements defined in commodity sheet SQR-Software applies for CCAs delivered with software (e.g. have programmable devices such as FPGAs installed.

END OF DOCUMENT

Revision History Summary

Revision #	Description of Change	Date
00	Initial Release.	1/08/2016
NA	Removed reference to WS-013 from section 1. No revision upgrade necessary.	03/21/2017
01	Updated sections 3 and 4 titles and added SQR-PCB reference with link to each section. Also, included ENIG finish nickel and gold thickness acceptance criteria to section 4. Updated WSM link in section 1 and added SQR-PCB to Internal Specifications and Workmanship Standards document list.	5/24/2022
NA	Updated hyperlink in section 1. No revision upgrade necessary.	2/25/2025