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PROCUREMENT SPECIFICATION FOR PCB ASSEMBLIES
OUTSOURCE, SEAKR

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REVISION/CHANGE RECORD

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1 SCOPE

This specification shall be used for the procurement of manufacturing services to assemble printed circuit board assemblies.

1.1 Classification

Unless otherwise specified in the PO or drawing, the required product class for the assembly is Class 3, in accordance with IPC-A-610 of J-STD-001. There are three classes to which a module can be assembled to:

1. Class 1 – General Electronic Products
2. Class 2 – Dedicated Service Electronic Products
3. Class 3 – High Performance/Harsh Environment Electronic Products

2 APPLICABLE DOCUMENTS

2.1 Military/Industry Specification and Standards

The following specifications and standards form a part of this specification to the extent specified herein. Unless otherwise specified, the applicable issues of these documents shall be those in effect on the date of the procurement. All other requirements shall default to Industry Standards.

Assembly drawings may reference SEAKR Engineering Work Instructions (SEWIs). Manufacturer shall follow these industry standards instead of SEWIs unless stated as required:

Document Number	Document Title
541-PC-8072.1.2	Goddard Space Flight Center Fastener Integrity Requirements
AFSPCMAN 91-710	Range Safety User Requirements Manual
ANSI/ESD S20.20-2014	Electrostatic Discharge Control Program for Protection of Electrical and Electronic Parts, Assemblies and Equipment
ANSI/NCSL Z540-1	General Requirements for the Competence of Testing and Calibration Laboratories
AS5553	Counterfeit Electronic Parts: Avoidance, Detection, Mitigation, and Disposition
AS6462	Fraudulent/Counterfeit Electronic Parts; Avoidance, Detection, Mitigation, and Disposition Verification Criteria

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Document Number	Document Title
ASM2700	Passivation of Corrosion Resistant Steels
ASTM A967	Chemical Passivation Treatments for Stainless Steel Parts
ASTM E595	Standard Test Method for Total Mass Loss and Collected Volatile Condensable Materials from Outgassing in a Vacuum Environment.
DOD-HDBK-343	General Guidelines for Electronic Equipment
GEIA-STD-0005-2	Standard for Mitigating the Effects of Tin Whiskers in Aerospace and High-Performance Electronic Systems
GEIA-STD-0006	Requirements for Using Solder Dip to Replace the Finish on Electronic Piece Parts
IPC/WHMA-A-620 -S	Requirements and Acceptance for Cable and Wire Harness Assemblies, Space Addendum
IPC-6012 (Class 3/A requirements)	Qualification and Performance Specification for Rigid Printed Boards
IPC-6013 (Class 3 requirements)	Qualification and Performance Specification for Flexible Printed Boards
IPC-A-610	Acceptability of Electronics Assemblies
IPC-J-STD-001	Joint Industry Standard, Space Applications Electronic Hardware Addendum to J-STD-001 Requirements for Soldered Electrical and Electronic Assemblies (Class 3 Requirements)
IPC-J-STD-001 with Space Addendum	Joint Industry Standard, Space Applications Electronic Hardware Addendum to J-STD-001 Requirements for Soldered Electrical and Electronic Assemblies (Space Requirements)
IPC-J-STD-004	Requirements for Soldering Fluxes
IPC-J-STD-005	Requirements for Soldering Pastes
IPC-J-STD-006	Requirements for Electronic Grade Solder Alloys and Fluxed and Non-Fluxed Solid Solders for Electronic Soldering Applications,
IPC-TM-650	Test Methods Manual
ISO/IEC 17025 Laboratories	General Requirements for the Competence of Testing and Calibration

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Document Number	Document Title
J-STD-020	Moisture/Reflow Sensitivity Classification for Non-Hermetic Solid State Surface Mount Devices (SMD)
J-STD-033	Standard for Handling, Packing, Shipping and Use of Moisture/Reflow Sensitive Surface Mount Devices
MIL-HDBK-454	Military Handbook: General Guidelines for Electronic Equipment
MIL-PRF-31032	General Specification for Printed Circuit Board/Printed Wiring Board
MIL-PRF-55110	General Specification for Rigid Printed Wiring Board
MIL-STD-202	Test Method Standard Electronic and Electrical Component Parts
MIL-STD-883J	Test Method Standard Microcircuits
MIL-STD-975	Electrical, Electronic and Electromechanical Parts List
MSFC-HDBK-527	Materials Selection List for Space Hardware Systems
NASA NPR 8705	Risk Classification for NASA Payloads
NASA-STD-8739.1	Workmanship Standard for Staking and Conformal Coating of Printed Wiring Boards and Electronic Assemblies
NASA-STD-8739.4	Crimping, Interconnecting Cables, Harnesses, and Wiring

2.2 Order of Precedence

Detailed requirements, specific characteristics, and dimensions of the assembly are specified in the assembly drawing, Source Control Drawing (SCD), and Supplier Bill of Material (BOM). All test requirements will be defined in the assembly drawing or separate test specifications. These documents and any supplemental requirements will be noted on the Purchase Order (PO). There shall be no substitutions or additional exceptions without written approval from SEAKR.

The following order of precedence shall apply in the event of a conflict between the procurement document(s), the text of this document and the references cited herein.

1. Purchase Order (PO)
2. Source Control Drawing (SCD)
3. Assembly Drawing
4. Test Procedure
5. This specification
6. Other applicable documents referenced herein

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2.3 Abbreviations

Acronyms are defined at first point of use within this document and defined below.

Acronym	Definition
BHR	Build History Record
BOM	Bill of Materials
CAGE	Commercial and Government Entity
CCA	Circuit Card Assembly
CDR	Critical Design Review
CofC	Certificate of Conformance
CFM	Customer Furnished Material
CM	Configuration Management
CRES	Corrosion Resistant Steel
CVCM	Collected Volatile Condensable Material
EEE	Electrical, Electronic, Electromagnetic
EIDP	End Item Data Package
EMI/EMC	Electromagnetic Interference/Electromagnetic Compatibility
ESD	Electrostatic Discharge
FMECA	Failure Modes, Effects, and Criticality Analysis
FOD	Foreign Object Debris
GIDEP	Government-Industry Data Exchange Program
GSE	Ground Support Equipment
Hi-Rel	Higher Reliability
IAW	In Accordance With
LDC	Lot Date Code
MA	Mission Assurance
MAP	Mission Assurance Plan
MAPTIS	Materials and Process Technical Information System
MIP	Mandatory Inspection Point
MLCC	Multi-layer Chip Capacitor
MODE	Mission Operations Design & Environments
MRB	Material Review Board
MRR	Manufacturing Readiness Review

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Acronym	Definition
MSL	Moisture Sensitivity Level
NASA	National Aeronautics and Space Administration
NCM	Non-Conforming Material
NSMAR	Non-Standard Material Approval Request
NSPAR	Non-Standard Part Approval Request
OEM	Original Equipment Manufacturer
PCN	Product Change Notice
PDR	Preliminary Design Review
PFR	Problem Failure Report
PMP	Parts, Material, and Process
PO	Purchase Order
QA	Quality Assurance
QC	Quality Control
QMS	Quality Management System
SCAR	Supplier Corrective Action Request
SCC	Stress Corrosion Cracking
SCD	SEAKR Control Drawing
SEWI	SEAKR Engineering Work Instructions
SOW	Statement of Work
SW/FW/GW	Software/Firmware/Gateware
UAI	Use-As-Is

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3 MISSION ASSURANCE REQUIREMENTS

3.1 General

Assemblies delivered shall be of the material, design, and construction specified on the PO including all referenced documents such as the assembly drawing, Source Control Drawing (SCD), Bill of Materials (BOM), and this specification.

Contract Manufacturer (also referred to herein as Supplier) shall develop build travelers in accordance with all requirements. The build travelers shall be presented to SEAKR in a Manufacturing Readiness Review (MRR) prior to initiation of the build process. SEAKR approval of build travelers is required prior to release.

3.2 Readiness Reviews

Supplier shall conduct readiness reviews in accordance with Statement of Work (SOW) requirements.

Supplier shall assure that readiness review action items are tracked to closure.

3.2.1 Authorization to Proceed Review

At each readiness review, Supplier will assess Mission Assurance (MA) planning maturity, confirm that planning is sufficient to execute the program with acceptable risk, and verify that Supplier's MA/Quality team is ready to execute.

3.3 Risk Management

Supplier shall implement a risk and opportunity management plan to meet contractual requirements as defined in the SOW, verifiable by audit or request.

3.4 Quality Assurance System

Supplier shall maintain a Quality Management System (QMS) in compliance with the most current version of AS9100 or IS09001. A QMS certification issued by a 3rd Party Registrar is preferred and shall be made available to SEAKR upon request.

3.5 Quality Assurance Approach

Supplier shall plan and execute a quality assurance program that is compliant with AS9100 or ISO9001 that provides adequate inspection, testing, and verification of products and services in full compliance with the purchase order requirements and all applicable specifications/standards.

Supplier should develop an internal Mission Assurance Plan (MAP) that will ensure the mission assurance requirements are defined and satisfied throughout all phases of project performance and are continuously maintained in the fabricated articles. This MAP will provide oversight for the early detection of actual or potential deficiencies, system incompatibility, marginal quality, and trends or conditions that could result in

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unsatisfactory performance. SEAKR SQE will assist with quality and questions related to build requirements during production.

Supplier shall appoint a quality lead to manage, enforce, and carry out the quality assurance requirements and tasks for the program. The program quality lead is expected to participate in quality status reporting, meetings, metric collection, and other collaborative activities with SEAKR when warranted.

3.6 **Supplier Subcontract Services**

All subcontracted manufacturing processes shall be approved by SEAKR in advance of PO acceptance. The Supplier shall not flow down any applicable requirements of this specification to a subcontractor without prior approval from SEAKR. The Supplier assumes all responsibility that the subcontracted service has demonstrated the ability to meet the applicable requirements of this specification. SEAKR reserves the right to audit the Supplier's subcontractors.

3.6.1 **Sub-tier Suppliers Management Quality Requirements**

Supplier shall maintain a Quality Management System (QMS) in compliance with the most current version of AS9100 or IS09001. A QMS certification issued by a 3rd Party Registrar is preferred and shall be made available to SEAKR upon request.

SEAKR reserves the right to conduct on-site survey of Sypris Electronics quality systems to ensure this specification is being met. More frequent surveys may apply if adverse quality trends are discovered during the on-site survey or if there are major changes to the Sypris Electronics operation location, equipment, and/or facilities.

Supplier is responsible for adequate and effective control over all sub-tier Suppliers and Suppliers. The requirements of this specification, PO, SOW and any other applicable requirements shall be imposed on sub-tier Suppliers where applicable to ensure the quality and reliability of their products.

3.7 **Supplier Surveillance**

Supplier surveillance may be performed when warranted by product complexity, high risk assessment, quality and delivery history, and other factors.

3.7.1 **Supplier Assessment**

SEAKR reserves the right to perform Supplier assessments to

(a) audit Supplier's QMS,

(b) determine the capability and competency of Supplier to meet the requirements of the purchase order

(c) verify that corrective action measures have been implemented after a nonconformance, and/or

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(d) conduct performance surveillance to meet the requirements of the purchase order.

3.7.2 Supplier Mandatory Inspection Points (MIPs)

SEAKR or its 3rd party representative reserve to right to perform MIPs on flight products as indicated by the SOW. Supplier shall incorporate appropriate hold points in assembly flow and provide SEAKR with appropriate notification as defined by the PO/SOW.

Typical MIPs are listed below:

- Pre-close out of electronics features that cannot be inspected in the final assembled state
- Post solder
- Pin/Probe Testing/Bed of needles
- Pre and post conformal coat
- Other misc. functional testing required
- Final inspection

3.7.3 Source Inspection

SEAKR or its 3rd party representative reserves the right to conduct source inspection before product test and delivery of production hardware, including all production/process documentation in accordance with the PO. SEAKR reserves the right to evaluate the test setup and observe the product tests and test documentation for all hardware deliverables. SEAKR shall be contacted prior to any inspection point being covered up to give SEAKR the opportunity to inspect.

When source/surveillance is required, any onsite SEAKR inspector shall be provided access to the production work area upon request and be provided with the appropriate inspection tools to safely and securely perform all tasks as defined above. This area should additionally include internet access for a personal work PC to acquire electronic reports, drawings, PO, standards, and general communication with SEAKR to allow for expediting of communication between Supplier and SEAKR. This area should be available during all supplier business hours of operation.

3.8 Configuration Management

Supplier shall establish and maintain a configuration management method for controlling the configuration of all designed hardware, software, specifications, test procedures, and documentation, which includes a change classification and impact assessment process.

Supplier shall identify when an item is formally released and placed under change control.

Supplier shall ensure effective levels of peer review, release and revision control, and technical and product baseline control are implemented on program and technical work products.

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All changes shall be incorporated into each deliverable component prior to delivery and demonstrated via inspection records included in the End Item Data Package (EIDP) as defined in Section 10.6.

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4 FAILURE REPORTING, ANALYSIS, AND CORRECTIVE ACTION SYSTEM

Supplier shall have a formal closed-loop incident/failure reporting system for deliverable hardware, software, and ground support equipment.

4.1 Failure/Mishap Notification

Any failures or other incidents that have the potential for adversely impacting the performance of the subcontract shall be reported to SEAKR within 48 hours. Examples of such items include:

- Serious accidents or incidents resulting in damage to the deliverable hardware
- Any issues or problems occurring after the start of Run for Record qualification, proto- qualification or acceptance testing
- Safety accident/incident reports to hardware or personnel (caused by the HW)
- Strikes or transportation tie-ups that could delay the program
- Natural disasters affecting program performance
- Lower-tier Supplier events that could delay the program (including any of the above)
- Any other event largely affecting production/manpower (pandemic, supply chain, etc.)

Supplier shall notify SEAKR of the matter by telephone or email and follow with a written report. SEAKR reserves the right to authorize Supplier to proceed after Failure/Mishap.

4.1.1 Failure Documentation

Supplier shall document such an event on a Problem Failure Report (PFR) in Supplier’s format. The completed PFR shall be submitted to SEAKR for review and, at a minimum, shall describe:

a) Failure type, nature of problem, and configured item identification
b) Assessment of configured item’s performance, lifetime, or ability to meet program requirements and any associated risks
c) Test conditions, test equipment, and environmental conditions at the time of failure
d) Symptoms and root cause(s), including potential impact on other hardware/software
e) Analysis and verification approach and results
f) Any rework or retest performed, including any repeat (penalty) testing to reverify requirements
g) Final disposition and corrective and preventive action recommendation

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This reporting includes support, as requested by SEAKR, on failures, returns, or troubleshooting expertise on delivered products/services that are part of Supplier's responsibility including any of their interfaces.

4.1.2 Parts Failure Analysis

Component part failures shall be reported to SEAKR's Parts, Materials and Processes Control Board (SEAKR). Supplier will be required to complete a failure analysis to determine the root cause, flight lot impact determination, reach back, and reach across. Supplier is not required to perform failure analysis on customer furnished material, but must notify SEAKR when there is a suspected part failure. Care must be taken not to remove parts with a suspected part failure until SEAKR has been notified.

4.2 Nonconforming Material

Supplier shall have established procedures for the identification, isolation, disposition, and tracking of nonconforming parts or materials in accordance with AS9100 or ISO9001 requirements. Any part or material found to be discrepant shall not be used in the fabrication and assembly of hardware without prior written approval from SEAKR.

4.2.1 Deviations/Waivers and Nonconformances

Engineering changes, deviation and waivers shall be implemented per Supplier's standard practices.

Deviations/waivers are defined as a notification from Supplier to SEAKR for a condition that is noted prior to the start of product assembly or manufacturing and may or may not require a Material Review Board (MRB). Supplier shall submit a deviation/waiver (NCM report) for all changes which affect the form, fit, function, or safety of the end item to SEAKR for approval. Deviations and waivers to the PO, engineering drawings, BOM, test procedures, or this specification require prior written approval from SEAKR Engineering. Written approval for any deviation or waiver shall be listed on the PO prior to delivering product and shall be documented and supplied as part of the End Item Data Package (EIDP). Engineering changes that don't affect the form, fit, function or safety of the end item shall be documented in Supplier's Configuration Management system.

A Nonconformance is defined as a defect that occurs after the start of product assembly or manufacturing that will result in a disposition of Repair or Use-As-Is (UAI).

4.2.2 Disposition of Nonconforming Material

Any deviations from drawings, specifications, or SEAKR requirements that cannot be returned to engineering requirements per rework must be submitted to SEAKR for consideration.

All Repair and UAI dispositions concerning nonconforming material shall be provided to the SEAKR Material Review Board (MRB). The disposition, including any alternative direction, must be approved in writing by SEAKR prior to shipment. Standard repairs are

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allowable once submitted and approved by SEAKR. SEAKR does not grant MRB Authority to the Supplier.

The following is SEAKR's definition of relevant dispositions.

a) Rework: A disposition process that eliminates the defect and returns a product to full conformance. Supplier is given authority to execute reworks without SEAKR approval except for stipulations outlined in Section 8.21.
b) Repair: A disposition process that reduces the defect but does not return the product to full conformance. This disposition requires SEAKR MRB approval before proceeding.
c) UAI: A disposition process that allows for the use of the nonconforming product in its existing condition for its intended purpose with no additional processing to eliminate or reduce the specific nonconformance. This disposition requires SEAKR MRB approval before proceeding.
d) Scrap: Supplier may scrap hardware if there is no impact to SEAKR's schedule or costs. Where there is impact, SEAKR written approval to scrap hardware is required.

4.2.3 **Formal Root Cause and Corrective Action**

SEAKR reserves the right to issue a Supplier Corrective Action Request (SCAR) to Supplier when a nonconformance has been identified or when root cause and corrective action must be taken to prevent the future occurrence of nonconforming deliverable hardware.

Supplier shall acknowledge any SCAR received from SEAKR within 2 business days. Communication between the Supplier QE and SEAKR SQE shall immediately occur to review a nonconforming status and follow-up of containment, RCCA, implementation and follow-up as defined by the SCAR.

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5 MATERIAL AND PRODUCT HANDLING AND STORAGE

5.1 Electrostatic Discharge (ESD) and Moisture Sensitivity Control

Supplier shall implement and maintain electrostatic discharge control procedures that conform to ANSI/ESD S20.20 Electrostatic Discharge Control Program for Protection of Electrical and Electronic Parts, Assemblies and Equipment or equivalent.

Electrical and electronic parts storage shall comply with the moisture sensitivity level (MSL) associated with each part. All goods will be placed in conductive or static-dissipative packages, tubes, carriers, conductive bags, etc., for storage and/or shipment. The packaging must be clearly labeled to indicate that it contains ESD materials and where applicable, the proper MSL in accordance with the rating identified on the Material Identification Tag (MIT). MSL parts shall be controlled per J-STD-020 and J-STD-033.

5.2 Cleanliness and Contamination Control

Contamination controls must be established to eliminate possible particulate matter that could be detrimental to materials or hardware. Operational areas, work items, tools, parts, and assemblies must remain clean and clear of Foreign Object Debris (FOD). Supplier shall implement a cleanliness control plan which includes requirements for cleanliness inspections, defines visually clean levels, and establishes cleaning operations prior to key manufacturing steps. This control plan shall be available for review to SEAKR upon request

5.3 Handling and Storage

Supplier shall ensure hardware is packaged to protect the parts from damage and contamination during all phases of procurement, manufacturing and shipment. Polyethylene packaging with anti-static film coatings, such as ‘pink poly’, are prohibited from directly contacting deliverable hardware.

Handling and storage procedures shall be instituted to prevent part, material, and product degradation, and to enable easy identification and control of parts or materials. These procedures shall be retained through inspection, kitting, testing, assembly and shipping. The following criteria shall be met as a minimum for establishing handling and storage procedures for parts, materials, and products:

a) Control of environment (temperature, humidity, contamination, and pressure)
b) Measures and facilities to segregate/protect parts and materials routed to different locations
c) Control measures to limit personnel access during receiving inspection and storage
d) Facilities for internal storage
e) Provisions for protective cushioning (as required) on storage area shelves, and in storage and transportation containers

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f) Protective features of transportation equipment designed to prevent packages from being dropped or dislodged in transit
g) Protective bench surfaces on which parts and materials are handled during operations such as test assembly, inspection, and organizing kits.
h) Required use of gloves, finger cots, tweezers, or other means when handling parts to protect the parts from contact by bare hands
i) Provisions for protection of parts susceptible to damage by electrostatic discharge (ESD)

5.4 Preparation for Delivery

Each assembly shall be double bagged with static dissipative bags:

1. Bag assembly in single ESD bag and completely seal the bag
2. Place bagged assembly, desiccant, and humidity indicator in a second ESD bag. New desiccant is preferred.
3. Secure desiccant and humidity dots to the interior of the outer ESD bag, in a position that cannot apply force to components and component leads.
4. Apply shock watch sensor as required per SOW or applicable assembly drawing.
5. Place box assemblies into shipping container. Supplier shall provide shipping containers and notify SEAKR if containers are to be returned.
6. Packaging shall comply with the ESD controls per Section 5.1. Supplier shall label external packaging in accordance with best practices and where applicable contract requirements and indicate when the item is temperature sensitive, moisture sensitive, ESD sensitive, shock sensitive, or hazardous.
7. Supplier shall ensure that deliverable hardware is properly labeled with SEAKR part number and Serial Number (where applicable).

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6 SOFTWARE ASSURANCE

Software/firmware/gateware (SW/FW/GW) used to test deliverable hardware shall be controlled for traceability.

6.1.1 Development of Software controls used to test Hardware

Supplier shall have a documented Development Process for SW/FW/GW including peer reviews at key points early in the development cycle. SEAKR may perform evaluations of this process during the software controls development life cycle that may be used specifically for testing hardware.

SW/FW/GW controls development shall be documented and controlled as necessary to provide evidence the software is adequately designed so requirements are met. Each version shall be documented and placed under configuration control.

6.1.2 Test Software Problem/Failure Reporting and Analysis

Suppliers shall have a formal closed-loop problem/failure reporting system for SW/FW/GW test problems and failures.

Problem/failure reporting may be informal up to the time of integration with Run for Record flight hardware. After flight SW/FW/GW integration with start of Run for Record hardware integration, problem/failure reporting shall be similar to that described in Section 4.

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7 PARTS AND MATERIALS REQUIREMENTS

Parts, Material, and Process (PMP) controls shall be established by the Supplier for delivered hardware throughout contract performance.

7.1 SEAKR Provided Material

The SEAKR BOM (pdf) specified in the PO identifies all material items and whether they are provided by SEAKR or Supplier. All parts or materials supplied by SEAKR shall be referred to as Customer Furnished Material (CFM).

SEAKR shall supply the designated material items in accordance with part number information specified. Supplier shall follow the Quality and Manufacturing requirements indicated in the Supplier BOM or SOW for all material items provided by SEAKR.

SEAKR will supply the designated material items along with spares for potential production loss, in packaging that segregates and identifies the applicable assembly serial number.

7.2 Parts, Materials, and Processes Control

The supplier will provide internal management oversight on the use of other PMP items (not delivered by SEAKR) in deliverable hardware. All parts and materials must be verified to be in compliance with procurement specification requirements.

When specified by the SEAKR BOM, as noted in Section 7.1, Supplier may be required to procure parts. The supplier will procure parts from the Manufacturer(s) or Manufacturer's authorized distributor as indicated. If Supplier would like to procure part from an alternate Manufacturer, they must get written approval from SEAKR prior to purchase.

Materials allowed for use in the construction of these assemblies are as-specified by the engineering drawings and BOMs. Additional or alternative materials not listed on the engineering shall not be used without prior written approval from SEAKR Engineering. Where component substitutions are required, a SEAKR representative (Buyer) shall be contacted to authorize the change. SEAKR will provide written authorization via email or PO notes for any changes.

7.2.1.1 Nonstandard Approvals

When required, Supplier shall submit a Non-Standard Part Approval Request (NSPAR) or Non-Standard Material Approval Request (NSMAR) to SEAKR for review and approval. Supplier's format may be used for these waiver approvals. NSPARs and NSMARs are required for all non-approved PMP. Any parts or materials provided by SEAKR are standard, and do not require nonstandard approval.

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7.2.1.2 Supplier Authority

The supplier ensures that all PMP approved are generally suitable for use in hardware required to meet the reliability performance requirements. The supplier will have the authority to approve technical changes to the baseline detailed in this plan.

7.2.2 Traceability and Lot Control

The Supplier shall implement a traceability and lot control plan. Supplier shall maintain traceability to lot date code and serialized components, where applicable, and be capable of determining the unique piece of equipment or assembly in which the part or material is installed or used. Supplier shall report this material or subassembly traceability information in the End Item Date Package (EIDP) as defined in Section 10.6. When SEAKR provides SN or lot date code information to the supplier they shall maintain that same level of traceability for supplied materials. Each program will specify for purchased components what level of traceability is required.

7.2.2.1 Lot Date Codes (LDCs)

No parts manufactured more than 7 years prior to contract issuance will be incorporated into the design without SEAKR written approval. Customer Furnished Material, CFM, is excluded from this requirement.

7.2.3 Shelf Life Control

For materials, the Supplier should identify specific temperature and humidity requirements and any associated limitations on life, such that materials can be stored and controlled accordingly. Expired material may be certified up to ½ the original shelf life, one time before getting SEAKR approval, assuming there is analysis that demonstrates the shelf life does not impact the functionality or reliability of the material. Any additional extension requires written approval from SEAKR Engineering.

7.2.4 Receiving Inspection

The Supplier shall develop a plan for receiving or incoming inspection of parts and materials for physical damage and workmanship, as well as conformance to the procurement records. CFMs may have a different receiving inspection plan.

7.2.5 Reuse of Parts and Materials

EEE parts and materials which have been installed in an assembly, and are then removed from the assembly for any reason, shall not be used again in any item of hardware without prior written approval from SEAKR Engineering.

This criterion applies to soldered hardware and components only. Jackscrews supplied with connectors may be tightened and/or loosened as needed during manufacturing and testing, so long as no damage to threads or inserts occurs.

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7.2.6 **Retaining Parts and Materials**

The Supplier shall return surplus parts and materials that were procured as a part of SEAKR purchase orders. The Supplier shall not dispose of any parts or materials related to SEAKR procurements unless written authorization has been provided by SEAKR. Refer to Section 7.2.2 for Traceability and Lot control.

7.2.7 **As-Built Configured Article List**

Supplier will maintain an As-Built Parts, Materials, and Processes List (ABPMPL) for each delivered line item. The As-Built PMP List will identify all EEE components, mechanical piece parts / hardware, polymeric materials, and manufacturing processes used on each box-level unit throughout the production program. This list shall be provided in a preliminary form to SEAKR at the conclusion of integration. After test and modification (if any) the PMP List will be finalized and delivered to the SEAKR.

7.2.8 **Obsolescence Management**

Supplier shall maintain a standard process for the periodic review of all EEE parts and materials, for obsolescence over the life of the production program, for any PMP that is not CFM.

7.2.9 **Government-Industry Data Exchange Program (GIDEP) and Product Alerts**

GIDEP Alerts are issued by Government contractors to document potential part, material, or design problems discovered with Government qualified parts or materials. SEAKR will supply GIDEP alerts to Supplier for review, processing and response. Supplier shall monitor GIDEP alerts and product change notices (PCNs) affecting any parts or materials intended for use in deliverable hardware that are not CFM.

7.3 **Tin Mitigation**

Supplier shall develop a mitigation strategy for any components with pure tin terminations or Sn terminations with >97% Sn by weight unless parts are CFM. It is recommended Supplier perform tin mitigation IAW GEIA-STD-0005-2, Standard for Mitigating the Effects of Tin Whiskers in Aerospace and High-Performance Electronic Systems and GEIA-STD-0006, Requirements for Using Solder Dip to Replace the Finish on Electronic Piece Parts*,* and perform all post-dip testing necessary to ensure proper electrical performance in accordance with the original manufacturer specifications. Oversight of this process will be developed by Supplier and must be available for SEAKR review upon request.

7.3.1 **Robotic Hot Solder Dip (RHSD)**

Devices with pure tin (Sn) terminations should be solder dipped in accordance with GEIA-STD-0006. Semi-automatic or purely manually dipping processes are not permitted without SEAKR approval. This is only required for components that purchased with an unallowable solder finish, i.e. pure tin. Other solder dipping methods maybe used for removal of gold plating.

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7.3.2 **Prohibited Materials**

The use of the following PMP is prohibited without prior approval from SEAKR:

1. Pure cadmium, magnesium, zinc, or selenium, except internal to hermetically sealed devices
2. Silver brazing alloys containing cadmium or zinc
3. Brass containing zinc in a vacuum environment, unless over-plated with an approved material such as nickel or gold.
4. Ozone depleting halogenated hydrocarbons in any process (e.g., Freon or Trichloroethane)
5. Corrosive solder fluxes without the use of qualified and controlled cleaning processes
6. Dissimilar metals (with different galvanic potential) will not be used in conjunction with each other unless protected and separated by a finish
7. Silver or silver-plated surfaces that will be exposed to atomic oxygen
8. Teflon used in structural applications or where mechanical forces will be exerted on the material
9. Corrosive (acetic acid evolving) silicone resins, adhesives, and sealants
10. Polyvinyl chloride (PVC) as insulation for electrical hook-up wiring or used for packaging electronic components or within shipping containers.
11. Pressure-sensitive adhesive tapes are prohibited in critical areas, except where mechanically captured to prevent delamination during service
12. High-volatility compounds (e.g., lubricants, greases, functional fluids) that are free to migrate onto critical surfaces
13. Cotton, linen, or cellulose films used as insulation, paper, tapes, or lacing
14. Anaerobic thread locking compounds and varnishes for staking fasteners
15. Plated threaded fasteners, including connectors, where rotational engagement may generate metal debris
16. Metals and alloys used in structural applications, which have do not have high resistance to SCC as defined in the MSFC-STD-3029
17. Wire bundle sheathing such as that made with braided glass fibers that readily shed broken fiber ends
18. Conductive epoxy unless over-coated to mitigate conductive particle shedding and/or electrochemical migration concerns

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19. Materials that are a nutrient for fungus
20. Non-reversion resistant polyurethane
21. Foams that may break apart during depressurization
22. Paints or other coatings that produce particulate contamination
23. Duct tape or Velcro
24. Dye penetrants
25. Split ring or tooth type lock washers
26. Parylene (paraxylylene-based) conformal coatings containing chlorine
27. Silver-plated copper wire with less than 40 µin of silver plating
28. Cyanoacrylate adhesives in structural applications
29. Elastomeric materials that contain hydrazine except for F-E-332 for diaphragms and AF- E-411 for soft valve seats
30. Silicone greases intended for thermal bonding
31. Kapton insulated wiring where voltage is greater than 18V and where flexure, tight bend radii, physical or chemical damage, or abrasion could crack insulation
32. PTFE, FEP, or PFA (Teflon) insulated wiring or tubing
33. Graphite used as a filler in lubricants
34. Butt splices
35. Solder sleeves, except for non-critical grounding of cable shields
36. Any non-vented honeycomb core structures
37. Pink poly packaging material in direct contact with hardware
38. Unannealed gold or silver ribbons
39. If solder attached, chip capacitor terminations without barrier plating layer
40. The use of chromium within MMICs
41. Surface mounted transistor outline (TO) case configurations with diameters of 0.35 inch or larger with three or less leads in which bonding or conformal coat completely fills the gap between the body and the case
42. TO case configurations where conductive bonding material for ESD bleed purposes bridges from the component body to the PCBs (refer to program processes)
43. Surface mounted dual-in-line packages (DIPs) lap soldered to surface mount pads

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44. No-clean flux chemistries are prohibited.
45. Materials containing mobile forms of silicone, such as greases or oils, or vulcanizing forms which can evolve corrosive gases in vacuum environments, are prohibited from coming into contact with deliverable hardware and may not be used during manufacturing or processing.

7.3.2.1 Prohibited Materials Screening

Supplier shall perform x-ray fluorescence (XRF) or energy dispersive x-ray (EDX) testing (or an equivalent means of quantitative material analysis) by way of verifying the absence of prohibited materials on all incoming flight hardware. Test reports shall be traceable to the materials tested, and Supplier shall maintain the reports on file for SEAKR review upon request. Review of the CofCs with visual inspection alone are not acceptable for piece parts which contain metals (i.e. metallic pieces). This requirement is not applicable for CFM.

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8 ASSEMBLY & INTEGRATION REQUIREMENTS

8.1 Workmanship Standards

Supplier shall implement a workmanship program to assure that electronic packaging technologies, processes, and workmanship meet mission objectives for quality and reliability per the requirements of the following standards:

a. IPC-J-STD-001, Joint Industry Standard, to J-STD-001 Requirements for Soldered Electrical and Electronic Assemblies (Class 3 Requirements)
    - Or IPC-J-STD-001 with Space Addendum for contracts requiring space grade hardware (Space Requirements). This will be specified on the purchase agreement.

b. IPC-J-STD-004, Requirements for Soldering Fluxes
c. IPC-J-STD-005, Requirements for Soldering Pastes,
d. IPC-J-STD-006, Requirements for Electronic Grade Solder Alloys and Fluxed and Non- Fluxed Solid Solders for Electronic Soldering Applications,
e. MIL-STD-883, Test Method Standard Microcircuits
f. NASA-STD-8739.1, Workmanship Standard for Staking and Conformal Coating of Printed Wiring Boards and Electronic Assemblies
g. NASA-STD-8739.4, Crimping, Interconnecting Cables, Harnesses, and Wiring or IPC/WHMA-A-620, Requirements and Acceptance for Cable and Wire Harness Assemblies, Space Addendum

8.2 Soldering

Soldering shall be performed according to J-STD-001.

All insulated wires that will be soldered shall be tinned and soldered to the PBA with RMA flux only. This is required for both stranded and non-stranded wires. Wires that run over an un-common conductor must be insulated. Wires that are longer than 0.5 inch must be insulated unless otherwise specified on the engineering documentation.

8.2.1 Low Temperature Soldering

Components sensitive to secondary reflow or thermal shock shall be soldered with a 260°C (500°F) tip only and with max dwell of five seconds. Ensure to heat the component as it will be placed on the board. If this is not sufficient to reflow then an IR preheater set to 100°C shall be considered in addition to the 260°C (500°F) solder tip.

Soldering on specialty PCB materials (e.g., Megtron 6) and other high-speed materials, assemblies require the lowest temperature tip that can get the soldering done. The CTE and lower glass transition temperatures of these materials makes them susceptible to micro-via cracks. When soldering to these PCB materials, technicians shall use the lowest temperature tip possible. A 500°F tip is preferred. If a 500°F tip does not work for

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soldering, then a 600°F tip can be used with the assembly at a stable 100°C temperature on a preheater.

8.3 **Staking and Bonding**

Staking shall be completed according to the assembly drawing and performed to J-STD-001 along with the SEAKR variations defined in the following:

- Staking of fasteners shall have torque verification done just prior to epoxy application.
- Bipax use: After mixing epoxy, cut one corner of the bipax and expel the material trapped in the corner and discard prior to use. This corner material that is not fully mixed shall not be used for the witness/control sample or any other staking operations.
- Alternative packaging methods must be approved by SEAKR prior to staking and bonding.

8.4 **Surface Prep**

All components shall be clean prior to bonding. This may be accomplished using IPA or other method determined by the supplier and approved by SEAKR.

There are specific items that require scuffing or abrading of the bondable surface prior to bonding or staking. These items are metallic bodied electrical components, or other metallic items where surface roughness may not be sufficient to provide for an adequate bondable surface. Surface scuffing is achieved with 320 grit sand paper or other items as noted in the engineering documentation or in the build traveler documentation. After scuffing operations, all bondable surfaces are to be cleaned with IPA.

The SCD documentation will list the metallic bodied electrical components that require scuffing prior to bonding or staking. However, if any electrical components appear to have metallic bodies, and are not listed in the SCD, then the supplier should ask SEAKR for clarification on if the part is to be scuffed prior to any part surface preparation. If scuffing is needed, then the build traveler documentation will be updated accordingly.

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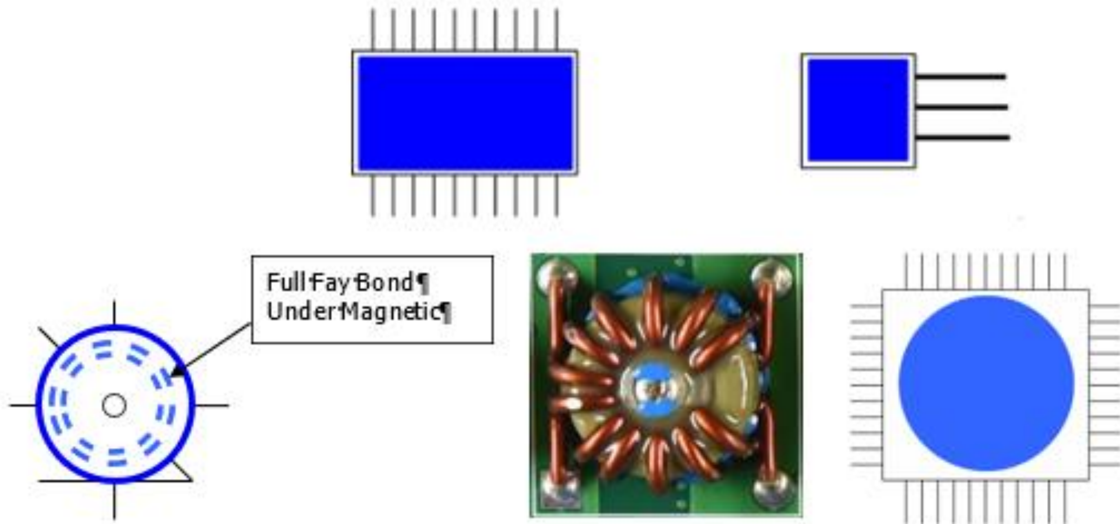
8.5 Full-Fay Bond

Full Fay Bond – More than 80% of the contacting surface of the component has epoxy applied to it prior to installation. Epoxy is applied to thermal plate or component prior to installation onto the PCB.

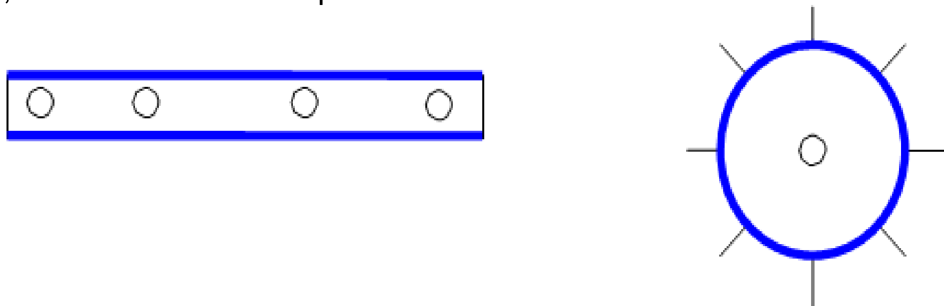
Typical Components: Quad Components, Inductors, Magnetics, Power switch, Voltage regulator, Transformer, and FETS.



8.6 Fillet Bond

Description: A line of epoxy applied to the sides of the component or mechanical fixture. This is a primary structural bond line. Only apply a fillet bond to mechanical fixtures as directed by engineering.

Typical Components: Structural support components such as ribs, transformers, magnetics, and axial leaded components.



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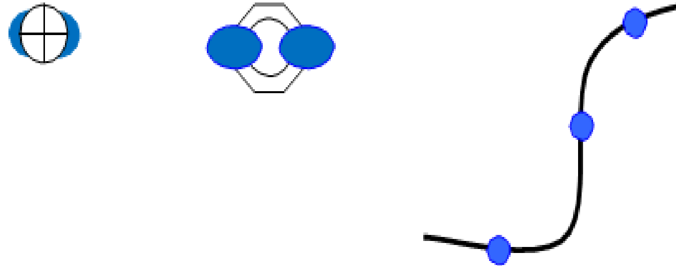
8.7 Spot Bond

Description: A small application of epoxy applied to secure lengths of jumper wires, dead bugged components or mounting fasteners to the substrate.

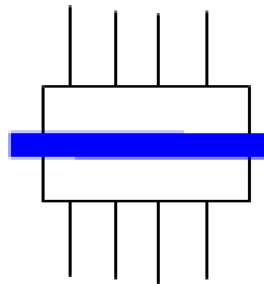
Typical Components: Screws, nuts, bolts, jumper wires, lacing cord, and two sided through-hole parts.



8.8 Line-Fay Bond

Description: A line of epoxy is applied under the component. This epoxy should be between 30% – 50% coverage after component installation. Epoxy is applied to the PCB prior to component installation. Epoxy must be in contact with the component body and should be approximately the length of the component body. It is preferable that the epoxy extends slightly beyond the component ends.

Typical Components: Two-sided gull winged components, bus drivers, resistor networks



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8.9 Corner Bonding

Description: A small application of epoxy applied to corners of leaded components to provide extra support.

Typical Components: Quad Flat Packs

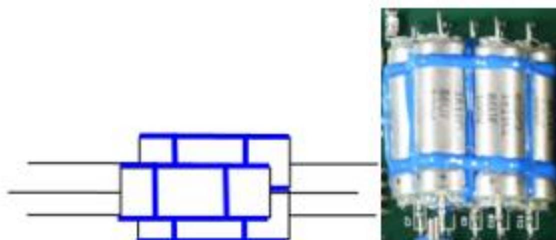
8.10 Double Strap Bond

Description: Similar to the strap bond, double strap bond is used for larger components where additional support is required. Double strap bonds can also be utilized when stacking large components in an array configuration. They are made in the same way as the strap bond, but with two straps on the part body. Their total width should not be greater than 50% of the part body.

These bonds are also usually used in combination with full fay or fillet bonds, and can blend into the fillet bond at the bottom of the component.

Typical Components and Examples: All horizontally mounted axial leaded tantalum capacitors.

When Tantalum Capacitors are stacked on top of one another, the underlying component may be used as an acceptable substrate for the fillet bond.



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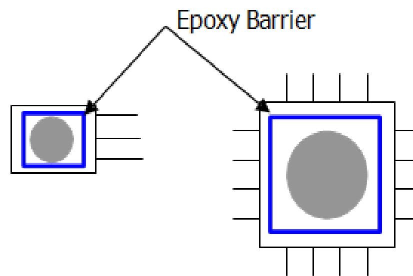
8.11 Conductive Epoxy Surrounded by a Barrier of Structural Epoxy Blue Epoxy Barriers

Blue epoxy barriers are required to retain any possible fragmentations that can be generated from the conductive epoxy. The blue barrier of epoxy will make a component more difficult to remove and could potentially damage an assembly. Unless otherwise called out on the engineering all silver epoxy shall be surrounded by blue epoxy.

When using a blue barrier, prepare a batch of non-electrically conductive BA-2151 blue epoxy or equivalent. Surround the conductive epoxy with the barrier epoxy in a manner that ensures contact with the PCB and the component bottom. Barrier epoxy should not be in contact or disturb the conductive silver epoxy.



8.12 Ablefilm Sheet Adhesive

Cure for Ablefilm adhesive shall include pressure applied to frame/thermal plate along with 3-8 hour cure of material at 120°C± 5°C. Follow manufacturer's instructions/internal lessons learned to address control of pressure.

8.13 Lifting and Isolating Leads

When component leads are lifted, all wires should be terminated to the component pad or lead prior to any epoxy applications.

For initial testing, the lead should be isolated from the pad using Kapton tape. After initial testing, the tape should be removed and isolation shall be done with structural epoxy

BA-2151 or equivalent epoxy should be applied to the isolated pad then cured. **Note: Ensure that any jumper wire solder joints have been inspected prior to application of any epoxy.**

After the isolation pad is cured, the isolated lead should be bonded to the isolated pad using BA- 2151 or equivalent epoxy and cured in place.

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8.14 **Dead Bug of Components**

All dead bugged components shall be secured to the assembly using BA-2151 epoxy. The epoxy should not extend over the solder joints connecting the components to the jumper wires. If this is unavoidable, then the solder joint must be inspected prior to application of the epoxy and documented in the operations traveler. Dead bugged resistors and capacitors with end cap terminations should be mounted in their intended upright orientation.

Figure 8-1: TO Can Dead Bug Configuration

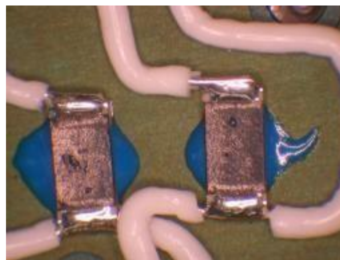

Figure 8-2: Discrete Resistor Addition

8.15 **Staking of Jumper Wires**

All jumper wires longer than 1 inch must be staked using a spot bond. Jumper wires shall be spot bonded at every 1 inch (minimum) in length. Jumper wires shall also be spot bonded at every change of direction, or cross over without negating the stress relief on the wires. No staking should be within 0.5 inch of the termination of the jumper wire, unless otherwise specified by engineering.

Figure 8-3: Jumper Wire Spot Bonding

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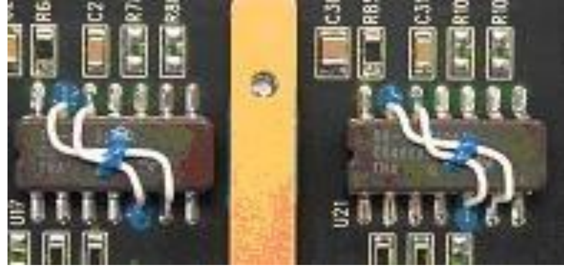

Figure 8-4: Jumper Wire Bonding over Components

8.16 **Cleaning of Assemblies**

The cleaning of assemblies shall be done in accordance with the flux manufacturers recommendations and best practices determined by assembly house. Bare PCBs shall be cleaned and baked out for minimum of 2 hours at 120°C prior to use.

Vented Ball Grid Array (BGA) and Column Grid Array (CGA) Devices Vented, metal lidded, area array devices such as the Freescale 8548 processor, must be baked out at 120°C for at least two hours prior to functional testing to remove potential moisture from the die cavity. These devices will be identified on the parts restrictions report. The actual bake-out time shall be recorded in the traveler.

8.17 **Crimping**

Crimping and crimp pull tests shall be performed in accordance with IPC/WHMA-A-620X-S.

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8.18 **Torqueing**

Torqueing shall be in accordance with 540-PG-8072.1.2. The value of torque being approximately 65% of yield strength for all metal to metal torqueing. PCB mounting hardware toque values shall be done to tables listed below. SEAKR uses both 300 series CRES and A286 grade Ftu = 160 ksi hardware. SEAKR will review torque values during MRR to ensure they are correct.

Table 8-1: Printed Circuit Board (PCB) Mounting Hardware Torque Values

Designation	Target -5% (in-oz)	Target (in-oz)	Target +5% (in-oz)	Target - 5% (in-lbs)	Target (in-lbs)	Target +5% (in-lbs)	Target - 5% (ft-lbs)	Target (ft-lbs)	Target +5% (ft-lbs)
0-80	10.0	10.5	11.1	0.63	0.66	0.69			
1-72	18.8	19.8	20.8	1.18	1.24	1.30			
2-56	29.5	31.1	32.6	1.8	1.9	2.0			
4-40	62.8	66.1	69.4	3.9	4.1	4.3			
6-32	116.4	122.6	128.7	7.3	7.7	8.0			
8-32				13.3	14.0	14.7	1.1	1.2	1.2
10-24				19.3	20.4	21.4	1.6	1.7	1.8
10-32				22.1	23.2	24.4	1.8	1.9	2.0
1/4-20				46.2	48.6	51.0	3.8	4.1	4.3
1/4-28				52.8	55.6	58.3	4.4	4.6	4.9

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Table 8-2: PCB Mounting Hardware Torque Values (Metric

Designation	Target - 5% (in-oz)	Target (in-oz)	Target + 5% (in-oz)	Target - 5% (in-lbs)	Target (in-lbs)	Target + 5% (in-lbs)	Target - 5% (ft-lbs)	Target (ft-lbs)	Target + 5% (ft-lbs)
M1.6-0.35	11.3	11.9	12.5	0.71	0.74	0.78			
M2-0.4	23.1	24.3	25.5	1.4	1.5	1.6			
M2.5-0.45	47.3	49.8	52.3	3.0	3.1	3.3			
M3-0.5	84.3	88.8	93.2	5.3	5.5	5.8			
M3.5-0.6	132.4	139.4	146.4	8.3	8.7	9.1			
M4-0.7				12.3	12.9	13.5	1.0	1.1	1.1
M5-0.8				24.8	26.1	27.4	2.1	2.2	2.3

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Table 8-3: Connector Hardware Torque Values

Panel/Box Mounted Connector Hardware						
Designation	**Target Torque -Tolerance (in oz)**	**Target Torque (in-oz)**	**Target Torque +Tolerance (in-oz)**	**Target Torque -Tolerance (in-lbs)**	**Target Torque (in-lbs)**	**Target Torque +Tolerance (in-lbs)**
2-56 Jackposts (Steel)	29.0	30.4	32.0			
4-40 Jackposts (Steel)	80	88	96	5.0	5.5	6.0
4-40 Jackposts (Brass)	40	45	48	2.5	2.8	3.0
SMA (Steel) Jam Nut				12.0	13.5	15.0
SMA (Brass) Jam Nut				8.0	9.0	10.0
Type N (Steel) Jam Nut				40.0	42.5	45.0
Type N (Brass) Jam Nut				35.0	37.5	40.0
TNC (.625) Jam Nut				35.0	37.5	40.0
TNC (.562) Jam Nut				22.3	23.5	24.7
38999 Series I, III, IV (Shell 09) Jam Nut				30.0	33.0	36.0
38999 Series I, III, IV (Shell 11) Jam Nut				40.0	43.0	46.0
38999 Series I, III, IV (Shell 13) Jam Nut				55.0	57.5	60.0
38999 Series I, III, IV (Shell 15) Jam Nut				70.0	72.5	75.0
38999 Series I, III, IV (Shell 17) Jam Nut				80.0	82.5	85.0
38999 Series I, III, IV (Shell 19) Jam Nut				90.0	92.5	95.0
38999 Series I, III, IV (Shell 21) Jam Nut				100.0	105.0	110.0
38999 Series I, III, IV (Shell 23) Jam Nut				110.0	115.0	120.0
38999 Series I, III, IV (Shell 25) Jam Nut				120.0	125.0	130.0
Twinax/Traix (1553) (BJ3150) Jam Nut				25.0	27.5	30.0
Filter Caps (MIL-PRF-28861/1D) Jam Nut				2.5	2.75	3.0

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8.19 **Assembly Instructions and Build History Records**

Manufacture, build and assembly operations shall be documented using planning/assembly instructions.

A Build History Record (BHR) shall be used to assemble (or correlate) the following elements of the product build, test and quality inspection history for each configured end-item including:

- assembly and rework/repair instructions
- trace/kit records
- test procedures, reports, and data logs (connector mate/demate, open liens, ovens, etc.)
- photos at component, subassembly, and top-level assembly including hardware part number, revision, serial number, and date taken in accordance with
- quality inspection results
- nonconformance and test event/failure records
- as-built configuration

8.20 **Operator Training and Certification**

Supplier shall maintain a Training and Certification program for all of its employees. All personnel (operators) involved in manufacture, handling, or testing of deliverable hardware should be certified to perform the task.

8.21 **Electronic Hardware Rework and Repair Restrictions**

Alternate wiring using jumper wires and/or rework and repair of printed wiring boards (PWBs) and circuit card assemblies (CCAs) shall conform to the following:

- EEE parts that have been installed and removed may not be reused without MRB approval.
- No more than three (3) allowable grid array reworks for any single assembly.
- Devices sensitive to heat and thermal shock (e.g. ceramic capacitors, glass-body diodes, planer packs or solder joint rework) may not be reused without MRB approval.
- Multi-Layer Ceramic Capacitors (MLCC) are limited to a maximum of 3 solder reflows.
- Cumulative area of all PWB or CCA repair/rework ≥ 33 percent of the total board or card surface area require approval from the SEAKR.
- PWBs or CCAs that require jumper wires in excess of the limits below require SEAKR approval prior to addition.
    - A maximum of 18 jumpers wires are permitted for a board size <100 in^2

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- A maximum of 24 jumpers wires are permitted for a board size ≥100 in^2
- The use of jumper wires is only permitted if the circuit card assembly is both producible and inspectable.

8.22 **Equipment Calibration**

Suppliers shall maintain documented procedures to control, calibrate and maintain inspection, measurement and test equipment (including software and tooling), that is used to demonstrate the conformance of product or service requirements and traceable to NIST Standards (ANSI/NCSL Z540-1 General Requirements for the Competence of Testing and Calibration Laboratories or ISO/IEC 17025, General Requirements for the Competence of Testing and Calibration Laboratories).

Supplier will maintain a calibration system that demonstrates the traceability between calibrated instruments or equipment found to be out-of-tolerance and the hardware that has been accepted using such equipment.

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9 SAFETY

Suppliers shall maintain a safe and healthy work environment and have a safety program to establish internal procedures and reporting systems for hazard identification, investigation, and mishap, and safety incident disposition. Supplier shall present and address safety issues during design reviews.

9.1 Hazard Identification

Suppliers shall assess hazardous operations to determine the risk to program personnel and use the assessment to establish guidelines, procedures for hazard resolution, and safe operations conduct.

All identified hazards and hazardous operations that could pose any serious health or safety risk to personnel shall be reported to SEAKR. Hazardous materials delivered to SEAKR shall be accompanied by a (Material) Safety Data Sheet (SDS).

9.2 Hazardous and Toxic Materials

All parts and materials will be reviewed for hazardous and toxic containing materials. The use of these materials will be compatible with AFSPCMAN 91-710, Range Safety User Requirements Manual. Any hazardous or toxic materials not meeting these requirements that will be delivered to SEAKR should be submitted to SEAKR for approval.

9.3 Records and Reports

Suppliers shall maintain hazard assessments and analyses performed records, and mishap reports on file and available to review by SEAKR upon request.

9.4 Mishap Reporting

Any mishap involving Supplier or deliverable hardware shall be reported to the SEAKR as soon as possible but no later than 24 hours after occurrence. A mishap is defined as an incident or series of incidents that result in death, injury, occupational illness, or damage/loss to equipment or property. Any mishaps shall be investigated to determine the cause and corrective action to prevent recurrence.

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10 ACCEPTANCE

10.1 Final Inspection

The assembly shall be visually inspected for quality per IPC-A-610 Acceptability of Electronics Assemblies of IPC J-STD-001 to verify that the design, construction, physical dimensions, markings and workmanship conform with the requirements of the PO, the drawing, and this specification. Suppliers shall maintain inspection records on file for a 7-year period and made available for SEAKR review upon request.

10.2 Photos

Photos may be requested and coordinated between SEAKR and Supplier. At a minimum, photos shall be taken for the following events:

- Photos of any portion of the assembly cannot be directly inspected when construction of the assembly is complete, shall be taken during manufacturing of the assembly.
- Additional photos of defects, anomalies, or any issues observed during processing to also include pictures of final ESD bag packaging and shipping box prior to shipping.
- Component, subassembly, and top-level assembly including hardware part number, revision, serial number, and date taken (also see Build History records)
- Detailed Build and close-out photos of final assembly, appropriately labeled in accordance with Section 15 prior to shipment (photos of each side of the assembly with the ability to zoom into photo and read reference designators on the assembly are sufficient).

10.3 Serialization

All SEAKR assemblies and subassemblies shall be serialized and labeled appropriately, per the assembly drawing or SCD. Serial number and part number information can be found on the PO. If the format is not specifically stated on the controlling document, the number format shall be comprised of the SEAKR Purchase Order Number and a sequential three digit number extension, i.e., for purchase order 23456 the first serial number would be 23456001, the second serial number would be 23456002, etc.

The supplier shall ensure that serial numbers for each discrete part and dash number are not duplicated. Serial numbers may be duplicated on the same PO amongst unique part numbers. For example, it is acceptable that part number 123456-009 has S/N 23456001 whereas part number 123456-010 has S/N 23456001. Subsequent purchase orders may reuse the three digit extension as long as the complete serial number is not repeated. For example, PO 23456 may use the 001 extension to create S/N 23456001 whereas PO 34567 uses the 001 extension to create S/N 34567001.

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10.4 **Certification of Conformance**

A CofC shall be supplied for any assembly built by Supplier. SEAKR reserves the right to require a manufacturer's CofC for all federal, standard, military-specified, and DLA controlled parts as well as any other high reliability parts procured by the supplier.

The CofC document provides traceability of parts and conformance and must include the following:

a) Manufacturer name with location or CAGE code

b) A manufacturer's or SEAKR part number (PN) that matches the PO including the drawing revision if called out per the PO. CofC PN must match part markings. Part markings may be directly labeled on the part itself or on the bag/container containing the part.

c) Serial numbers (if applicable) of all parts delivered.

d) Signature and date of an authorized representative (electronic signature is acceptable). Title of authorized representative is optional but encouraged.

10.5 **Sub-Tier Certificates of Conformance**

Supplier shall require and retain a CofC with lot date code traceability for all procured parts and materials from its sub-tier Suppliers.

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10.6 End Item Data Package (EIDP)

Supplier shall submit an EIDP with each completed assembly. Supplier's standard format for documentation and data package is acceptable. All assembly documentation shall be available for SEAKR review. The EIDP shall contain the following, at a minimum:

A) An ABPMPL for each unit built, that specifies all parts and materials, both manufacturing-supplied and CFM, used in the manufacturing and assembly of the module. This list will include at a minimum:
   - Material manufacturer and manufacturer part number
   - Material type (e.g., Tape, Adhesive, Epoxy, Sleeving, etc.)
   - Material Traceability in accordance with Section 7.2.2.

B) Certifications for all Supplier-provided materials, components, and the top-level assemblies

C) Documentation of all waivers, written approvals including nonconformances, or deviations from the engineering between SEAKR and Supplier.

D) Build and close-out photos, appropriately labeled in accordance with Section 10.2

E) Box-level and subsystem requirements verification/compliance matrix (RVCM): Signed documentation, test data, test results, and test reports (e.g. electrical), used to verify requirement

F) The completed traveler/router for each assembly built, which includes all documentation for each build including clearly identified rework and repair documentation and signed manufacturing operation steps

G) End item mechanical and electrical interface control drawings

H) End item test electrical and environmental summary reports, including cumulative operating time and power levels for any life limited items

I) End item acceptance, proto-qualification, or qualification test data, including environmental test results.

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