# QUALITY REQUIREMENTS *for* cPCI BASED ADVANCED LAUNCH COMPUTER

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*This Document Contains Pages*

## 1. COMPONENTS

### 1.1. General

- The electronic components in the vendor-fabricated items shall be as specified. The components in Test-jig(s) [if any] shall be of industrial (or better) grade.
- All MIL Grade components shall be procured with CoCs (with Batch No., Lot No. & Date code, etc.). The industrial grade components shall be subjected to Burn-in test at PCB level as per the ASL standard."
- The contractor shall submit detailed engineering technical data on all components in the preliminary design document.
- Wherever not specified, the components shall be selected either MIL/Automotive/Industrial grade type. The preference shall be in the following order: MIL grade -> Automotive -> Industrial grade.
- Commercial grade components shall not be used.
- For MIL grade components, MIL COC certificate from OEM (Original Equipment Manufacturer) and Traceability shall be submitted. The contractor shall submit detailed engineering technical data for all components in the PDR stage and the same to be approved by ASL work-center and R&QA, ASL.
- Automotive parts & Industrial grade Parts shall not be older than 5 years from date of manufacturing. More than 5 years old parts shall undergo screening as per ASL plan.
- The BOM (Bill of Materials) has to be submitted by the firm to ASL QA agency for approval.
- In case of PCBs (if any), if all or some of the components are unscreened, Burn-in test at Populated PCB level has to be carried out for all such cards (In-house made OR Bought-out) at *'+65°C'* for *'168' hours* in powered ON condition. *In Situ Functional test* may be carried out if specified in Supply Order Or suitable Test-jig for card level functional test is available.
- The components shall be purchased with a derating factor of 1.5. No component shall be operated above 80% of its maximum rated voltage, current or power ratings. Digital components shall not be operated above 3% over their nominal voltage, current or power ratings.
- Components shall be arranged so they are easily accessible, replaceable and *identifiable* for testing and maintenance. The part no., Batch code, ratings shall be clearly visible after the components are mounted and soldered on PCBs. Where damage by shock or vibration exists, a clamp, fastener, retainer, or hold-down bracket, etc shall support the component mechanically.
- Component mounting shall be as per standard workmanship practices. Military standards like IPC 770, NASA 8739.2, 8739.3, etc may be used for reference.
- In case there is any conflict found between this QR and User's Technical specification document "cPCI Based Advanced Launch Computer" (vide doc no. ASL/16(b)/2019/1325/A1PR/LAUNCH COMP, Ver. 1., dtd 26/11/2019), this QR will take precedence.

**1.2. Connectors**

- The circular connectors should be sourced from SOURIAU/ AFRO/ ITT Cannon/ Deustch/ TE/ Amphenol USA or as specified in the User's specification document. *Mating connectors should be of the same make as that of the unit side connectors, if in the vendor's scope.*

- The connectors shall be conforming to the following MIL standard.

  **Circular connectors:**

  Series-2: MIL-STD-26482
  Series-3: MIL-STD- 38999

  **D-sub connectors:** MIL-STD-24308

- **Screening test Requirements:**
  - ❖ Refer QR for Series III and Series II Connectors-Avionic Subsystems: ASL/21/R&QA/QAP3/2143, Rev.03, Dtd:27/01/2015 : Enclosed
  - ❖ Refer QR for DSUB Connectors: ASL/21/R&QA/QAP3/726, Rev:01, Dtd 19/11/2013. Enclosed.

  (***Note:*** For the DSUB connectors, Sampling to be done 2 samples irrespective of lot size.)
- **NOTE:**
  1. Connectors to be procured from QPL/QML sources only. COC shall be from OEM.
  2. If the connectors are procured from foreign sources supplied by local distributors/traders, Screening tests to be carried out by concern distributor/trader as per ASL QA plan in the presence of nominated QA agency.
  3. If connectors are procured from Indian source, screening tests shall be done at source.
  4. If the connectors are not procured from QPL/QML sources, Batch qualification and screening tests to be carried out.
- BACKSHELLS shall be as per MIL-C-84059 sourced from Sun banks/ Amphenol India/ Souriau/ Glenier or from any other QPL sources. MIL-COC has to be submitted.

**1.3. PTFE Cables**

i. Single Shielded (Silver coated copper with Max Temp limit 200°C), Single Jacketed (Extruded or taped and fused white PTFE with Max Temp limit 260°C) Cables consisting of a Single wire/core OR multiple wires/cores.

ii. The wires/cores shall be PTFE insulated (extruded or spiral wrapped and fused 260°C) with soft or annealed Silver coated conductor strands (19 Nos.) with Max temperature rating of 200°C.

iii. These High Voltage (600V AC) cables rated for are intended for use in Aerospace & ground system applications requiring wires in a cable configuration for additional versatility & protection.

iv. Applicable Mil standards is/are: JSS51034/ JSS51038/ MIL DTL 16878G/ NEMA HP3/ MIL-DTL-22759/ SAE-AS-22759/ MIL-DTL-27072F

v. Should be of **FLUTEF/TYCO** make or as specified in the specifications document.

vi. COC has to be submitted to the ASL QC personnel during inspection.

1.4. **Printed Circuit Boards:**

- PCBs, if any shall be in compliance with the MIL-PRF-55110G, if FR4 is the base material.
- The contractor / PCB fabricator shall produce certificate of conformance.
- The base material shall be FR4 for Rigid and FR4-Polymide for Rigid-flex PCBs.
- The manufacturer's name or logo, model number, serial number, and circuit issue or revision number shall appear and be readily visible on all PCBs.
- Group A and Group B certificates have to be submitted to ASL QC during inspection. For any PCB in Test-jigs/Class-2 items, Group-A certificate shall be submitted.
- All PCB connectors mounted on a motherboard shall be mechanically secured to the chassis or frame of the unit or assembly.
- No components, traces, brackets or obstructions shall be within 2mm of the board edge (guide edges).
- Baking for 2 Hrs @110degC shall be done for PCBs *before components soldering* on PCBs.
- Baking for 45 minutes @65degC shall be done for the populated PCBs *before conformal coating*.

2. Wiring, Cabling and Harnesses:

a. All conductors shall be conforming to MIL/JSS and shall have a minimum of 19 strands of copper with silver coating. The AWG will be not less than 24 and insulation shall be Teflon.

b. Harness shall be neat, firm and properly bundled with external protection. They shall be tie-wrapped and routed to minimize cross talk and electrical interference. Each harness shall be of adequate length to allow any conductor to be connected properly to its associated connector or termination point. Wiring shall be routed to prevent conductors from being in contact with metal edges. Wiring shall be arranged so that any removable assembly may be removed without disturbing conductors not associated with that assembly.

c. ***Continuity test, Isolation/Insulation Resistance test, Contact Retention test,*** **etc** shall be done *as per standard practices followed in ASL for cable harnessing*. All required tools/instruments/Measuring equipments for carrying out these tests shall be the responsibility of the Vendor.
A copy of the ASL document titled *"QA PLAN-CUM-PROCESS DOCUMENT for HARNESS & CABLE ASSEMBLIES"* (Doc. No.: ASL/21/R&QA/QAP3/51, dtd 16/08/2010) can be collected from ASL R&QA on request basis. QT-A1 / ATP documents to be referred for details.

3. Electrical Isolation:

(1) Earthing System: Single point Earthing outside the system. System chassis should be floating and shall not be connected anywhere inside the unit. Resistance between unit chassis and rack chassis should be < 10mOhm.

(2) Insulation between input lines (± 28V) and chassis shall be > 10 M ohms.

4. DESIGN & ENGINEERING

**Thermal Analysis** shall be carried out for the "cPCI based advanced Launch Computer" and shall be approved by ASL during the design review.

5. INSPECTION & TESTING

5.1. General Guidelines:

The *inspections & testing during various specified stage inspection shall be carried out by the specified/nominated Inspection agency* of ASL for all subsystems/systems *irrespective of whether the same is manufactured by the vendor or by the subcontractor(s).*

**5.2.** Component level:
Inspection shall be carried out to verify usage of components/parts as per the approved BOM/QAP.

**5.3.** Cable Harness (if applicable): Inspection and Testing (*Continuity test, IR/Isolation Test, Contact Retention Test*) shall be carried out as per the approved Data card/QAP/QT-AT/ATP documents. *For panel mounted Mil Connectors, Contact Retention test is mandatory.* Appropriate calibrated **HT-250** tools shall be used for Contact Retention test.

***5.4.*** **CARD LEVEL:**
The following shall be followed if the order specifies requirements of PCBs.

*a.* CoC verification: Group-A and Group B test certificates as per MIL-PRF-55110 shall be submitted for Class 3 units. For Class-2 items / test jigs, Group-A certificate shall be submitted.

*b.* Card level **inspection** shall be done to verify that there is no physical defects, dimensional variations and printing issues are there in the bare pcb.

*c.* Bare board testing (BBT) shall be carried out for *Net list verification.*

*d. Visual inspection* shall be carried out to ensure the standard workmanship norms have been followed for components preparation & mounting, soldering, conformal coating, potting, etc. Stress relief, Electrical clearance and visibility of parts details, soldering quality, wires routing quality, etc. shall be verified.

*e. Functional testing* of the Populated PCB shall be carried out as specified in the QT-AT/QAP documents.

*f.* Burn-in testing: In PCBs, if all or some of the components are unscreened, ***Burn-In test*** *at Populated PCB level has to be carried out for all such cards (In-house made OR Bought-out) at '+65°C' for '168' hours in "powered ON" condition. In-Situ Functional test* may be carried out if specified in Supply Order Or suitable Test-jig for card level functional test is available. The visual inspection shall be carried out pre & post Burn-in. Functional testing can be carried out as specified.

**5.4.1. GUIDELINES FOR ENVIRONMENTAL TESTING OF SPARE PCB CARDS, if any:**
The following to be followed for *ENTEST requirements* in case the supply order specifies requirements for Spare cards for units:

a. For **Class-1** GSE:Not applicable

b. For **Class-2A** GSE:
   i. Batch level (AT) ENTEST at package level.
   ii. ENTEST not applicable for spare cards.
   iii. Burn-in Test shall be applicable for the spare cards.

c. For **Class-3A** GSE:
   i. Type Testing at package level.
   ii. Burn-in Test shall be applicable for all the spare cards.

d. For **Class-3B** GSE:
   i. Type Testing at package level.
   ii. Burn-in shall be carried out for all the Spare cards.
   iii. AT level ENTESTs shall be applicable for the spare cards.

a) **SAMPLING**: 100%. That is, AT-level ENTESTs are applicable on all the cards.
b) **ESS and Damp Heat tests shall be carried out for the spare cards *at units level*.** For this, an already cleared Type tested/AT unit may be selected and the card(s) therein to be replaced with the Spare card(s) under consideration and then the ESS to be carried out.

### 5.5. UNIT LEVEL TESTING

It (at unit level, i.e. on completed/final product) consists of *Functional testing, Environmental testing* and *Endurance Testing*. The QT/AT level Environmental tests requirements, specifications, sampling, etc for a package are according to the respective GSE class and applicability. The classification used for GSE is briefly given below.

#### 5.5.1. Classification of GSE

5.5.1.1. **Class-1: General GSE**

Includes general equipments and products suitable for applications where *extended life and cosmetic imperfections are not important and the major requirement is their functioning.*

5.5.1.2. **Class-2: High Performance GSE**

Includes those equipments and products where high performance and extended life is required and a moderate level of confidence is desirable that the equipment will function satisfactorily in the actual intended environment generally in Lab condition for testing purposes. These GSE generally are ***not required to undergo any Type Approval/Acceptance tests***. They need to undergo Batch-level Performance Verification test wherein one unit (or as specified by the competent authority) **randomly** selected out of each batch shall undergo the specified environmental tests. The Class-2 GSEs are again sub-divided into two types as follows:

*a. Class-2 Type-A:*

These are basically **Non-intelligent units** i.e. those without critical electronic components like FPGA/processors and other microcircuits. It contains mainly passive components, switches, LEDs, DPMs, resistive loads, turret PCBs, relays, timer, POTs, etc.

*b. Class-2 Type-B:*

Those units (e.g. Test-jigs & various simulator units) which are ***intelligent*** in nature as containing processors/FPGA and other critical microcircuits.

5.5.1.3. **Class-3: Mission critical GSE**

Includes equipments and products which are **directly involved in launch operations/programs** or are required for applications where **extremely high levels of assurance** are required, service is essential or the end use environment may be uncommonly harsh. Continued performance or performance-on demand is critical. *Equipment downtime cannot be tolerated and must function when required.* These **Mission critical** GSE are again sub divided into two types as follows:

a. ***Type-A: GSE not containing critical electronic Parts/Components***

These are **non-intelligent** in nature. They include equipments and products containing mainly *discrete and passive components, switches, LEDs, DPMs, resistive loads, turret PCBs, relays, timer, POTs wires, terminal junctions, resistors, Diodes, etc.*

**b. Type-B: GSE containing critical electronic Parts/Components**

GSE under this type are intelligent in nature. It includes equipments and products containing *critical electronic components and devices* like PCBs, microcontroller, microprocessor, microcircuits and semiconductor parts, etc.

5.5.2. The **Classification** of items under this Order is given in **Table-1.**

TABLE – 1: CLASSIFICATION OF ITEMS/GSEs and TEST APPLICABILITY

| S.No. | Item Nomenclature | Item Class | ENTEST Requirements | Remarks/ Applicability |
|---|---|---|---|---|
| 1. | cPCI Based Advanced Launch Computer | 2B | Batch Acceptance test | Refer Clauses 4.6 & 4.7 |

5.5.3. **Functional testing:** These tests are done at room ambient to check for its functionality after the units are offered for test/inspection. All the units have to undergo the functional testing (at room temperature). All Class-2A, 2B, 3A and 3B units shall undergo Functional Testing as per approved ATP or QT/A1 document.

5.5.4. **Environmental Testing (ENTEST):** These tests are done to test and evaluate performance of the item(s) at the specified environmental conditions. The QT/AT level Environmental tests requirements, specifications, sampling, etc are according to the respective GSE class and applicability. The following shall be applicable.

i. **General:**

- Vibration test of an item shall be carried out along all the three axes. However, in case of *Vibration machine capability limitations* due to *larger dimension and/or weight of UUT*, Single axis vibration test would be applicable, but for full (cumulative) test duration.
- PREET, INSET, POET shall be applicable for Vibration testing.
- Bump test and Vibration test for quite heavy and/or very large dimensions items may be waived off if there is ENTEST facility limitations. But, approval of ASL QA agencies shall be taken.
- For ENTEST of UPS (if the order specifies UPS requirements), Batteries need not undergo ENTEST and hence, may be removed.

ii. **Class-1 units:** No ENTEST applicable.

iii. **Class 2 GSE:** Batch level Acceptance testing (also called Performance Verification Test) shall be carried out for **Class-2A & Class-2B** GSEs; i.e, only *one unit*, selected ***randomly*** out of the given order-lot, shall undergo the specified ENTESTs. Satisfactory Test-completion & Clearance of this unit/set shall be considered as passing of all the other such units.

a) **SAMPLING:** One out of the Batch.

iv. **Class 3A and 3B GSE Type Approval:**

a) *TYPE APPROVAL CONCEPT* shall be carried out for Qualification of Class-3 units. *The **purpose** of the Type Approval tests is to qualify the design, process, workmanship, components & materials, etc* of the unit identified by its *unique Model or Part no.*

5.5.5. **Endurance Test:** Endurance test of the unit should be carried out after completing all the environmental tests. The endurance testing shall be done *with the specified load* at *room-temperature* for a duration of *8 hours in case of AT units and for 16 hours in case of Type Approval*. However, the various details such as Applicability, Test Procedure, Load condition, Test setup diagram, etc shall be as per the respective QT/AT documents. *Sampling 100%. Applicability: for Class 2, 3A and 3B units. Relay Units not containing dc/dc converters need not undergo Endurance test.*

TABLE 2.1: BATCH ACCEPTANCE TEST SPECIFICATIONS *for* CLASS 2B GSE (without LCD Display)[1]

| SNo | Test | Specification | Ref. | REMARKS |
|---|---|---|---|---|
| 1. | ESS | | | |
| (a) | Random Vibration (03 axes) | Random Vibration:<br>5 – 20 Hz : (6db per octave) desirable<br>20 – 50Hz : 0.02 $g^2$/Hz,<br>then rolling down to 0.001$g^2$/Hz at 500 Hz<br>Duration: 15 minutes cumulative | -- | PREET.<br>INSET<br>POET. |
| (b) | Temp. Cycling | Temperature levels:<br>(a) –20°C to +55°C for Custom made items.<br>(b) 0°C to +55°C for standard products.<br><br>Dwell time: 60 minutes<br>Rate: 10°C/minute (min). Total 6 cycles. | -- | PREET & POET at ambient.<br>INSET 2 times every cycle;<br>1st before switching OFF at the end of higher temp dwell period. And, 2nd after switching ON at the end of the lower temp. dwell period. |
| (c) | Random Vibration (03 axes) | Random Vibration:<br>5 – 20 Hz : (6db per octave) desirable<br>20 – 50Hz : 0.02 $g^2$/Hz,<br>then rolling down to 0.001$g^2$/Hz at 500 Hz<br>Duration: 15 minutes cumulative | -- | PREET.<br>INSET<br>POET. |
| 2. | Damp Heat | 45°C, RH 95%, for 8 Hrs duration | -- | PREET, INSET, POET<br>INSET at 7 ½ Hr. |
| 3. | EMI/EMC | EMI/EMC shall be applicable only if the item is to be *mounted on launcher.*<br>*In such case, only the following two tests RS103 and CS115* shall be applicable. | -- | Refer Section III for full Details |
| a. | RS 103 | Electric Field, 2MHz to 18GHz. | | • Field str. of 50V/m in with 1kHz pulse modulation, 50% duty cycle<br>• For both vertical and horizontal polarizations. |
| b. | CS115 | Bulk Cable Injection, Impulse Excitation | | • Applicable to all interconnecting cable bundle, power cable, & separately on high (+ve) line /wire, excluding neutral / ground lines.<br>• Injected signal characteristics as shown in Fig. CS115-1.<br>• Test pulse applications duration on each cable bunch/line: 60 secs. |

1: Exact applicability of tests for a particular item/unit/package has to be referred from ENTEST Applicability Matrix *Table*.

2: For Units having LCD panels: ESS shall not be carried out. Instead, High Temperature, Low Temperature and Random Vibration shall be carried out as given in Table 2.2.

| TABLE-2.2: BATCH ACCEPTANCE TEST SPECIFICATIONS *for* CLASS-2B GSE **with LCD Display#** | | | | |
|---|---|---|---|---|
| No | Test | Specification | Reference No. | REMARKS |
| 1. | High Temperature | +55°C±3°C for 4 Hrs. | -- | PREET, INSET, POET. INSET in last 30mint. |
| 2. | Low Temperature | -20°C±3°C for 4 Hrs. | -- | PREET, INSET, POET. INSET in last 30mint. |
| 3. | Damp Heat | 45°C (RH 95%) for 8 Hrs | -- | PREET, INSET, POET. INSET at 7 ½ Hr. |
| 4. | Vibration (Three axes) | Random Vibration:<br>5 – 20 Hz: (6db per octave) desirable<br>20 – 50Hz : 0.02 $g^2$/Hz,<br>then rolling down to 0.001$g^2$/Hz at 500 Hz.<br>*Thirty minutes cumulative* for 3 axes. | -- | PREET, INSET, POET |

TABLE – 2.3: ENTEST APPLICABILITY MATRIX FOR THE ITEMS

| S.No. | GSE | EMI/ EMC | ESS# | DAMP HEAT | High Temp. | Low Temp. | Ran. Vibr. |
|---|---|---|---|---|---|---|---|
| 1. | **cPCI Based Advanced Launch Computer** | NA | A | A | NA | NA | NA |
| 1.1 | • **KVM (Monitor + Keyboard) module** | NA | NA | A | A | A | A |

#: KVM module contains LDC display. So, shall undergo HT, LT, Random Vibration instead of ESS.

6. Mechanical QAP: The Mechanical QAP is attached

7. <u>Quality Control:</u>

a. **General:**

- Detailed process-sheet-cum traveler card shall be maintained.
- The customer QC stages shall be clearly specified in QA Plan/Process Flow-chart indicating either of Witness/Verification (as relevant).
- Test report shall indicate the name of the operator/technician & the Internal QC Inspector.
- The internal QC shall maintain certificates & records of all the processes. A complete Report shall be submitted to the Inspection agency.
- SMD components to be soldered by REFLOW soldering method and through-hole components to be soldered by hand soldering. In case an SMT machine is to be used the same to be approved by R&QA, ASL and if the assembly of PCB is out sourced the sub vendor needs to be approved by R&QA.
- Test cables, test-jigs and test software shall be cleared by QA agency before using.

b. **Workmanship:**

- Workmanship shall conform to standard practices suitable to Missile applications.
- Solder alloy shall conform to J STD 006B(63/37) & solder paste to J STD 005.
- Flux shall be electronic grade (RMA type) conforming to MIL-F-14256F/J-STD 004.
- The conformal coating shall conform to MIL-P-46058 , silicone1 2577

- The potting material shall be conforming to MIL-A-46146, silicone 3140(PCB mountable components), 3145 (screws, nuts etc)
- The Isopropyl alcohol shall be Electronic grade and shall conform to IS standards.
- The various materials/parts (in case used for assembly) shall be as per the details given in **Appendix-'A'.**

c. **Subassembly, Unit or Module:**

- The equipment shall be visually and physically inspected to assure proper placement, mounting and compatibility of subassemblies.
- Complete electrical testing shall be performed on each module, unit, or subassembly.
- Housing, chassis and connection terminals shall be inspected for mechanical sturdiness, and harnessing to sockets shall be electrically tested for proper wiring sequence.
- Four copies/Sets of the complete QC/test/Inspection report shall be supplied with each item. The report shall be duly signed by internal QC personnel as well as by the responsible manager. One set shall be handed over to each of Project, SSQAG, Work-Center and R&QA.
- A proper log-book shall be supplied with each unit.
- Inspection by the nominated Inspection Agency (R&QA/SSQAG) shall be carried out in the various stages as mentioned below. Detailed stage inspection reports have to be generated for the stages/activities. The exact applicability & Test procedures shall be as per the QAP/Type Approval/AT documents of the UUTs.
  - i) BOM verification before procurement
  - ii) BOM verification after procurement: **All the components, bare PCBs**, etc shall be offered for verification. Following certificates/reports shall be verified during inspection.
    - Certificates (Group A and Group B) for PCB's
    - Component and connectors CoC/certificates/reports/datasheets
    - Traceability, Batch code/ Date code, etc
    - Mechanical housing, raw material, radiography and dimensional Inspection reports, etc.
  - iii) **Screening** of Connectors, Relays, etc as per QAP.
  - iv) Cable harness inspection & Testing (Visual inspection, Crimping/Soldering inspection, Continuity test, IR test, Contact Retention test)
  - v) Net list Verification testing for PCBs
  - vi) Visual inspection of Populated PCBs (parts formation and mounting, Soldering, marking, traceability, etc.) before Potting & Conformal coating.
  - **vii) Radiographic inspection of the PCBs having BGAs, PLCC, etc is mandatory.**
  - viii) Burn-in test of PCBs in Power-On condition.
  - ix) Visual inspection *after Potting & Conformal coating.*
  - x) *Visual inspection of the unit after* assembly of various modules (PCBs, DC/DC converters, EMI/EMC filters, etc).

xi) Isolation checks (Pin to Chassis and Pin to Pin)
xii) Unit level Functional tests
xiii) Environmental tests (QT/AT level)
xiv) Final isolation checks
xv) Endurance Tests
xvi) Integrated level test(s), if any (refer QT/AT document for applicability)

**d. Documentation:**

The following documents shall be prepared by the vendor and approved by R&QA.

(i) QA Plan document (Electrical): It shall include the following information.

- TITLE PAGE
- Contents
- List of Abbreviations
- List of References
- Introduction
- Technical specifications
- Block diagram of the system
- Brief Introduction of each modules with Technical Specifications
- A **TABLE** showing **Station-list/List of deliverables** [It should have separate columns for QUANTITY, FIM(if any)/Vendor supplied]
- Bill of materials approved by user & R&QA ASL
- Family Tree of the System (with drawing numbers) and List of drawings/ PCB layouts/schematics – as applicable
- Process flow chart/diagram (***each step duly numbered***)
- Process flow chart description (with ***one-to-one correspondence*** with the steps mentioned in the Process Flow-chart)
- Functional test/electrical tests procedure (*as and if applicable*)
    - **PCB level** Functional/Screening test procedure
    - **Unit level** functional test procedure
    - **Integrated-level** functional test procedure
- Environmental test specifications
    - Type Approval/Batch level AT / AT level ENTEST Specifications
- Entest procedures
- Process test formats & Entest report formats
    - Physical Inspections at every relevant stages
    - Functional Tests at every relevant stages including Endurance test
    - Environmental Test, as and if applicable
    - Unit level Final Conformance/Clearance Report
- Process traveler card
- Safety precautions
- Storage and packing details
- Appendix, if any

**APPENDIX – 'A'**

## ACCEPTANCE CRITERIA FOR CATALOGUED AND OFF-THE-SHELF ITEMS

1. The catalogued and Off the shelf materials which are used for Electrical Integration and Electronic Assembly are classified into two type's.
   i) Components/Material imported from foreign sources with MIL/DEF/SAE certifications.
   ii) Indigenous material from Indian sources and certified as per ASL norms.
2. The said items along with Acceptance criteria is given in the **TABLE** below. The items classified are bought out as a product and process inspection may not be possible for these items.
3. The supply order for such items will be placed directly and product delivered with necessary certification.
4. It is requested to follow this procedure for said items.

### TABLE-A.1:
### TYPE-I: Components/material imported from foreign sources with MIL/SAE certification.

| Nomenclature of material | Source | Acceptance criteria | Certification as per catalogue |
|---|---|---|---|
| Potting – Silicone-3140, 3145 | Dow corning | Verify UBD( Use by date) or shelf life and verify that the material is conforming to MIL-A -46146B standard number on the tube | MIL-A-46146B |
| Conformal coating Silicone-2577 | Dow corning/ Humi seal | Verify UBD( Use by date) or shelf life and verify that the material is conforming to MIL-I-46058C standard number on the bottle | MIL-C-46058C |
| Lacing thread (nylon) LC-136 black | ALFA | Verify the part number on the bundle | MIL-T-43435 |
| FRP tape (glass cloth with silicone pressure sensitive adhesive) Scotch 69 | 3M | Accept on brand name | MIL-I-19166 C |
| Heat shrinkable sleeves | Tyco/Raychem/ PEP Charles, bangalore | Verify the COC certificate | SAE AMS-DTL-23053 |
| Junction modules (QPL only) | Amphenol Pcd/TE/ Deustche | Verify the COC certificate | MIL-T-81714 |
| Lugs( for connector shielding, motor and battery | Tyco | Accept on brand name & part number | SAE-AS-7928 |

| | | | |
|---|---|---|---|
| contacts) | | | |
| EMI/EMC tape 1181 tape (copper foil with conductive tape) | 3M | Accept on brand name & part number | ASTM D 1000 MIL-STD-202 method 307 |
| Contacts (pin/socket) | From QPL source only | Verify the COC certificate | MIL-C-39029 D |
| Splices | TYCO | Verify the COC certificate | MIL-S-81824/1 |
| Inline resistors (crimp type) | Deustche | Verify the COC certificate | ASNE-535-536-537 |
| Boots & transitions | TYCO/Raychem | Verify the COC certificate | SAE-AS-81765/4 OR DEF STD-59-97 issue 3 Type-DD |
| Back shells | From QPL source | Verify the COC certificate | MIL-C-85049 |

**TABLE-A.2**

**TYPE II-Indigenous material from Indian sources is available, certificate required as given below**

| Nomenclature of material | Source | Acceptance criteria | Certification as per catalogue |
|---|---|---|---|
| Flux cored Solder alloy: Sn/Pb:63/37 Sn/Pb:60/40 Ag/Sn/Pb: 2/62/36 | Hybrid metals/Cookson | Verify the batch number and test report as per J-STD-006 | J-STD-006 |
| Flux RMA type | Hybrid metals/cookson | Verify the batch number and test report as per J-STD-006. Verify the expiry date | J-STD-004 |
| Isopropyl alcohol (Electronic grade) | MERK/cookson | Verify the expiry date | |
| Turrets | AFCOSET | Accept on brand name | Industrial grade |
| Cable clamps | Amphenol Penduct Awe polymers | Verify the test report | Industrial grade |
| Lugs | Dowell | Certificate will be provided as per ASL QA plan | As per ASL QA plan |