Printed Wiring Assembly Process Requirements

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0PR0187
Rev J

Revision Log

Revision	Affected Section(s)	Description of Changes	Change Date
A		Initial Release	11/5/2013
B		Update to add reballing of BGA parts with pure tin balls	1/12/2015
C		Incorporate turnkey requirements	11/3/2016
D		Update to X-Ray and Inspection requirements	6/11/2018
E		Add MSL requirements and clarify X-Ray inspection requirements	11/23/2020
F		Add required J-STD information and clarify requirements for when components are returned to BCT	3/31/2021
G	Section 3 – Items 5, 9-b and c, 13	Update requirements to allow lower IPC standards if BCT specifies lower standards to the vendor. Added MOQ statement to #13 under Shipping	10/20/2022
H	11	Updated Shipping to require double bagging of PWA's	12/22/2023
I	Section 3 & Section 4	Added table 1 Cleaning of Mechanical Components Added Fig 1-4 to clarify X-Ray Requirements Added details of EIDP requirements	4/29/2024
J	Section 3	Update 9. MSL Guidance Added Deployment is required statement with instructions	1/22/2026

1. Purpose

This document defines processing requirements for electronics Printed Wiring Assembly (PWA) soldering, assembly, and general manufacturing provisions, required by BCT Purchase Orders.

2. References

- **ANSI ESD S20.20** – Protection of Electrical and Electronic Parts, Assemblies and Equipment (Excluding Electrically Initiated Explosive Devises)
- **IPC J-STD-001 IPC *Space Addendum*** - Joint Industry Standard, Space Applications Electronic Hardware
- **IPC-A-610** - Acceptability of Electronic Assemblies
- **IPC-6012** - Qualification and Performance Specification for Rigid Printed Boards

3. Requirements

Controlled Data Requirements:

1. All information (including data, drawings, bills-of-material) provided by BCT shall be handled as protected information (proprietary) and shall not be disclosed to any third parties without prior written approval from BCT.

2. Unless stated otherwise in writing, all BCT products and data should be treated as export- controlled items. An ITAR registration and compliance program is required prior to accepting any purchase order or executing operations on behalf of BCT.

BCT Supplied Documentation and Hardware:

3. BCT will provide with each purchase order (PO) the following information and hardware:

    a. Printed Wiring Assembly drawing, defining the board overall assembly and location of all parts and special operations

    b. Bill of Materials for all parts to be installed, including item numbers and reference designators

    c. Parts kit(s) for each assembly to be processed, with each part identified by item number

    d. Technical and contractual points of contact at BCT for any questions requiring resolution prior to processing the assembly

Mechanical Components

4. Mechanical components purchased by supplier shall be properly cleaned prior to installation, per table 1

Process	Process requirements
Cleaning Solution	Ethanol/IPA
Sonic Clean or Soak/Bath	10 min 20 min
Repeat	As needed
Rinse	As needed
Dry	Air Dry or 60C as needed
Verification	Visibly Clean/Highly sensitive

Table 1

a. Mechanical components include, but are not limited to fasteners, nuts, bolts, helicoils, and washers
b. Mechanical components provided by BCT are already pre-cleaned and do not need to be cleaned again

Assembly and Inspection Requirements:

5. All personnel handling BCT hardware shall be trained and certified for ESD handling and protection in accordance with an approved program meeting the requirements of ANSI ESD S20.20 or equivalent.

6. Soldering and assembly operations shall be conducted in accordance with IPC J-STD-001 Space Addendum unless specified otherwise by BCT in the PO or Q-Notes.

7. Solder using Sn63Pb37 leaded solder.

8. All BGA parts with pure tin balls used on flight assemblies shall be re-balled with 63/37 leaded balls. If this process is performed by supplier or their sub-tier supplier, process documentation shall be submitted to BCT for review and approval prior to proceeding.

9. **MSL Guidance:** All components shall be handled per their Moisture Sensitivity Level. Whenever pre-conditioning is required a copy of the data sheet showing the time and temperature of the preconditioning shall be included

in the EIDP. There are additional requirements for solid tantalum capacitors detailed in the PO Q-Note. All Solid Tantalum capacitors shall be identified and treated at a minimum of MSL 3 or their MSL Rating whichever is higher. FR4 PWBs to be treated as MSL3; Rigid Polyimide as MSL4; Rigid-Flex/Flex/FPC as MSL5A.

Tantalum Preconditioning: Mandatory preconditioning at 125C for 15 hours shall be implemented for solid tantalum capacitors, in the event the floor life is reached IPC/JEDEC J-STD-033 Bake Conditions are appropriate with no additional preconditioning.

10. Assembled hardware shall be inspected prior to delivery, in accordance with the drawing and processing requirements cited herein, including:

    a. A detailed inspection report, including identification of non-conformances and dispositions, shall be included with the delivered assembly, or provided electronic format (email). Supplier format acceptable.
        i. <u>For components that were re-balled reports shall include process identification and materials certification</u>

    b. PWAs shall be inspected to IPC-A-610 prior to delivery. All PWA's shall pass all Class 3 criteria and the following additional criteria unless a lower inspection standard is specified by BCT in the PO or Q-Notes

    c. Automated Optical Assembly reports shall be supplied if completed for assembly.

    d. All EEE components that cannot be visually inspected shall be inspected via X-Ray to IPC-A-610
        i. Components include, but are not limited to, bottom terminated or through hole parts such as: BGA, CGA, LGA, QFN, LCC, SON, Thermally Enhanced TSSOP, and through-hole connectors.
        ii. X-Rays shall be focused on each specific component (see Fig 1 below) and be sharp enough to maintain clarity when zoomed in (see Fig 2 below)
        iii. X-Ray of a large section of the PWA is unacceptable (see Fig 3)
        iv. Through Hole components must be X-Ray'd using 3D or 2D with tilt to verify >75% fill requirement has been met (see Fig 4 below)
        v. Thermal or ground pad coverage shall be >50%

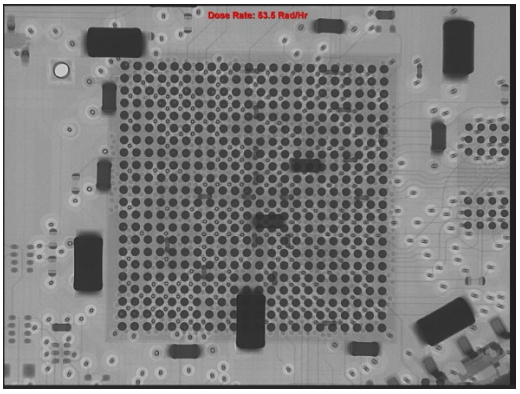


Fig 1

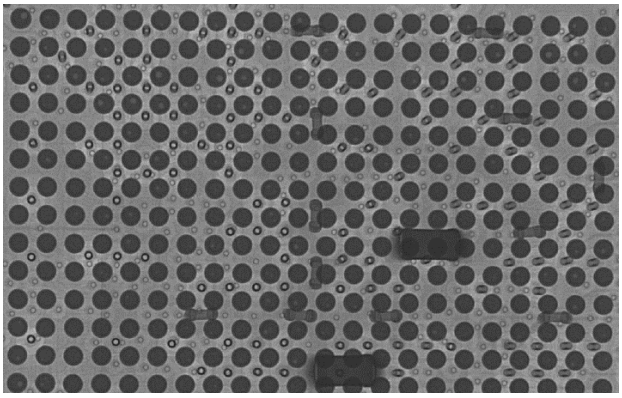


Fig 2

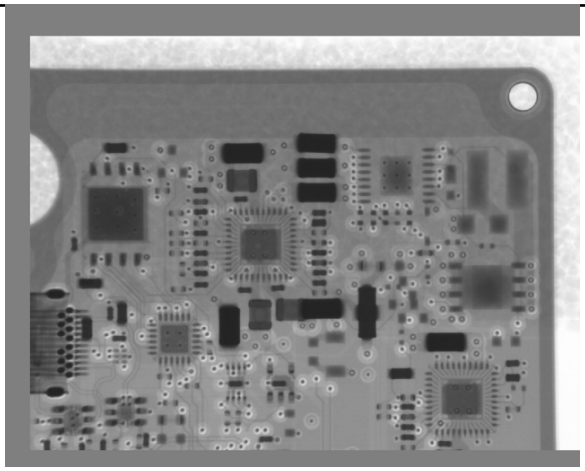


Fig 3

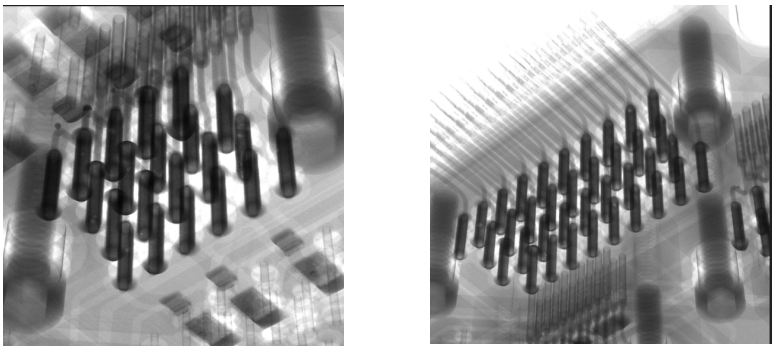
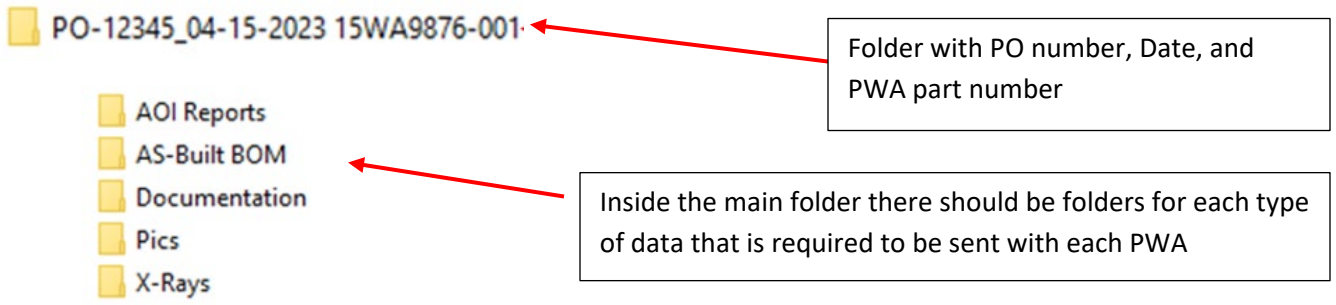


Fig 4

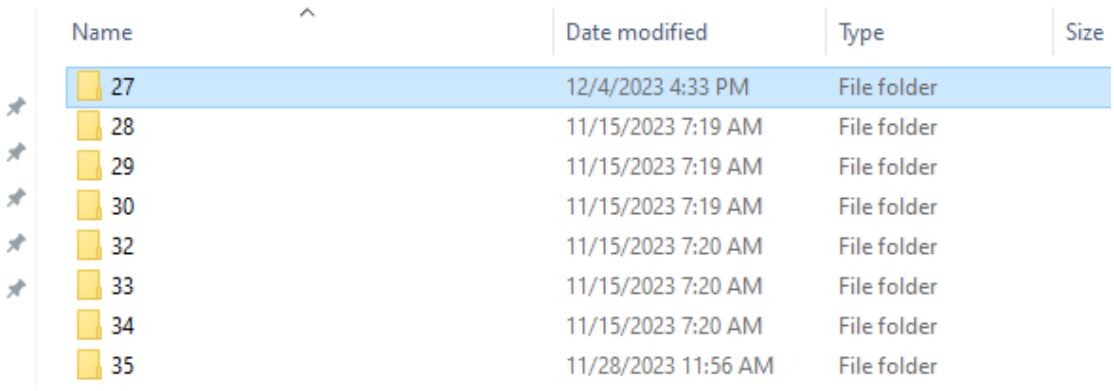
e. Photographs of each side of each board shall be provided in electronic format (email or CD-ROM). Resolution and quality of supplied files shall be sufficient to identify parts, reference designators on silkscreen and part numbers if visible.

4. End Item Datapak (EIDP)

11. All EIDPs shall be provided in electronic format and organized as shown below:

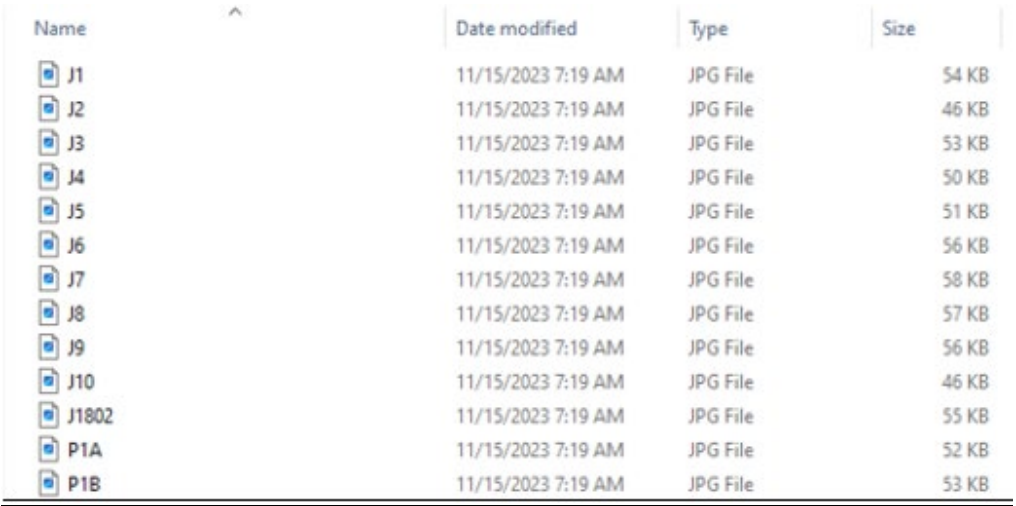


a. X-Ray folder shall contain a folder for each PWA serial number.



Name	Date modified	Type	Size
27	12/4/2023 4:33 PM	File folder	
28	11/15/2023 7:19 AM	File folder	
29	11/15/2023 7:19 AM	File folder	
30	11/15/2023 7:19 AM	File folder	
32	11/15/2023 7:20 AM	File folder	
33	11/15/2023 7:20 AM	File folder	
34	11/15/2023 7:20 AM	File folder	
35	11/28/2023 11:56 AM	File folder	

b. Each SN folder shall contain all x-rays taken and each x-ray must be identified by the reference designator of the component being x-ray'd.



Name	Date modified	Type	Size
J1	11/15/2023 7:19 AM	JPG File	54 KB
J2	11/15/2023 7:19 AM	JPG File	46 KB
J3	11/15/2023 7:19 AM	JPG File	53 KB
J4	11/15/2023 7:19 AM	JPG File	50 KB
J5	11/15/2023 7:19 AM	JPG File	51 KB
J6	11/15/2023 7:19 AM	JPG File	56 KB
J7	11/15/2023 7:19 AM	JPG File	58 KB
J8	11/15/2023 7:19 AM	JPG File	57 KB
J9	11/15/2023 7:19 AM	JPG File	56 KB
J10	11/15/2023 7:19 AM	JPG File	46 KB
J1802	11/15/2023 7:19 AM	JPG File	55 KB
P1A	11/15/2023 7:19 AM	JPG File	52 KB
P1B	11/15/2023 7:19 AM	JPG File	53 KB

Parts Procurement "Turnkey" (if applicable):

12. If supplier will be performing EEE or Printed Wiring Board (PWB) procurement, the following requirements apply:
    a. PWBs shall comply with IPC-6012, Class 3 unless explicitly noted otherwise in Fabrication Notes/Drawing.
    b. EEE parts shall only be procured directly from the manufacturer or the manufacturer's franchised distributor
    c. All PWB and EEE part lot and date codes shall be recorded and supplied in Excel spreadsheet format for each delivered assembly
    d. All Ball-Grid-Array (BGA) parts shall be processed in accordance with #10d. above
    e. All non-conformances shall be reported to BCT formally (written or email) prior to proceeding

Shipping:

13. Completed assemblies shall be packed & shipped to BCT including ESD protection, moisture control (desiccant), and protection against shipping damage. ESD bags shall be "static shielding" and metal-in and of suitable size for the PCA. PCA shall be double bagged with the PCA packaged in the "inner" bag with bag properly sealed. The sealed bag shall be placed inside a second "outer" ESD bag with the desiccant and an ESD warning label adhered in a visible area on the "outer" bag with the outer bag properly sealed. Only one printed circuit assembly per bag. For smaller PCA's, several individually ESD bagged and sealed PCAs may be placed into one larger sealed ESD bag with one desiccant. ESD bags should also meet ANSI/ESD S541 and ANSI/ESD S11.4 level 3 standards with 10nJ minimum rating.

    For BCT supplied components - Excess / spare components shall be returned to BCT with the following:
    a. Return with traceability data
    b. Return in original BCT packaging
    c. Return excess parts WITH the boards/PWA's (not a separate shipment)
    d. If the supplier procures components, do not ship any extra parts back to BCT. Components should be maintained as BCT inventory to be used for future builds.

14. There are no minimum order quantities (MOQ's) required by BCT and BCT is not responsible for excess inventory from said orders. All MOQ purchases by a supplier of BCT must be approved by BCT prior to execution.