

INCH- POUND

MIL-P-50884C
AMENDMENT 5
27 November 1998
SUPERSEDING
AMENDMENT 4
9 April 1993

MILITARY SPECIFICATION
PRINTED WIRING BOARD, FLEXIBLE AND RIGID-FLEX
GENERAL SPECIFICATION FOR

Inactive for new design after 28 February 1999.
For new design use MIL-PRF-31032.

This amendment forms a part of MIL-P-50884C, dated 4 May 1984,
is approved for use by all Departments and Agencies of the
Department of Defense.

PAGE 1

* Box at bottom of page: Delete "Commander, Naval Electronic Systems Command, ATTN: ELEX 8111, Washington, DC 20363" and substitute "Commander, Defense Supply Center Columbus, ATTN: DSCC-VAC, 3990 E Broad Street, Columbus, OH 43216-5000".

PAGE 2

* 2.1.1, SPECIFICATIONS, MILITARY, Delete "MIL-P-116 Preservation-Packaging, Methods of.", "MIL-P-13949 - Plastic Sheet, Laminated, Metal-Clad (For Printed-Wiring Boards), General Specification for.", "MIL-F-14256 - Flux, Soldering, Liquid (Rosin Base).", "QQ-S-571 - Solder, Tin Alloy, Tin/Lead; and Lead Alloy."

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* 2.2: Delete "IPC-S-801 - Edge Dip Solderability Test for Printed-Wiring Boards" and "IPC-B-29/50884 - Master Drawings for Flexible and Rigid-Flex Certification Boards." Add the following new publications:

"J-STD-004 - Solderability Tests for Printed Boards.
IPC-100041 - Single Sided Drawing.
IPC-100042 - Double Sided Drawing.
IPC-100043 - Multilayer Printed Board Drawings.
IPC-100044 - Four Layer Mass-Laminated Multilayer Printed Boards."

Also, delete "3451 Church Street, Evanston, IL 60203." and substitute "2215 Sanders Road, Northbrook, IL 60062-6135."

3.2, delete and substitute the following:

"3.2 Qualification. Flexible and rigid-flex printed wiring furnished under this specification shall be products which are qualified for listing on the applicable Qualified Products List at the time set for opening of bids (see 4.5 and 6.5)."

* 3.3.1 and 3.3.2, delete and substitute the following:

"3.3.1 Metal clad materials. The metal clad materials shall be as specified by the master drawing (see 3.1)."

"3.3.1.1 Cap lamination (type 4). Type 4 boards with outer layers made using cap layer lamination techniques shall use materials specified by the master drawing (see 3.1). Note: Boards constructed using cap lamination do not require any additional testing."

"3.3.1.2 Foil lamination, (type 4). Type 4 boards with outer layers made using foil lamination techniques shall use bonding materials that are in accordance with 3.3.2 and copper foil in accordance with 3.3.9.

"3.3.2 Preimpregnated bonding material (prepreg). The preimpregnated bonding materials shall be as specified by the master drawing (see 3.1)."

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PAGE 4

* 3.3.11 and 3.3.12, delete in its entirety.

PAGE 5

* TABLE I, TABLE II, TABLE III and TABLE IV, delete in their entirety.

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3.4.3a, delete and substitute: "a. Imperfection is translucent."

3.4.4, fourth sentence, delete and substitute the following:

"The marking shall be produced by the same process used in producing the conductor pattern; or by the use of a nonconductive, permanent fungistatic ink or paint (see 3.4.7) applied to the board or to a label which is applied to the board. The label shall be a polyimide film with acrylic pressure sensitive adhesive that shall withstand solder fluxes, cleaning solvents, molten solder, and conformal coating encountered in the manufacture of printed circuit boards. Electrical pencil marking on a metallic area provided for marking purposes may also be used."

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TABLE V, delete in its entirety and substitute the following:

"TABLE V. Adhesion to printed-wiring boards. 1/

Material	Maximum percentage of lifting
	melting and non-melting metals
Bare copper	0
Gold or nickel	5
\4Tin-lead plating	10
Reflowed tin-lead	10
Base laminate	0

1/ Test coupon or production board."

Add new 3.6.4.1 as follows:

"3.6.4.1 Surface peel strength (type 4 foil laminated printed wiring boards). When type 4 printed boards are tested in accordance with 4.8.4.4.1, the surface conductor shall withstand a minimum peel strength of 5 pounds per inch of width. Peel strength failures shall be handled in accordance with 4.7.1.3.4. This requirement is only applicable to boards that have surface conductors or surface mount lands. Pad only boards do not require peel strength testing."

3.6.5.1, title: Delete "(certification)" and substitute "(qualification)".

3.6.6.1, title: Delete "(certification)" and substitute "(qualification)". At end of paragraph, add the following: "The mandrel size shall be .250 inch diameter."

PAGE 12

3.7.1, line nine: Delete "exceed one and one-half times the foil" and substitute "exceed two times the foil".

* 3.7.2, delete and substitute the following:

"3.7.2 Plating deposits or coating thickness. The plating deposits or coating thickness shall be as specified on the master drawing (see 3.1) when examined in accordance with 4.8.5.2."

* TABLE VI, delete in its entirety.

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FIGURE 4, upper right: Delete "(see 3.7.9)" and substitute "SEE NOTE 3."

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3.7.12.2, title: Delete "(type 2, 3, 4, and 5)" and substitute "(types 2, 3, and 4)". First sentence: Delete "type 2, 3, 4, or 5" and substitute "type 2, 3, or 4". Line seven: Delete "(see figure 2)" and substitute "(see figure 4)".

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4.1.1, line six: Delete "Certified suppliers shall" and substitute "Suppliers shall". Line eight: Delete "certified manufacturer" and substitute "manufacturer".

Add new paragraph 4.1.2 as follows:

"4.1.2 Responsibility for compliance. All items must meet all requirements of sections 3 and 5. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of assuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling in quality conformance does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to acceptance of defective material."

4.2b, delete and substitute: "b. Qualification inspection (see 4.5)."

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* 4.3, second line: Delete "listed in table VII,".

4.5, first line: Delete "Supplier's certification inspection" and substitute "Qualification inspection" (2 places).

4.5.1, last sentence, delete and substitute the following:

"Sample test specimens shall conform to the following for the type shown:

- a. Type 1: Test specimens for this type shall meet the requirements specified in master drawing IPC-100041.
- b. Type 2: Test specimens for this type shall meet the requirements specified in master drawing IPC-100042.
- c. Types 3 and 4: Test specimens for this type shall meet the requirements specified in master drawing IPC-100043.
- d. Type 5: Test specimens for this type shall meet the requirements specified in master drawing IPC-100044, except no plated through-holes."

* TABLE VII, delete in its entirety.

4.5.1.1, line five: Delete "certification" and substitute "qualification".

4.5.2, delete in its entirety and substitute the following:

"4.5.2 Materials inspection. Materials inspection shall consist of certification supported by verifying data that the materials specified on the master drawing (see 3.1), used in fabricating the printed wiring boards, are in accordance with the applicable referenced specification or requirements prior to such fabrication."

4.5.3, first line: Delete "certification" and substitute "qualification" (2 places). Also, delete "Certification" and substitute "Qualification" (6 places).

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4.5.3, NOTE first line: Delete "certifying" and substitute "qualifying". Line two: Delete "Certification" and substitute "Qualification". Line three: Delete "certification" and substitute "qualification".

4.5.4, first line: Delete "certification" and substitute "qualification".

TABLE VIII, title: Delete "Supplier certification" and substitute "Qualification". Column heading: Delete "Certification". Test coupon column: Delete "Supplier certification".

TABLE VIII, Inspection column, Thermal stress (type 1), test specimen number column: Add "1".

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TABLE VIII, title: Delete "Supplier certification" and substitute "Qualification". Column heading: Delete "Certification".

Inspection column, Adhesive on land, test specimen number: Add "1, 4"; Test coupon column, types 2, 3, and 4: Add "A-1" (3 places).

Inspection column, Coverlayer wrinkles, test specimen number column: Add "1, 2, 3, 4"; Whole specimen column: Add "X".

Inspection column, Coverlayer access holes, test specimen number column: Add "1, 2, 3, 4"; Whole specimen column: Add "X".

Inspection column, Conductor edge overhang, test specimen number column: Add "1, 4"; Test coupon column, type 1, 2, 3, 4, 5: Add "A-1 or A-5" (5 places).

Inspection column, Bond strength (type 1), test specimen number column: Add "1, 4".

Inspection column, Flexibility endurance, Test coupon column, type 2, 3, 4, 5: Add "H-1" (4 places).

Inspection column, Plated-through hole, test specimen number column: Delete "1" and substitute "1, 4"; Test coupon column, type 2, 3, 4: Delete "B-3" and substitute "A-1 or A-5" (3 places).

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TABLE VIII, title: Delete "Supplier certification" and substitute "Qualification". Column heading, delete "Certification".

Inspection column, Undercutting, test specimen number column: Add "1, 4"; Test coupon column, type 2, 3, 4: Add "A-1 or A-5" (3 places).

Inspection column, Flexible material, test specimen number column: Add "1, 4"; Test coupon column, type 2, 3, 4: Add "A-1 or A-5" (3 places).

Inspection column, Laminate voids, test specimen number column: Add "1, 4"; Test coupon column, type 2, 3, 4, 5: Add "A-1 or A-5" (4 places).

Inspection column, Lifted lands (as received), test specimen number column: Add "1, 4"; Test coupon column, type 2, 3, 4: Add "A-1" (3 places).

Inspection column, Lifted lands, test specimen number column: Add "1, 4"; Test coupon column, 1, 2, 3, 4: Add "B-3, A-2, A-2, A-2".

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TABLE VIII, title: Delete "Supplier certification" and substitute "Qualification". Column heading: Delete "Certification".

Inspection column, Moisture and insulation resistance, Test coupon column, type 1, 2, 3, 4, 5: Delete "E-5" and substitute "E-3" (5 places).

Inspection column, Dielectric withstanding voltage, Test coupon column, type 1, 2, 3, 4, 5: Delete "E-5" and substitute "E-3".

Inspection column, Continuity, test specimen number column: Add "2".

Inspection column, Insulation resistance, test specimen number column: Add "2"; Test coupon column, type 2, 3, 4, 5: Add "E-1" (4 places).

Inspection column: Delete "Adhesive on land" and all applicable information.

Inspection column: Delete "Coverlayer wrinkles" and all applicable information.

Inspection column: Delete "Coverlayer access" and all applicable information.

Inspection column: Delete "Flexible material" and all applicable information.

Inspection column: Delete "Laminate voids" and all applicable information.

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Inspection column: Delete "Lifted lands" and all applicable information.

Footnote 3/, after "submitted": Add "and used for flexibility endurance."

Footnote 4/, delete and substitute: "4/ See MIL-STD-2118."

4.5.5: Delete "certification" and substitute "qualification" (4 places).

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4.5.5b, last line: Delete "certification" and substitute "qualification".

4.5.5c: Delete "certification" and substitute "qualification" (2 places). Line six: Delete "30 days" and substitute "60 days"; also, delete "interval shall" and substitute "interval may". Line eight: Delete "certifying" and substitute "qualifying". Line twelve: Delete "recertify" and substitute "requalify".

4.5.5d: Delete "certification" and substitute "qualification".

Add new subparagraph 4.5.5e as follows:

"e. The manufacturer shall requalify every 36 months. The extent of qualification specified in 4.5.3 shall apply."

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TABLE XI, inspection column: Delete "Surface imperfection 3.4.3" and substitute "Subsurface imperfections 3.4.3".

Inspection column: Delete "Marking (missing and legibility)" and substitute "Marking".

Requirement paragraph column: Delete "3.4.4" and substitute "3.3.14". Method paragraph column: Delete "4.8.2.4" and substitute "4.8.4.8".

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* 4.7.1.3, Delete "certifying activity (DESC-EQ)" and substitute "qualifying activity (DSCC-VQE)".

TABLE XI, Inspection column, Continuity, Production board column: Delete "7/" and substitute "X".

Inspection column, Insulation resistance, Production board column: Delete "10/" and substitute "X 9".

Footnote 8/, second sentence: Delete in its entirety.

Footnote 8/, third sentence: Delete "Type 2" and substitute "Types 1, 2, and 5".

Footnote 9/: After "and 2" add "an AQL of 2.5 percent defective".

Footnote 11/, delete and substitute: "11/ See MIL-STD-2118."

TABLE XII, inspection column: Delete "Marking ink" and all applicable information.

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TABLE XII, footnote 3/: Delete "See figures 17, 19, and 22." and substitute "See MIL-STD-2118."

TABLE XIII, inspection column, flexibility endurance: After "2/" add "4".

Footnote 3/, delete and substitute "See MIL-STD-2118."

Add footnote 4/ as follows: "4/ A type 1 specimen or board shall be used for flexibility endurance."

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Add new paragraph 4.7.2 as follows:

"4.7.2 Inspection of packaging. The sampling and inspection of the preservation and interior pack marking shall be in accordance with the groups A and B quality conformance inspection requirements of MIL-P-116."

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4.8.1, line six: Delete "3 diopters (approximately 3/4X)" and substitute "4X".

* 4.8.2.6: Delete "IPC-S-801" and substitute "J-STD-004".

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* 4.8.2.7, delete and substitute the following:

"4.8.2.7 Thermal stress (see 3.4.7 and 3.7.12). The printed wiring board test specimen shall be inspected for thermal stress in accordance with IPC-TM-650, method 2.6.8."

4.8.3.3: Delete "and 4.8.5.1".

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* 4.8.4.1, delete and substitute the following:

"4.8.4.1 Solder mask adhesion (see 3.6.1). The permanency and adhesion of cured solder mask shall be determined in accordance with IPC-TM-650, method 2.4.28.1."

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Add new 4.8.4.4.1 as follows:

"4.8.4.4.1 Surface peel strength (foil lamination)(see 3.6.4.1). The peel strength shall be inspected in accordance with IPC-TM-650, method 2.4.8. For quality conformance testing the specimen shall consist of conductors that provide a minimum test length of 2 inches (50 mm) and a conductor width of .125 inch (3.3 mm); see IPC-TM-650, section 5.8.3. This coupon can be placed in the border of the panel or elsewhere as space is available. This coupon is not described in MIL-STD-2118. The test frequency shall be once per month. Ten peel strength specimens shall be selected from two different production lots; coupon traceability shall be maintained. Plated tin-lead, solder coating, or other plated metallic resist shall be chemically removed prior to test, or shall be prevented from being deposited during manufacturing. The test specimen shall not be coated with any organic coating for test. Peel strength readings shall be averaged, discarding invalid results in accordance with IPC-TM-650 section 1.7."

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4.8.4.8: Delete "Method 215A" and substitute "method 215".

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4.8.6.1, line three, after Method 2.6.3: Add ", class 3".

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4.8.6.4, third sentence: Delete in its entirety.

PAGE 44

6.1.1h.: Delete "preservation-packaging" and substitute "preservation".

PAGE 45

6.3.1c: Delete "EI Dupont Company, Incorporated, 'Ion Chaser™,'" and substitute "Zero Systems, Incorporated, 'Zero Ion™, Model ZI-100.'".

Add new 6.3.1d as follows:

"d. Westek, 'ICOM 5000™'".

* TABLE XIV, delete in its entirety and substitute:

"TABLE XIV. Equivalence factors.

Method	Equivalence factors	Equivalents of sodium chloride		Related IPC-TM-650 test method
		Micrograms per Square inch	Micrograms per square cm	
Resistivity of solvent extract	1.00	10.06	1.56	2.3.5
Omega meter™	1.39	14.00	2.20	2.3.26
Ionograph™	2.01	20.00	3.10	2.3.26.1
Zero ion™	3.68	37.00	5.80	N/A
ICOM 5000™	2.20	22.00	3.40	N/A

* 6.5, delete and substitute the following:

"6.5 Qualification. With respect to products requiring qualification, awards will be made only for products which are at the time set for opening of bids, qualified for inclusion in the applicable qualified products list whether or not such products have actually been so listed by that date. The attention of the contractors is called to these requirements, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or orders for the products covered by this specification. The activity responsible for the qualified products list is Commander, Defense Supply Center Columbus (DSCC-VQE), 3990 East Broad Street, Columbus, Ohio 43216-5000."

6.5.1: Delete in its entirety.

Add new paragraph 6.6.2 as follows:

"6.6.2 MIL-P-50884 printed-wiring board. A MIL-P-50884 printed-wiring board is a flexible or rigid-flex printed-wiring board produced by a manufacturer listed on the Qualified Products List (QPL) and comes from a lot which has been subjected to, and passed all quality conformance inspections."

* Add new 6.6.3 as follows:

"6.6.3 Foil lamination, type 4 boards. Type 4 boards with outer layers made using foil lamination techniques make use of bonding materials (prepreg) and copper foil. Minimum dielectric thickness must meet the same requirements specified on the master drawing. Foil lamination of type 4 board requires the same testing as specified for groups A and B evaluations plus the peel strength surface conductor evaluation test specified in 3.6.4.1."

Concluding material, under preparing activity: Delete "Navy - EC" and substitute "DLA - CC".

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APPENDIX: Delete in its entirety.

The margins of this amendment are marked with an asterisk to indicate where changes (additions, modifications, corrections, deletions) from the previous amendment were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationship to the last previous amendment.

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CONCLUDING MATERIAL

Custodians:

Army - CR
Navy - EC
Air Force - 85

Preparing Activity:

DLA - CC

(Project 5998-0088)

Review Activities:

Army - AR, MI
Navy - AS, CG, MC, OS, SH, TD
Air Force - 11, 16, 99