PRINTED WIRING PRODUCTS AND ASSEMBLIES GENERAL REQUIREMENTS

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1. GENERAL

SCOPE

1.01 This section specifies general engineering requirements for printed wiring products and assemblies. Requirements for printed wiring boards are covered in **2. REQUIREMENTS FOR PRINTED WIRING BOARDS**. Requirements on assemblies are covered in **3. EQUIREMENTS FOR PRINTED WIRING ASSEMBLIES**. Modifications and repair requirements are covered in **4. MODIFICATION AND REPAIR**. **5. DEFINITIONS** defines terms used throughout this section.

1.02 This section is reissued to make the changes listed in **6. REASON FOR REISSUE**.

1.03 The term "Approved" as used in this document shall mean approved in writing by an authorized Bell System organization.

REFERENCES

1.04 For design considerations and drawing standards consult the following documents:

(a) X-74425: BELLPAC* System Guidelines:

Printed Wiring Products: Volume 1; Design Guide and Standards

Printed Wiring Products: Volume 3; LDI Documentation, Data Interchange, Coding and Marking

(b) Engineering Drawing Standards CI 97.111 Part M, Printed Wiring Drawing Standards

1.05 Specific printed wiring board and assembly requirements are controlled by the following X-specifications:

X-17186—Specification Plated-Through Holes - Method Of Test For Process Evaluation
X-17199—Engineering Requirements For The Plug End Of Printed Wiring Board Connector Fingers
X-17410—End Point Requirements For Flexible Printed Wiring

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* BELLPAC in a registered trademark of Western Electric

X-17442—Flexible Printed Wiring Assemblies
X-17753—Assembly and Testing Of a Clinched Wire Through Connection
X-17815—Requirements For Multilayer Printed Wiring Boards
X-18021—Ultraviolet Radiation Curable Cover Coats For Printed Circuitry
X-18241—Multiwire Interconnection Board
X-18300—Requirements and Methods of Detection Of Surface Ionic Contamination Of Printed Wiring Panels and Boards
X-18337—Requirements and Test Procedures For Press-Fit Pins In Printed Wiring Boards
X-18338—Requirements For Flexibility of Flexible Printed Wiring
X-18351—Repair and Modification Of Printed Wiring Products
X-18367—Requirements For BELLPAC Circuit Packs
X-18368—Requirements For Multilayer and Double-Sided Rigid Backplanes For Use With the BELLPAC Circuit Package
X-18374—Requirements Of Interference - Fit Pin Designs For Termination To Rigid Printed Wiring Boards
X-18500—Methods of Measurements for Warpage of PWBs and PWP Assemblies
X-18956—End Point Requirements For Leaded Chip Carrier Assemblies
X-19262—End Point Requirements for Rigid Single- and Double-Sided Printed Wiring Boards
X-19292—PWB Assembly With Aqueous Processing

2. REQUIREMENTS FOR PRINTED WIRING BOARDS

2.01 Multilayer printed wiring boards shall meet the requirements of X-17815.

2.02 Double- or single-sided rigid printed wiring boards shall meet the requirements of X-19262.

2.03 Flexible printed wiring boards shall meet the requirements of X-17410.

2.04 Multiwire interconnection boards shall meet the requirements of X-18241.

3. REQUIREMENTS FOR PRINTED WIRING ASSEMBLIES

GENERAL

3.01 All relevant printed wiring board requirements of **2. REQUIREMENTS FOR PRINTED WIRING BOARDS** shall apply to the completed assembly unless modified by provisions of **3. REQUIREMENTS FOR PRINTED WIRING ASSEMBLIES** or of the appropriate manufacturing drawings.

THROUGH CONNECTIONS

3.02 Clinched wire-through connections, when specified, shall meet the requirements of X-17753.

JUMPER CONNECTIONS

3.03 Jumper connections or strap wires, shall be made in accordance with Fig 1, using grade 1 annealed copper wire (Materials Specification 57772), coated with solder (nominal 60% tin, 40% lead). The wire shall be solderable (see MS-17000 Section 1065, Procedure A). Insulated wire may be used if desired.

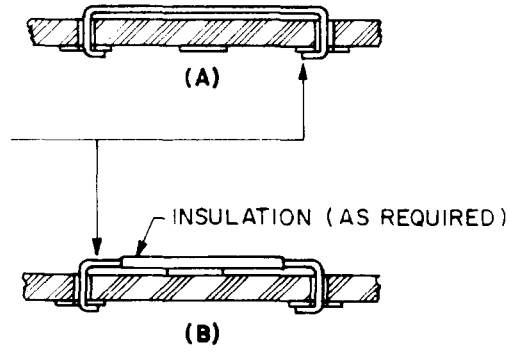


Fig 1—Jumper Connections

POSITIONING OF COMPONENTS

3.04 ***Conductor Spacing***: The clearance between any conducting surface on a part attached to the printed wiring board and any other conducting surface that is not electrically common shall be a minimum of 0.005 inch unless one of the following conditions is satisfied:

(a) One of the conducting surfaces is covered by a solder mask that satisfies the applicable printed wiring board requirements and is at least 0.0005 inch thick. NOTE: Covercoat per 642A finish (WL-2243) does not satisfy this requirement as an insulator.

(b) One of the conducting surfaces is covered by a 0.003-inch thick (0.001-inch material plus 0.002-inch adhesive, typical) tape of Polyethylene Terephthalate (Mylar-type) or Polyamide (Kapton-type).

3.05 ***Orientation***: Component code and electrical value markings may be oriented in different directions. It is preferable, although not a requirement, for these markings to be visible.

3.06 ***Mounting of Components***: Components shall be mounted so as to assure both satisfactory solder connections and the mechanical integrity of the final assembly. Heavy components may require mechanical restraint beyond that provided by the soldered component leads. For assemblies using immersible aqueous processing, the gap between the component body and the board shall not violate the requirements of X-19292.

ASSEMBLY OF COMPONENTS

3.07 ***Component Substitution***: Components can be substituted subject to the limitations defined in Section 800-610-154.

3.08 ***Damage to Components***: Component leads shall not be fractured, and any insulation present shall not be frayed or otherwise damaged. Nicks that do not reduce the lead cross-section area by more than 20 percent (judged visually) are acceptable.

3.09 ***Bending of Component Leads***: Component leads attached to a component by welds, solder joints, or through-glass seals shall not be bent at any point within 0.04 inch of that attachment point. In addition, on components with tubulations, the tubulation shall not be bent or stressed.

3.10 Clinched Connections

(a) When a clinched connection is made, the degree of clinching shall be sufficient to retain the component and to restrict its movement during soldering without placing undue strain on the internal structure of the component. The component lead may be at an angle to the terminal area if the clinched portion of the lead overlaps the terminal area enough to permit an acceptable solder connection per paragraph 3.12.

(b) Clinched connections may extend beyond the terminal area, but shall not violate the minimum clearance requirements of paragraph 3.04.

SOLDERING

3.11 All solder used for an assembly shall be of an approved alloy equivalent to nominal 63% tin, 37% lead or 60% tin, 40% lead.

3.12 Solder Connections

(a) All solder joints shall be clean, shiny, and smooth; shall feather out to a thin edge; and shall not show evidence of nonwetting or dewetting.

(b) Solder coverage is required only on areas where solder connection exist; or where it is specified for electrical contact. On all other areas, bare copper or moderate dewetting is acceptable.

(c) Wire ends protruding from solder joints and excessive quantities of solder are acceptable if all other provisions of this requirement are met and if these protrusions:

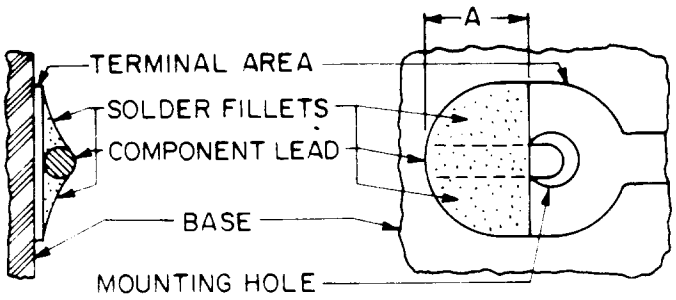
(1) Are not liable to cause bridging under moderate deformation.

(2) Will not cause clearance problems in subsequent assembly.

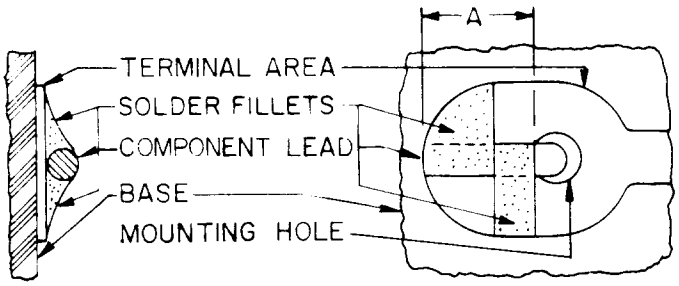
(3) Do not violate minimum conductor spacing.

(d) Unless otherwise approved, all component leads used in nonplated holes shall be clinched. Clinched lead solder connections shall meet the requirements of Fig 2 (judged visually). With plated-through holes, clinched lead solder connections are also acceptable if they meet the requirements of Fig 3 (fillet around 75% of lead periphery, judged visually). It is not necessary to fill the component lead hole with solder, however, components must be mechanically secure [see subparagraph (k)].

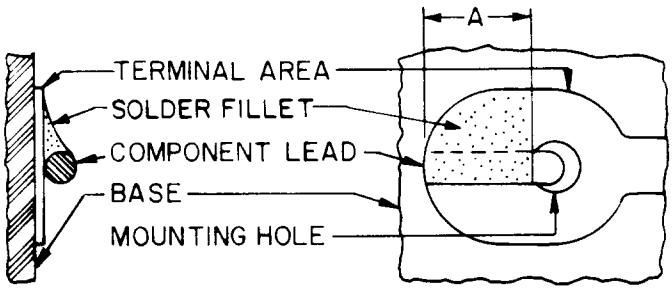
(e) Nonclinched connections are acceptable on plated-through holes if the solder fillet (judged visually) meets the requirements of Fig 3.



(a) PREFERRED - TWO SOLDER FILLETS, FULL LENGTH OF DISTANCE "A". (SEE NOTE)



(b) MINIMUM ACCEPTABLE - TWO SOLDER FILLETS TOTALING IN LENGTH AT LEAST THE DISTANCE "A". (SEE NOTE)



(c) MINIMUM ACCEPTABLE - ONE SOLDER FILLET, FULL LENGTH OF DISTANCE "A". (SEE NOTE)

NOTE: DISTANCE "A" IS THE DISTANCE FROM THE EDGE OF THE HOLE TO THE EDGE OF THE TERMINAL AREA, OR THE DISTANCE FROM THE EDGE OF THE HOLE TO THE END OF THE LEAD, WHICHEVER IS SHORTER.

Fig 2—Soldering of Clinched Connections

(Fillet around 75% of lead periphery, judged visually). It is not necessary to fill the component lead hole with solder, however, components must be mechanically secure [see subparagraph (k)].

(f) On plated-through holes, semi- or partially-clinched leads are acceptable if they meet the solder requirements for either clinched (d) or nonclinched leads (e).

(g) Components, terminals, hardware, or similar items that are fastened to the board by spinning, swaging, or similar operations and that require electrical connections to the conductor pattern shall have no more than two solder fillets. These fillets shall total at least 50 percent of the distance around the periphery of the fastening device, judged visually.

(h) Lands to which solder joints are made may be lifted without limit if hardware is fastened to that land by spinning or equivalent method. Lands may be lifted up to 50 percent of their periphery if the lead is clinched and the joint meets the requirements of Fig 2. In any other cases lifted lands must be repaired per X-18351.

(i) For surface-connected ribbon leads, such as a flat pack integrated circuit, a solder fillet must exist on one or both sides of each lead. The total length of the fillets on both sides of the leads shall exceed 0.1 inch or the length of overlap between the leads and the land whichever is less.

(j) Solder joints on surface-mounted chip carriers and small outline (SO) surface-mounted devices shall meet the requirements of X-18956.

(k) For through-hole mounted devices, all leads must be soldered with a mechanically secure solder joint to a secure land except for devices with four or more leads. For devices with four or more leads, a total of four leads one on each corner or 50 percent of the possible leads whichever is greater shall be soldered with a mechanically secure solder joint to a secure land. In addition, any lead specifically designed to mechanically secure the component must be soldered with a mechanically secure solder joint to a secure land. A mechanically secure solder joint to a secure land is one capable of supporting an axial load of 10 pounds. Lands not used for electrical functionally or for testing may be lifted; or removed from the board.

3.13 ***Press-Fit Pins***: Requirements for press-fit pins, whether or not reflow soldered, are covered in X-18337.

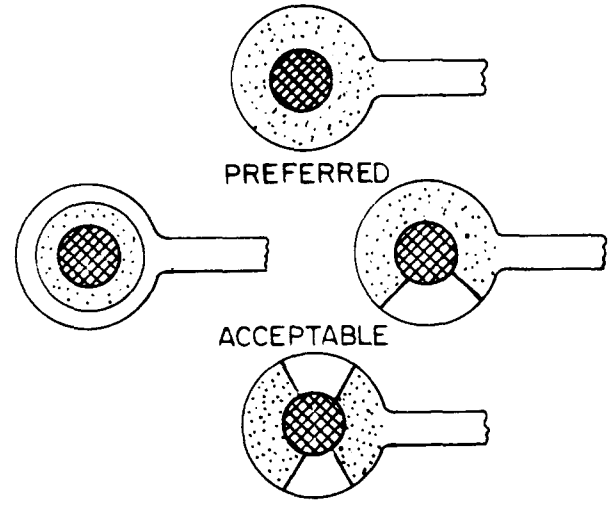


Fig 3—Soldering of Partially Clinched and Nonclinched Connections

3.14 ***Solderless Wrapped Connections***: Requirements for solderless wrapped connections on printed wiring boards are contained in X-17963.

3.15 ***Assembly Flatness***: When measured per X-18500 Method C, any bow or twist in the printed wiring board assembly shall not exceed the use-related limit specified. When measured per X-18500 Method B, the bow or twist shall not exceed the following limits:

MATERIAL		
BOARD NOMINAL THICKNESS	FR-4 OR EQUIVALENT	FR-2, FR-3, G OR EQUIVALENT
Less than 0.032 inch	0.018 in./in.	0.030 in./in.
0.032 to 0.064 inch	0.012 in./in.	0.024 in./in.
Greater than 0.064 inch	0.010 in./in.	0.020 in./in.

CLEANING AND PROTECTION

3.16 ***Cleaning***: Following completion of assembly and soldering operations, all printed wiring assemblies shall be cleaned to remove fingerprints, dust, dirt, grease, excessive flux residue, and other foreign matter. If water soluble type flux is used in soldering, assemblies shall be cleaned per X-19292. If immersible aqueous cleaning is used, the requirements of X-19292 shall be met. If other types of cleaning are used following soldering with rosin type flux, the following requirements shall be met:

(a) Underbush cleaning processes are acceptable on the noncomponent side of the board provided only occasional isolated droplets of liquid fall on the component side of the board.

(b) For devices encapsulated in RTV rubber (such as WE manufactured HICs, TEDs, PCDs, and DIPs), precautions shall be taken in cleaning operations to minimize contact with organic solvents. The following procedures are acceptable.

(1) Immersion for a maximum of 1 minute in Freon* TE or Freon TE-35 or equivalents followed by: removal of excess liquid solvent by forced-air drying, shaking, or other suitable means; transfer to an air oven in 1 minute or less; and baking for 15 minutes at 55°C.

or:

(2) Immersion in specially denatured alcohol (SDA) (ethyl alcohol with between 5 and 30 percent methyl alcohol) for a maximum of 10 minutes.

Note: It is recommended that the devices be subjected only once to either of the preceding procedures. Repeated exposure may result in device damage.

(3) Underbrush cleaning per subparagraph (a) above.

(c) Assemblies containing only plastic DIPs may be cleaned by immersion in Freon TA, Freon TE, Freon TE-35, Freon TF, PCE, TCE, or the equivalent for periods up to 5 minutes, followed within 5 minutes by the removal of excess liquid solvent (by a forced-air dry; shake; vertical positioning for natural drainage; or other suitable means).

3.17 ***Protection***: Unless otherwise approved or unless waived by the provisions of paragraph 3.18, all regions on the printed wiring board where isolated conductors are spaced by design closer than 0.020 inch shall be protected by a dielectric coating satisfying one of the following requirements: MS 58600; X-18021; WL-2333; WL-2243 type 3 or 4 (642A covercoat). Areas to which future electrical connections will be made and components with moving parts shall be masked from all covercoats such as 642A. The addition of 642A finish over solder mask is not required. The 642A finish, type 4 may be inspected for coverage under an ultraviolet light.

3.18 Protection may be omitted from any portion of any conductor pattern provided that the exposed conductor areas are more than 0.020 inch from any other isolated exposed conductor. Protection may be omitted from dielectric areas between connector fingers or terminals that by design are closer than 0.020 inch. Localized skips and voids are allowed in any coating provided they do not expose two isolated conductors closer than 0.020 inch to each other.

3.19 After cleaning and the application of any required covercoat, noble metal connector fingers shall be lubricated as specified in X-17199.

3.20 After application of protection and lubrication, noble metal connector fingers shall meet the cleanliness requirements in X-18328.

3.21 ***Shipping and Storage***: When assemblies are shipped and stored, they shall be placed in containers which are free of corrosive constituents such as silicone, sulphur and chlorine. Excessive fibrous materials shall be avoided. Ordinary

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* Registered trademark of E. I. Dupont

cardboard and brown paper containers are not permitted. Polyethylene bags and antistatic bags (where applicable) are satisfactory. All packaging shall be sufficiently durable as to protect assemblies during commercial carrier transportation.

4. MODIFICATION AND REPAIR

4.01 When it is necessary to modify an assembly or to make an authorized repair, the printed wiring assembly shall meet all requirements of **3. REQUIREMENTS FOR PRINTED WIRING ASSEMBLIES** after the modification or repair is completed.

4.02 Requirements for repairs on printed wiring products are contained in X-18351.

5. DEFINITIONS

Additive Process— A process for obtaining conductive patterns by the selective deposition of copper on unclad base material. See ***Fully Additive*** and ***Semi-Additive***.

Annular Ring*— That portion of conductive material completely surrounding a hole and including the barrel of the plated-through hole, if plated.

Art Master*— An accurately-scaled (usually 1:1) pattern which is used to produce the Production Master.

Back Side— On bonded flexible printed wiring, the side of the board on which most of the components will be mounted. Also called nonsolder side of component side.

Base Material*— The insulating material upon which the conductor pattern may be formed. The base material may be rigid or flexible. It may be a dielectric sheet or insulated metal sheet.

Bend Region— A region on a flexible printed wiring board that will sustain flexing or bending (other than the bending necessary for roll-to-roll processing) during manufacture, assembly, installation, service, or repair and that is designated as such on drawings and specifications by the responsible designer.

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* ANSI/IPC-T-50

Blister, Foil— A localized separation between the base and the conductive material.

Blister, Interlaminar— A void produced under the surface of a laminated material. This is a form of delamination.

Bond Strength*— The force per unit area required to separate two adjacent layers of a board by a force perpendicular to the board surface. (See also: ***Peel Strength***.)

Bonded Printed Wiring Board— A conductor pattern formed on a flexible base and subsequently bonded to a rigid support to become entirely or partly a rigid printed wiring board.

Bow*— The deviation from flatness of a board characterized by a roughly cylindrical or spherical curvature such that, if the board is rectangular, its four corners are in the same plane. (See also: ***Twist***.)

Bridging— The formation of an unintended conductive path between conductors. Also referred to as shorts or crosses.

Buried Via— A via connecting two adjacent layers of a multilayer board which does not pass completely through the board. This includes vias connecting two internal layers as well as vias connecting a surface layer to an internal layer.

Checking— Fine hairline cracks in the surface of the base material.

Circuit Packs (cp)— An assembly of components mounted and interconnected on a printed wiring board (single, double, or multilayer) that connects into the backplane of a frame, shelf, or nest. It is usually a plug-in assembly. Typical components mounted on the circuit packs are:

(a) Discrete components

(b) Integrated circuits (SICs, FICs, and HICs)

(c) Circuit modules (CMs)

(d) Any combination of (a), (b), and (c).

Clinched Leads*— Component leads that extend through the printed board are formed to effect a

spring action, metal-to-metal electrical contact with the conductive pattern prior to soldering.

Clinched-Wire Through Connection*— A connection made by a wire that is passed through a hole in a printed board, and subsequently formed, or clinched, in contact with the conductive pattern on each side of the board, and soldered.

Component Side*— That side of the printed board on which most of the components will be mounted.

Conductor Path— The portion of the conductor pattern on a board that provides point-to-point electrical connections between terminal areas or contact fingers or both.

Conductive Pattern*— The configuration or design of the conductive material on the base material. (Includes conductors, lands, and through connections when these connections are an integral part of the manufacturing process.)

Conductor Side— The side opposite the side where the majority of the components are mounted. Also referred to as the wiring side, noncomponent side, solder side or on bonded flex the front side of the assembly.

Contact Finger— The portion of the conductor pattern from which contact is made between the circuit board and external (off-board) circuitry.

Cosmetic Defect— A variation from the conventional appearance of an item, such as a change in its usual color.

Covercoat— A finish applied to printed wiring assemblies to preserve the completed printed wiring assembly's insulation resistance and to protect the conductor pattern from corrosion or contamination.

Cover Lay— A layer of insulating material applied to the outer surface of a printed wiring board after the conductor pattern has been etched.

Crazing— Connected white spots or crosses that are on or below the surface of an epoxy glass laminate and that reflect a separation of fibers in the glass cloth and connecting weave intersections. See ***Haloing*** and ***Measling***.

Current-Carrying Capacity*— The maximum current which can be carried continuously, under specified conditions, by a conductor without causing objectionable degradation of electrical or mechanical properties of the printed board.

Datum Axes— Horizontal and vertical straight lines at right angles to each other and drawn through datum points, forming a quadrant. The lines, which do not appear on the board, serve as base lines for positioning conductors, holes, land areas, and board edges on a PWB drawing.

Datum Points— Three fixed reference points positioned within or outside the board outline and used to establish the datum axes.

Delamination*— A separation between plies within the base material, or between the base material and the conductive foil, or both.

Design Modularity— The minimum dimensional change or unit of measurement used in defining feature dimensions and locations. The grid spacing used in the board layout normally reflects design modularity.

Dewetting*— A condition that results when molten solder has coated a surface and then receded leaving irregularly shaped mounds of solder separated by areas covered with a thin solder film; base metal is not exposed.

Double-Sided Board— A printed board with a conductive pattern on both sides.

Dross— Oxide and other contaminants which form on the surface of molten solder.

Etchant— A solution used to remove, by chemical action, the unwanted portion of the conductive material.

Etch Factor— The ratio of the depth of etch (conductor thickness) to the amount of lateral etch (undercut).

Etched-Foil Type Printed Wiring Board— A conductor pattern formed on a base by chemical or electrochemical removal of undesired conductive material.

Etching*— A process wherein a printed pattern is formed by chemical, or chemical and electrolytic removal of the unwanted portion of conductive material bonded to a base.

Feed-Through— See ***Through Connection***.

Firmware— A printed wiring board product that contains a program that is stored on read-only memory (ROM) devices.

Flair (Hole)— A condition often seen on punched boards in which the hole diameter varies through the board. Generally, the punch exit side has a larger diameter than the entrance side.

Flexible Printed Wiring Board— A conductor pattern formed on a base of flexible substrate.

Flexibility— The ability of a flexible printed wiring board to sustain multiple flex strains of a given severity without catastrophic consequences.

Foil— The thin layer of conductive material bonded to the base.

Functional Electrical Test— A bare board electrical test of circuit connectivity, generally done using a low dc voltage, whose purpose is to show that all nets are continuous and that no shorts exist between nets.

Full-Additive Process*— An additive process wherein the entire thickness of electrically isolated conductors is built up by electroless metal deposition.

Grid*— An orthogonal network of two sets of parallel equidistant lines used for locating points on a printed board.

Haloing*— Mechanically-induced fracturing or delaminating on or below the surface of the base material; it is usually exhibited by a light area around holes, other machined areas, or both.

Hazing— The loss of gloss on the surface of the board due to micro-cracks on the surface dielectric. This condition is often caused by excessive exposure to solvents.

Hole Breakout— A condition in which a hole is not completely surrounded by a land.

Icicle— See ***Solder Projection***.

Inclusion*— A foreign particle, metallic or nonmetallic, in a conductive layer, plating, or base material.

Interfacial Connection— See ***Through Connection***.

Imidazole— A generic copper complexing chemical treatment used for the preservation of solderability of bare copper.

Jumper*— An electrical connection between two points on a printed board added after the intended conductive pattern is formed.

Land*— A portion of a conductive pattern usually, but not exclusively, used for the connection or attachment, or both, of components.

Least Nominal— The finest conductor path width or spacing requirement before application of tolerances.

Measling— Discrete white spots or crosses that are below the surface of the base laminate and that reflect a separation of fibers in the glass cloth at weave intersections.

Metal Cladding— See ***Foil***.

Microvia— Landless vias whose small size allow them to connect circuits on two layers without blocking any wiring tracks on either layer.

Multilayer Printed Board— The general term for a completely processed printed circuit or printed wiring configuration consisting of alternate layers of conductive patterns and insulating materials bonded together, with conductive patterns in more than two layers, and with the conductive patterns interconnected as required. The term includes both flexible- and rigid-multilayer boards.

Nonclinched Connection— A connection to a printed wiring board in which a component lead or wire is inserted through a hole in the base and is not subsequently clinched.

Noncomponent Side— See ***Conductor Side***.

Nonfunctional Plated-Through Holes— Those holes not specified as plated-through by the drawing and not required for electrical through connection.

Nomenclature— Electrically nonfunctional coding or marking applied to the board or the assembly by a process such as screen printing; etching or stamping. Nomenclature indicates such information as

board code, board issue, vendor code, date of manufacture, component type, component outline, etc.

Nonwetting*— A condition whereby a surface has contacted molten solder, but the solder has not adhered to all of the surface; base metal remains exposed.

Overhang— The unsupported section of plating extending beyond the conductor pattern, caused either by overplating or by undercutting of the conductive material.

Panel*— A rectangular or square base material of predetermined size intended for or containing one or more printed boards and, when required, one or more test coupons.

Peel Strength*— The force per unit width required to peel the conductor or foil from the base material.

Pinhole*— A small hole occurring as an imperfection that penetrates entirely through a layer of material.

Pit*— A depression in the conductive layer that does not penetrate entirely through it.

Plated-Through Hole*— A hole in which electrical connection is made between internal or external conductive patterns, or both, by the deposition of metal on the wall of the hole.

Plating Equalizer— Isolated conductor patterns used to balance electroplating currents over the surface of the panel to obtain a more uniform electroplate thickness. These conductors are not functional in the final product.

Printed Circuit*— A conductive pattern comprised of printed components, printed wiring, or a combination thereof, all formed in a predetermined design and intended to be attached to a common base. (In addition, this is a generic term used to describe a printed board produced by any of a number of techniques.)

Printed Component*— A part, such as an inductor, resistor, capacitor, or transmission line, which is formed as part of the conductive pattern of the printed board.

Printed Wiring Assembly— An assembly of electrical or electronic components mounted and interconnected on a printed wiring board. See ***Circuit Packs***.

Printed Wiring Board— A conductor pattern on a base.

Resin Starved Area*— An area in a printed board that has an insufficient amount of resin to wet out the reinforcement completely, evidenced by loss gloss, dry spots, or exposed fibers.

Resist*— Coating material used to mask or to protect selected areas of a pattern from the action of an etchant, solder, or plating.

Rigid Printed Wiring Board— A conductor pattern, formed on a rigid substrate.

Semi-Additive Process*— An additive process, for obtaining conductive patterns; it combines an electroless metal deposition on an unclad substrate with electroplating or with etching or with both.

Single-Sided Board*— A printed board with a conductive pattern on one side only.

Solder Mask— A dielectric material applied to the board to prevent the adhesion of solder to selected areas of the conductor patterns during soldering. Solder mask may also serve as a covercoat for the assembly.

Solder Projection*— An undesirable protrusion of solder from a solidified solder joint or coating.

Solderability*— The property of a metal to be wetted by solder.

Strap— See ***Jumper***.

Substrate— See ***Base***.

Supported Hole*— A hole in a printed board that has its inside surface plated or otherwise reinforced.

Surface Mounting*— The electrical connection of components to the surface of a conductive pattern without utilizing component holes.

Terminal Area— See ***Land***.

Test Coupon*— A portion of a printed board or of a panel containing printed coupons, used to determine the acceptability of such a board(s).

Test Point*— Special points of access to an electrical circuit, used for testing purposes.

Through Connection*— An electrical connection between conductive patterns on opposite sides of an insulating base, eg, plated-through hole or clinched jumper wire.

Twist*— The deformation parallel to a diagonal of a rectangular sheet such that one of the corners is not in the plane containing the other three corners.

Unclinched Connections— See ***Nonclinched Connection***.

Unsupported Hole— A hole containing no conductive material nor any other type of reinforcement.

Via Hole*— A plated-through hole used as a through connection, but in which there is no design intent to insert a component lead or other reinforcing material.

Wave Soldering*— A process wherein printed boards are brought in contact with the surface of continuously flowing and circulating solder.

Weave Exposure*— A surface condition of the base material in which the unbroken fibers of woven gloss cloth are not completely covered by resin.

Wetting*— The formation of a relatively uniform, smooth, unbroken, and adherent film solder to a base material.

6. REASON FOR REISSUE

1. To incorporate changes to, and add new requirements for printed wiring boards and printed wiring assemblies.
2. To include references to X-19262 and X-19292.
3. To expand and modify the list of definitions.