ASSOCIATION CONNECTING
ELECTRONICS INDUSTRIES®

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Number	
2.4.36	
Subject	
Rework Simulation, Plated-Through Holes for Leaded Components	
Date	Revision
05/04	**C**
Originating Task Group	
Rework Simulation Task Group, 7-11c	

IPC-TM-650
TEST METHODS MANUAL

1 Scope This test method is used to simulate the procedures for plated-through hole (PTH) component removal and replacement, in order to determine the effects of rework on the quality and integrity of the PTH barrel and conductor foil on *bare* rigid or flexible printed boards. The five steps are designed to simulate initial soldering after a preconditioning bake and two subsequent replacements.

2 Applicable Documents

IPC-TM-650 Test Methods Manual

2.1.1 Microsectioning

2.1.1.2 Microsectioning - Semi or Automatic Technique Microsection Equipment

J-STD-004 Requirements for Soldering Fluxes

J-STD-006 Requirements for Electronic Grade Solder Alloys and Fluxed and Non-Fluxed Solid Solders for Electronic Soldering Applications

Commercial Item Description (CID) A-A-59551 Wire, Electrical, Copper (Uninsulated)

3 Test Specimen

3.1 The standard test sample shall be as specified in the governing specification or standard. In certain situations, it may be necessary to perform this test on a production printed board. In this case, a minimum of three PTHs shall be selected. For military printed board(s), the selected holes shall contain the maximum number of internal layer connections, so that a complete quality evaluation can be made.

Note: This is a destructive test.

4 Equipment/Apparatus

4.1 A soldering and/or desoldering iron with temperature control accurate within ± 6 °C [11 °F] of the preselected idle temperature of 260 °C [500 °F], 315 °C [599 °F], or 371 °C [700 °F] (see 6.2).

4.2 Tin coated solid copper wire, conforming to (CID) A-A-59551.

4.3 Liquid soldering flux conforming to J-STD-004, Flux Designator ROL1.

4.4 Rosin fluxed solder Sn60Pb40A or Sn63Pb37A with Flux Designator ROL1 (Rosin, Flux activity Type L1) conforming to J-STD-006.

4.5 Metallographic laboratory facilities, conforming with IPC-TM-650, Methods 2.1.1 or 2.1.1.2.

4.6 Metallograph capable of up to 200X magnification.

4.7 Forced air convection oven capable of maintaining 121 °C to 149 °C [250 °F to 300 °F].

4.8 Shear type wire cutters.

4.9 System for solder removal (desoldering braid or vacuum assisted desoldering tool).

5 Procedure

5.1 Condition specimens in a forced air convection oven at 121 °C to 149 °C [250 °F to 300 °F] for a minimum of six hours to remove moisture. After conditioning, allow the specimens to cool to room temperature.

5.2 To aid in the addition or removal of solder, flux may be applied to both sides of the test specimen.

5.3 The hand soldering and desoldering operation of the wire shall be performed as follows:

Step 1: Solder wire into PTH
Step 2: Remove (desolder) wire from PTH
Step 3: Resolder wire into PTH
Step 4: Remove (desolder) wire from PTH
Step 5: Resolder wire into PTH

During the desolder and solder steps, solder every other PTH in the row and allow the specimen to cool to room temperature. Then solder the remaining PTHs.

5.4 During the solder and desoldering steps, the soldering and/or desoldering iron shall have a tip temperature as follows (see 6.1):

Method A: 260 °C [500 °F] - Default method
Method B: 315 °C [599 °F]
Method C: 371 °C [700 °F]

Create a solder bridge between the soldering iron tip, land area, and wire, avoiding direct pressure on the land area. The solder is to melt and form the connection within two to five seconds. Permit the wire and specimen to cool to room temperature.

If the solder connection cannot be formed within five seconds using the specified method the test shall be repeated using the subsequent method. This deviation shall be noted in the test report.

5.5 Position test wires in the PTHs and solder by hand. The test wires that are to be hand soldered in the PTHs shall have a diameter between 0.25 mm [0.00984 in] and 0.71 mm [0.028 in] less than the diameter of the PTH.

5.6 During the desoldering step, form a solder bridge and remove the solder from the PTH within two to five seconds. Allow the specimen to cool to room temperature. Resolder the wire in the PTH using fresh solder.

5.5 Prepare a microsection specimen for metallographic evaluation per IPC-TM-650, Method 2.1.1 or 2.1.1.2. Evaluate the microsection in accordance with the requested standard or specification.

6 ***Notes***

6.1 Those who require the use this test method will need to specify either Methods A, B, or C which affect the soldering iron tip temperatures that are to be used when performing the soldering and desoldering operations. If no method is specified then Method A (260 °C) [500 °F] is to be used.

6.2 Users of direct power soldering irons with fixed temperature tip cartridges may substitute the appropriate series tip cartridge for the specified temperatures in Methods A, B, and C as follows:

260 °C [500 °F] ≈ 500 series cartridges
315 °C [599 °F] ≈ 600 series cartridges
371 °C [700 °F] ≈ 700 series cartridges

The type of soldering iron technology used (direct power or stored heat) will affect the test results and therefore the repeatability of this method. The type of soldering iron technology used shall be specified in the test report.

6.3 Users of this method are cautioned to use good industry assembly soldering techniques when performing the operations specified herein. This includes, but is not limited to the handling of the specimens, lead cutting, and soldering/desoldering operations.