



Design and Fabrication of Prototype P.C. Boards

- 11.00 Developing Techniques - to develop the exposed photo resist use the Lake Developer for this purpose. Trichlorethylene could be used instead but it is quite toxic if not used with care. Fill a plastic tray with the Developer and place the board in the tray. Rock the tray back and forth to keep the solution moving over the exposed surface. This process will remove all the photo resist that has not been exposed to the light. About 2 minutes of this treatment should be sufficient. After air drying the board is ready for etching.
- 12.00 Circuit Board Etchants - in the etching of circuit boards the processor must consider undercutting, line definition and tolerances, board substrate contamination, and degradation. The etchants selected must represent a careful mating of composition and properties with regard to control, useful life, dissolved copper content, regeneration, and economy.
- 12.01 Etching Resists - when etching circuit boards some form of "resist" is used to cover the circuit that will be left unetched at the completion of the process. This can be asphalt or vinyl based resist applied by silk screening, a "photo" resist applied by dipping or spraying and sensitized photographically or an electro-plated resist. The electroplated resists may be gold, tin-lead or tin-nickel plating. After the circuit board is etched, the "photo" resist is removed by scouring with a cleaning pad, leaving a bare circuit which is usually sprayed with a solder flux to facilitate soldering and prevent the copper from oxidizing. The plated circuit requires no further treatment except it is usual to dip the tin-lead plated board into a hot "peanut" oil to "fuse" the "solder" plating. This step acts as a quality control check on the plating and facilitates subsequent component soldering.
- 12.02 Etching Solution
- Ferric Chloride is the most accepted etchant for unplated circuit boards. In operation the etchant reacts with the copper on the circuit board to form copper chloride in the solution. The time required to etch a board is a function of the concentration of copper content in the etching solution, the solution temperature and the degree of agitation used. In production, ferric chloride is usually heated to about 100-120°F and sprayed on the circuit board to be etched. The etching time used is about 1 to 5 minutes with the solution discarded when this exceeds about 5 minutes. For producing prototypes, the solution can be used at room temperature and the circuit board moved in the solution so as to produce a uniform etch. The etching time will vary from 3 to 10 minutes depending on the solution concentration.
- Chromic-Sulphuric Acid - is the preferred etchant for plated circuit boards. It is usually used in etching machines at a temperature of about 100° F. Due to the highly corrosive nature of this solution, when in contact with rubber gloves, shoes, etc., it is not recommended for prototype use.



Reference Specifications Applicable to P.C.'s

Federal (US) QQ-N-290 Class 11 - Nickel Plating, Electrodeposited
 QQ-S-571 - Solder, Tin alloy, Lead-tin alloy, and Lead alloy.

Industry

Electronic Industries Assoc.

- RS209 - Definition and Register, Printed Wiring
- RS213 - Test Point Locations in Printed Wiring Assemblies
- RS216 - Standard Method of Test for adhesion of Printed Wiring
- RS251 - Test to determine Temperature Rise as a Function of Current in Printed Conductors.
- RS319 - Solderability of Printed Wiring Boards.

Institute of Printed Circuits

- IPC-A-600 - Acceptability of Printed Circuit Boards
- IPC-CF-150 - Copper Foil for Printed Circuit Application
- IPC-D-300 - Standard Tolerances for Printed Circuit
- IPC-FC-218 - Flexible Flat Cable type Connectors
- IPC-FC-240 - Flexible Printed Wiring Specifications
- IPC-TC-500 - Copper Foil for Printed Circuit Application
- IPC-TC-510 - Clinched Wire type Interfacial Connections
- IPC-TC-550 - Interfacial Connections Specifications
- IPC-R-700 - Rx for repair of Printed Wiring Boards
- IPC-ML series Multilayer Design Guide

International Electrotechnical Commission

Publication 194 - Terms and Definitions for Printed Circuits

Military

- A.B.M.A. Std. 428 - Printed Circuit Design and Construction Standard
- MIL Std. 202 - Test Methods for Electronic and Electrical Comp. Part
- MIL Std. 275 - Printed Wiring for Electronic Equipment
- MIL Std. 429 - Printed Circuit Terms and Definitions
- MIL Std. 440 - Soldering Techniques for Standard type Solder terminals.
- MIL-C-14550 - Copper Plating
- MIL-G-45204 - Gold Plating
- MIL-P-13949 - Plastic Sheet, Laminated, Copper Clad
- MIL-P-55110 - Printed Wiring Boards
- MIL-S-46844 - Solder bath soldering of Printed Circuit Boards
- MIL-T-10727 - Tin Plating
- MIL Dwg. - Bu Weps dwg. 62A4B1 - Cleaning process for Printed Circuits and Terminal Boards.