

Acknowledgement
Many thanks to Walid Khalil

PCB Manufacturing

**Assembly
Assembly
Processes**

By
Mustafashiple

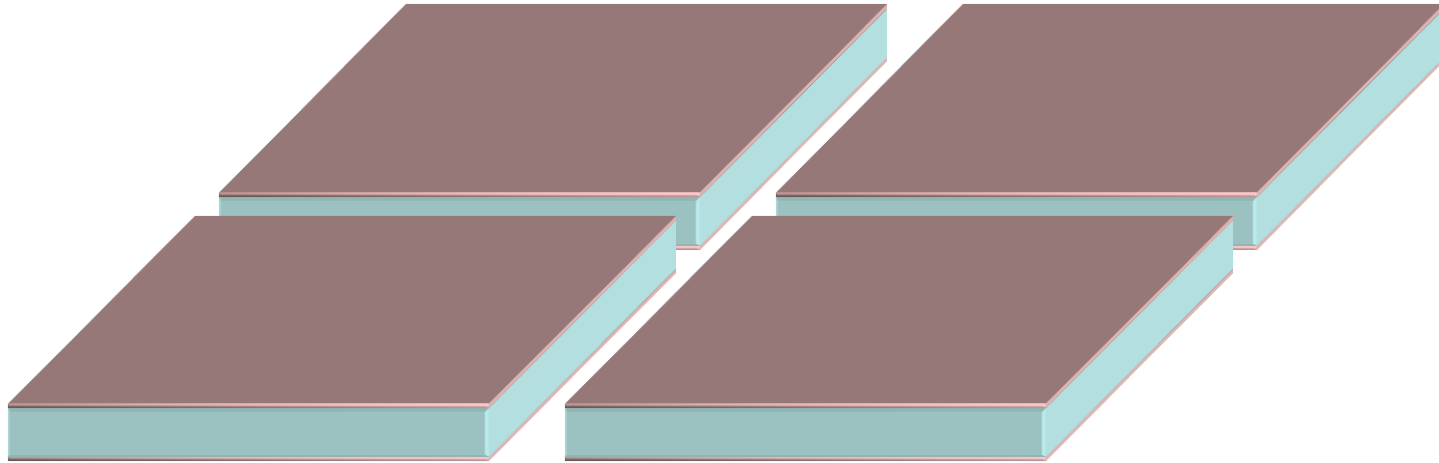
Topics



- PCB Fabrication :-
 - Single sided.
 - Double sided.
 - Multi-Layer.
- PCB Assembly :-
 - Through Hole Assembly.
 - SMT Assembly:-
 - Glue Dispensing.
 - Paste printing .

The background features a grid of binary code (0s and 1s) in a light blue color, set against a gradient background that transitions from red on the left to blue on the right. A magnifying glass with a black handle is positioned in the lower-left quadrant, its lens focused on the binary code. The text "Manufacturing Of Multi-Layers PCB" is overlaid in the center in a bold, yellow, sans-serif font with a slight shadow effect.

Manufacturing Of Multi-Layers PCB

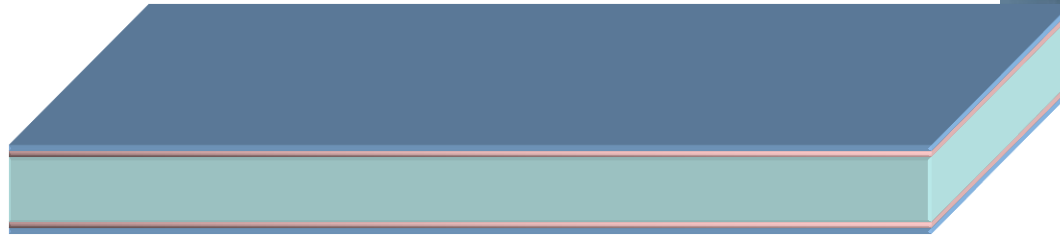
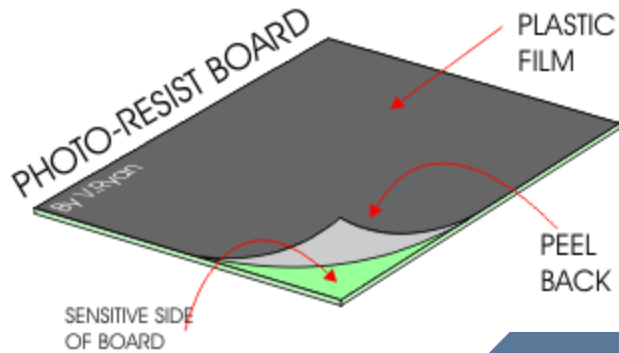


Cutting Of Raw Material

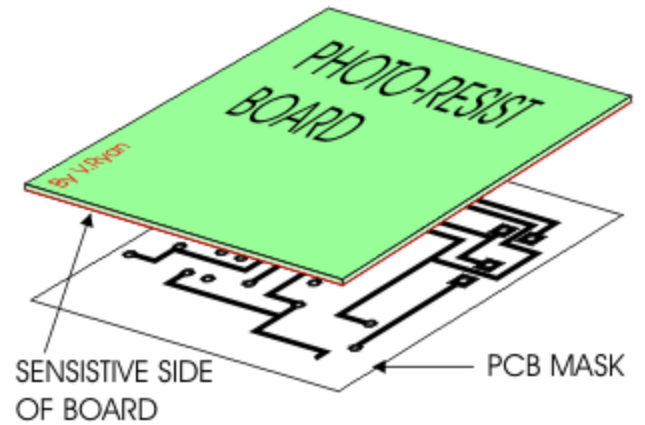
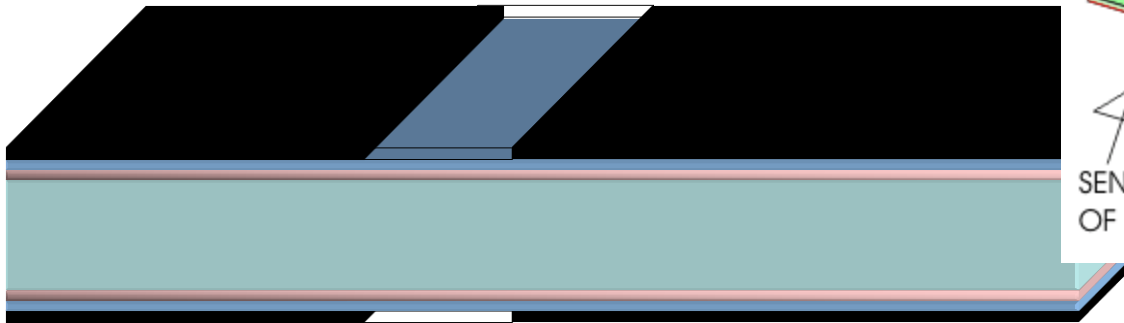
0.7 mm core 35/35 μm Copper Clad



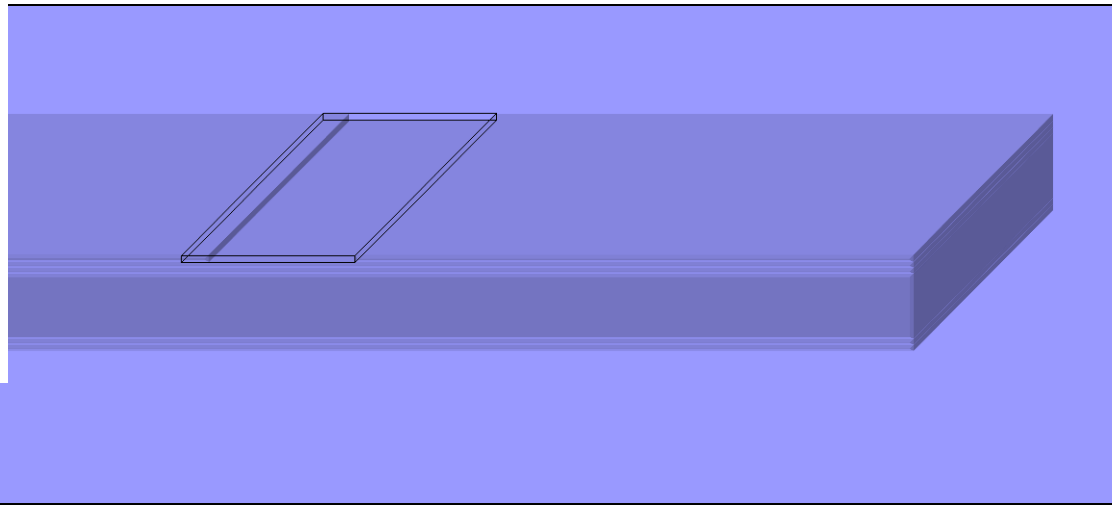
Surface Preparation



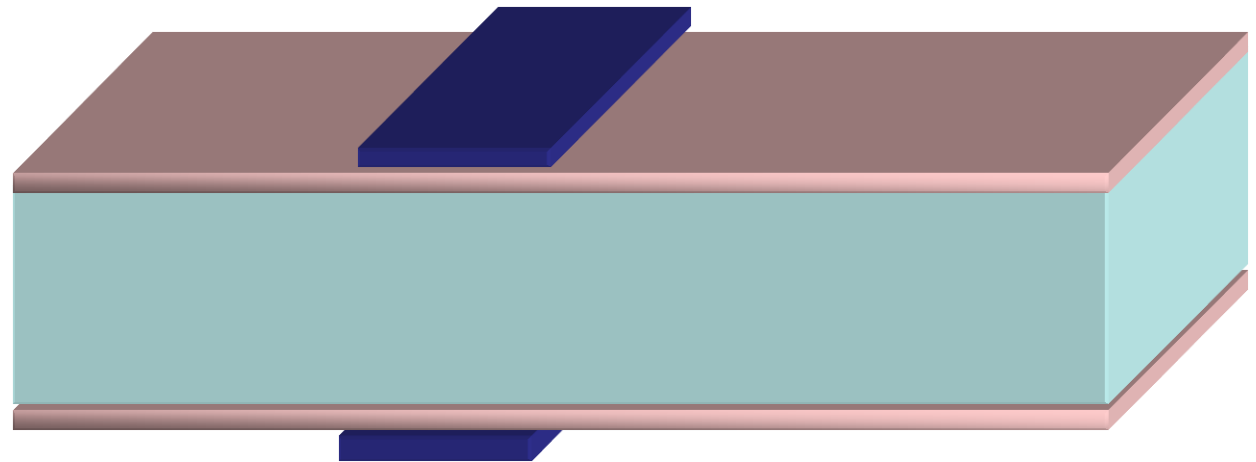
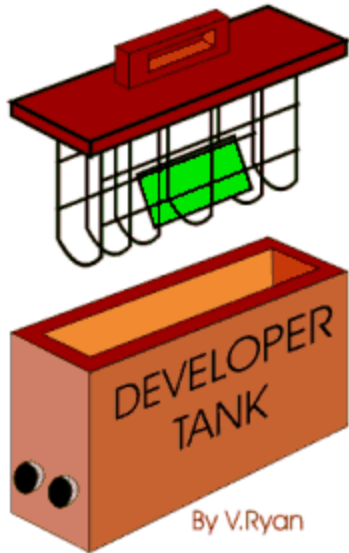
**Apply Photo-Resist
38 μm -ve working Dry Film**



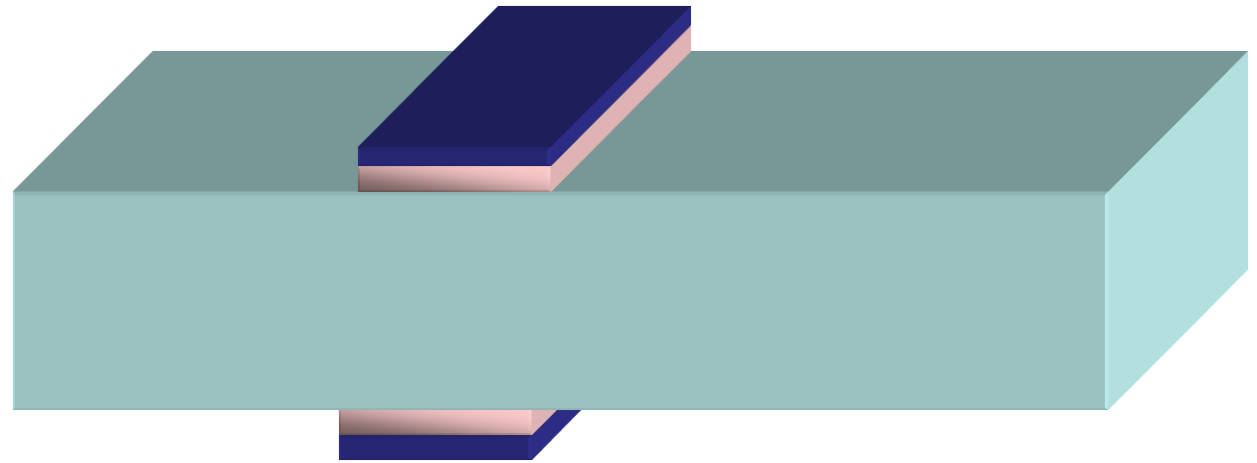
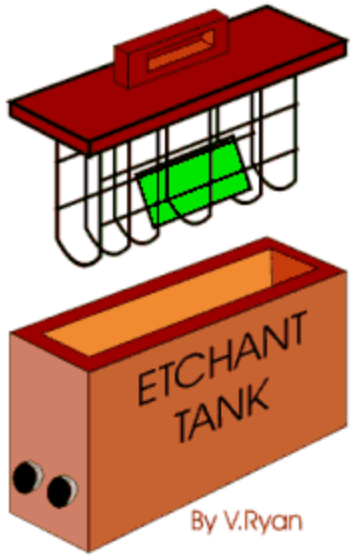
Register Art Work Tools



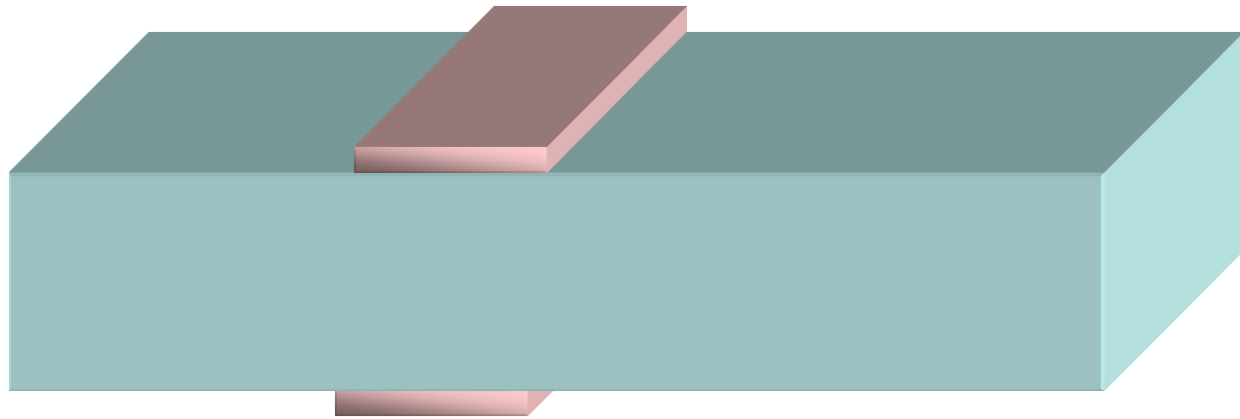
Exposure Ultra -Violet Light



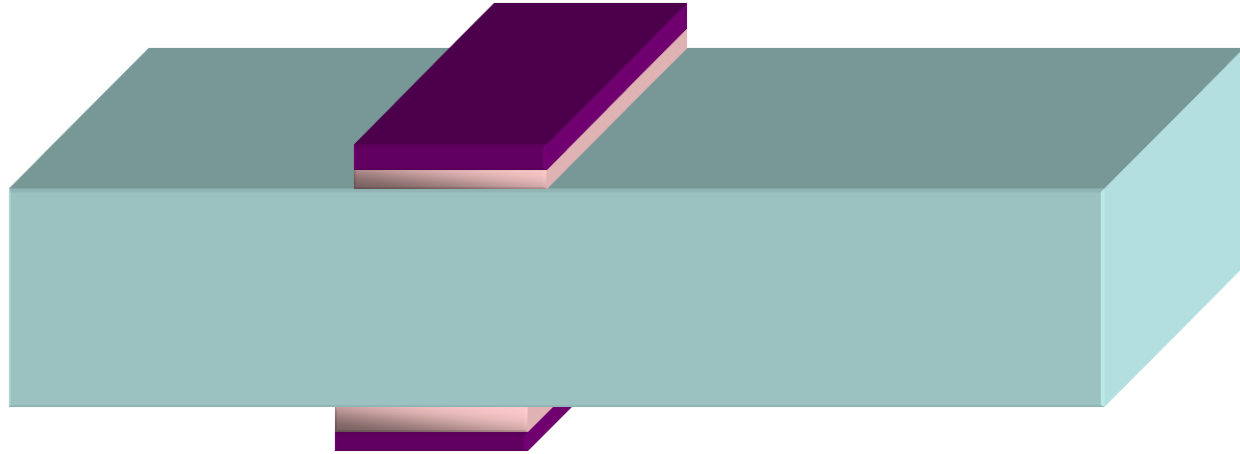
Developing
0.7 % Na OH / 40 °C



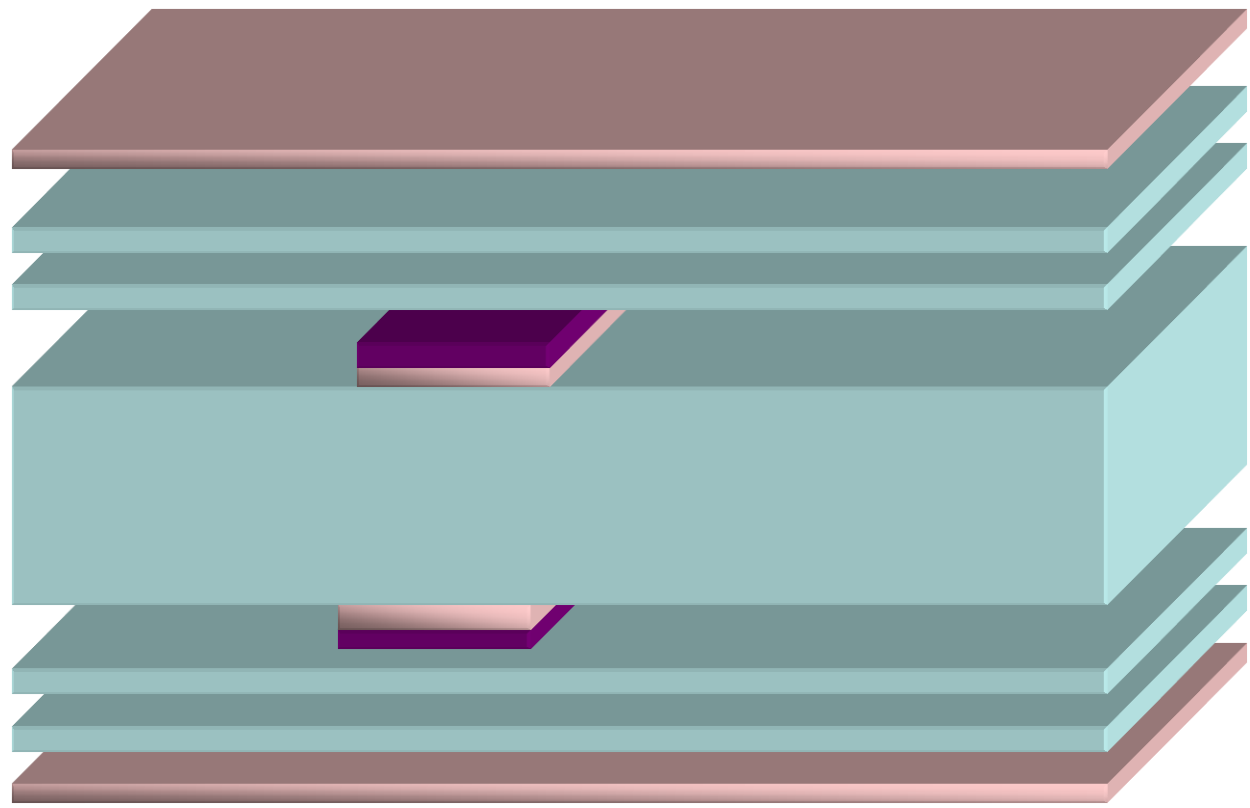
Etching



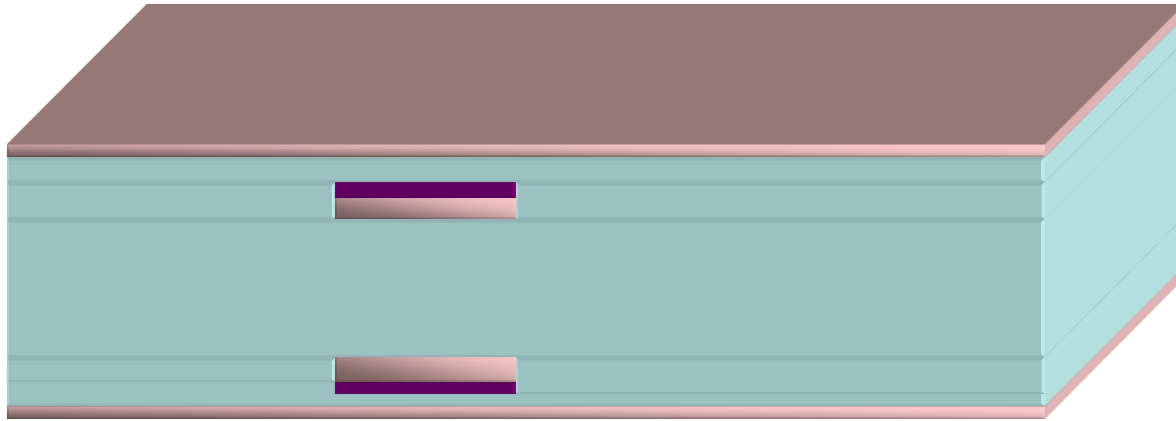
Strip Photo-Resist



Phosphate Oxide Application



Lay up And Registration

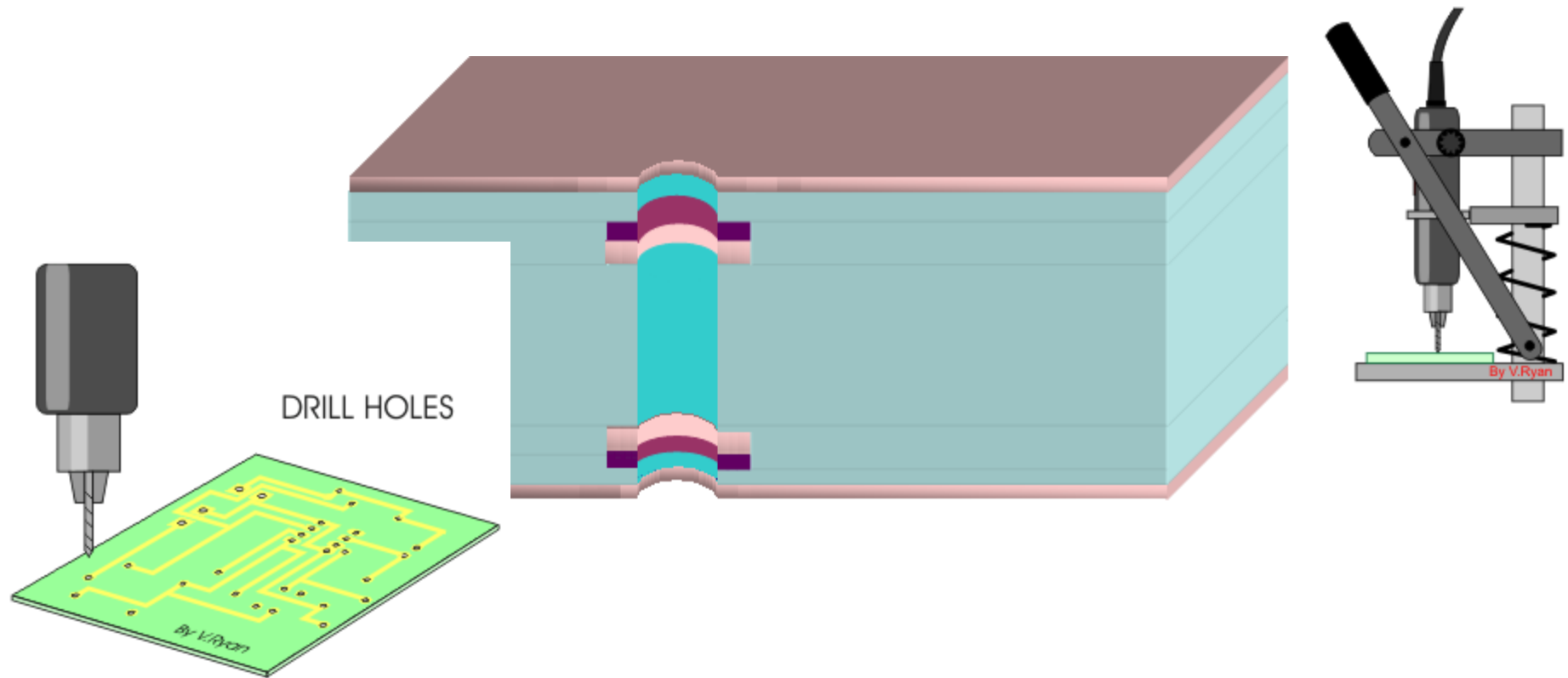


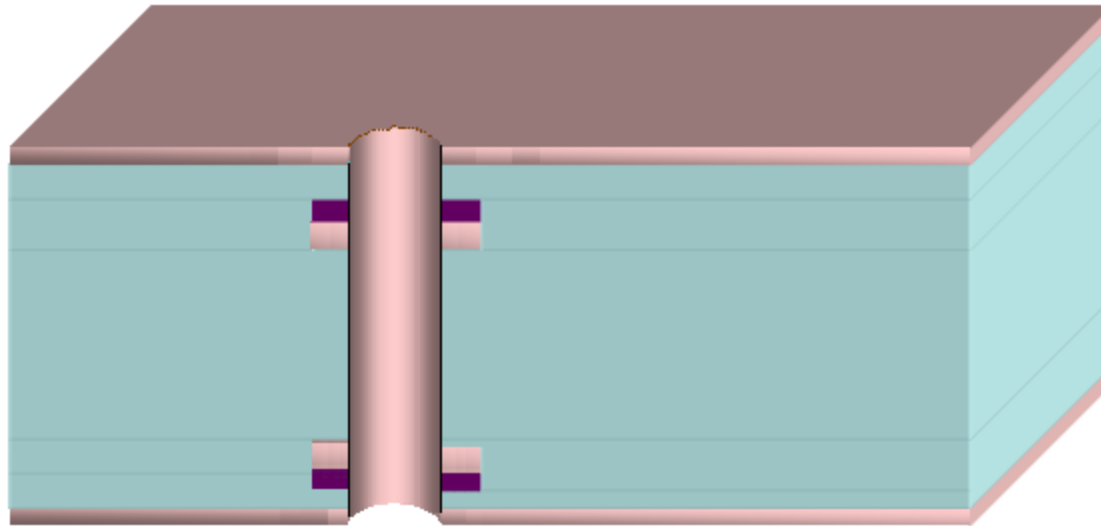
Press

90 minutes 175°C 400 psi

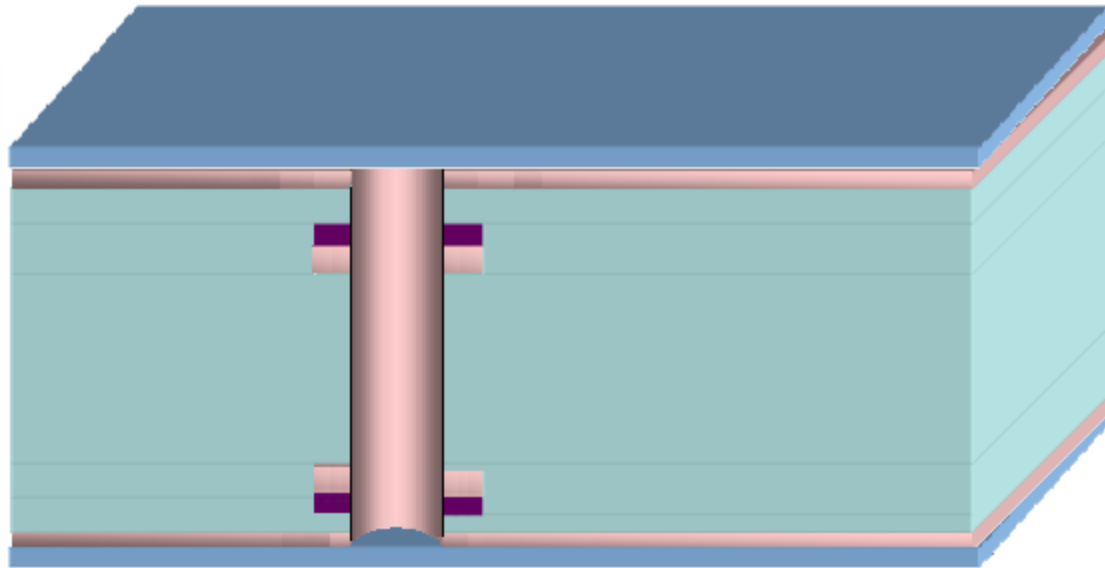
1.6 mm Copper Clad Laminate

Drilling

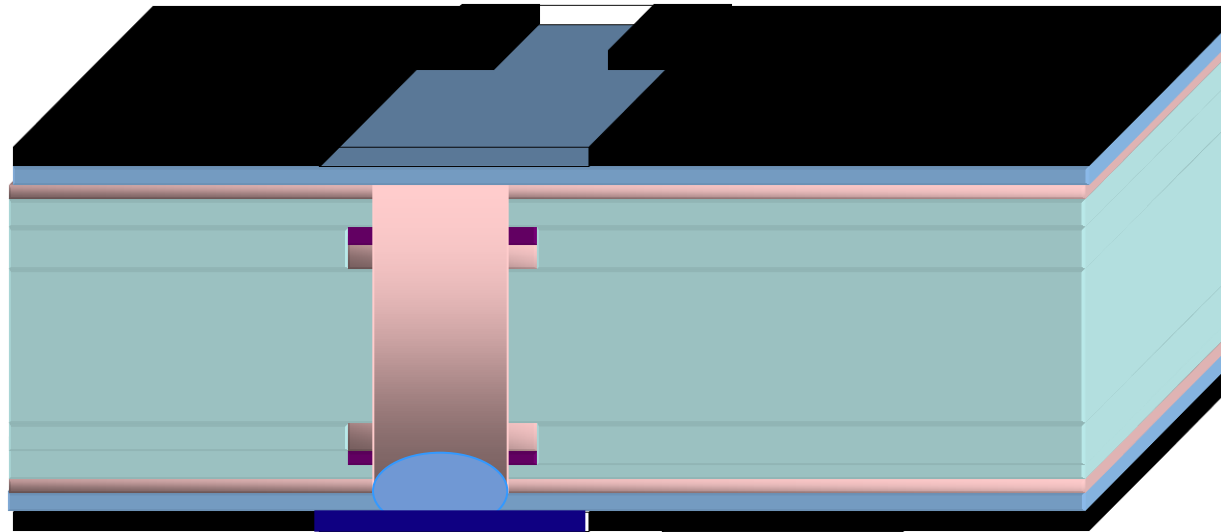




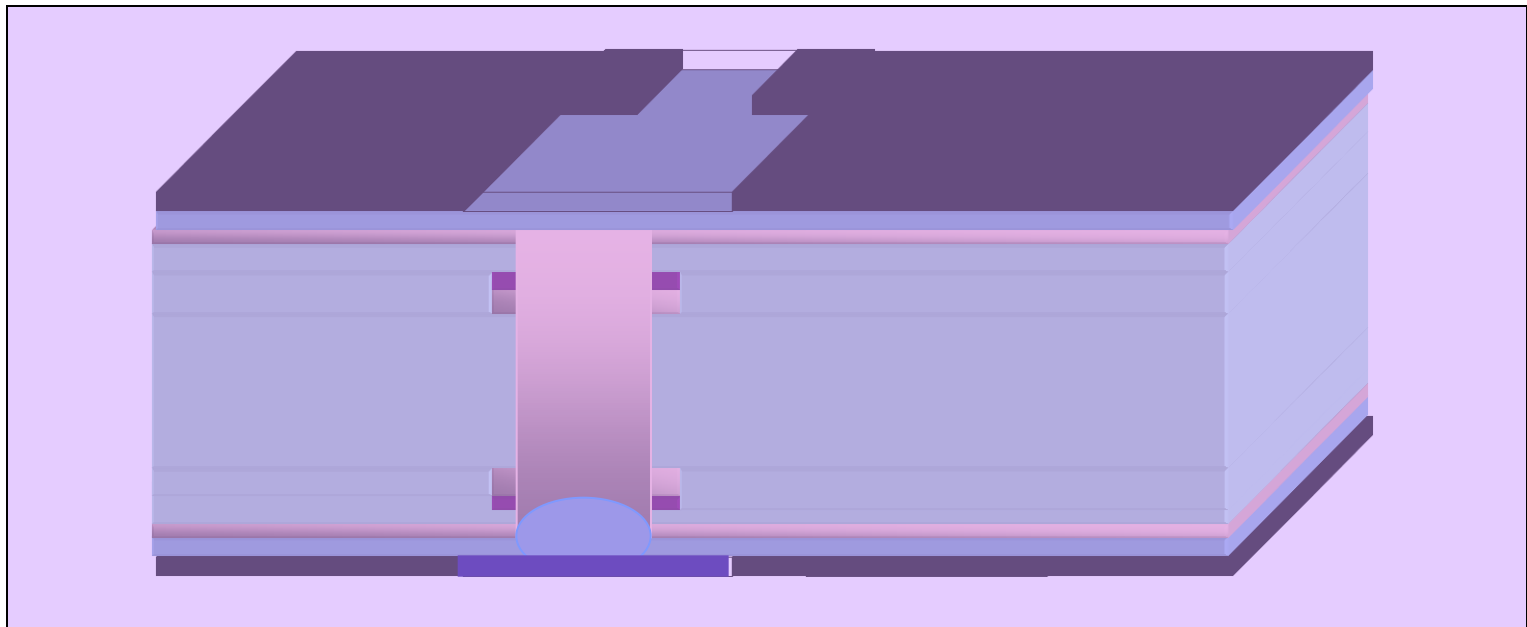
Panel Plating (Direct metalization)



Apply Photo-Resist

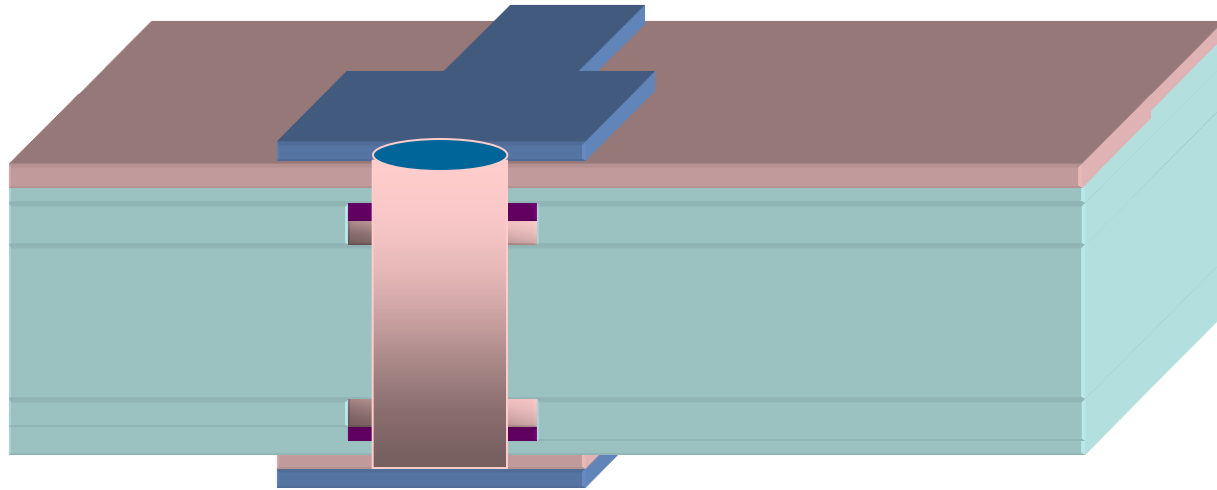


Register Photo-Tools

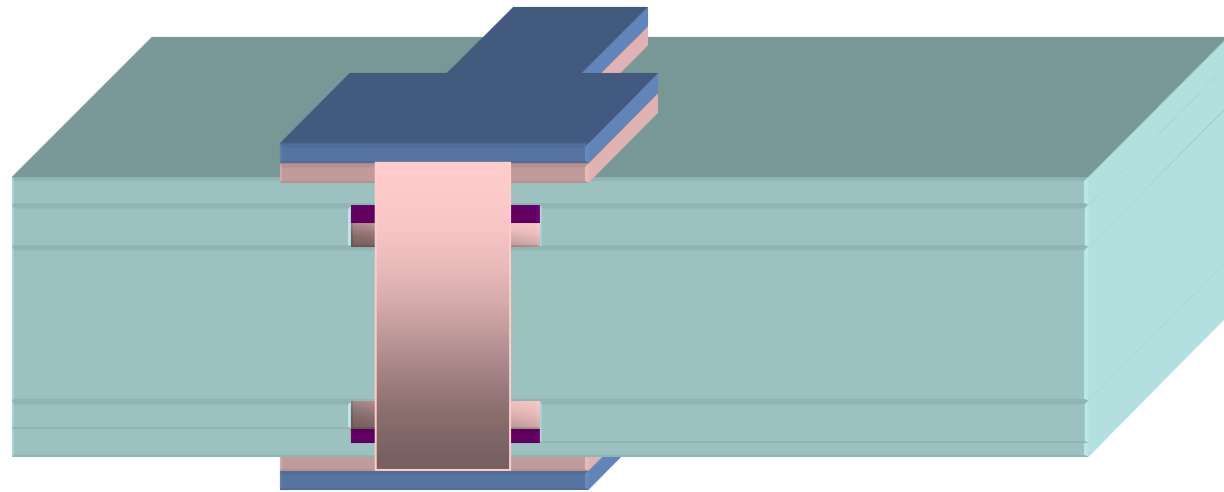


Exposure

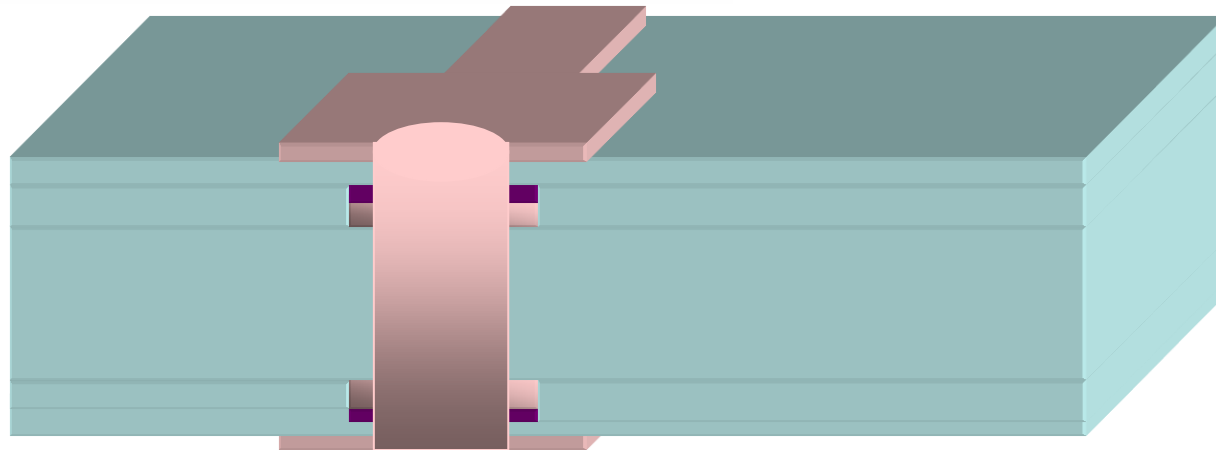
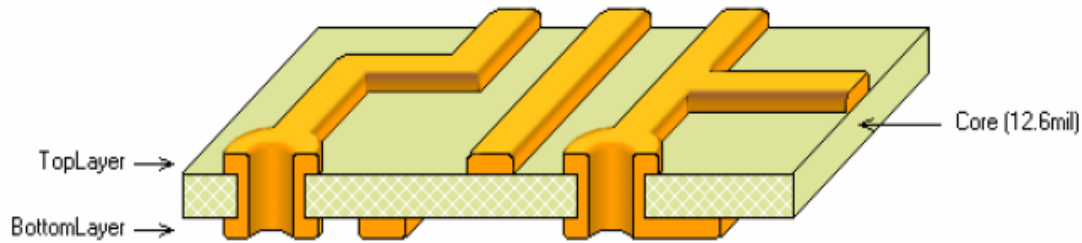




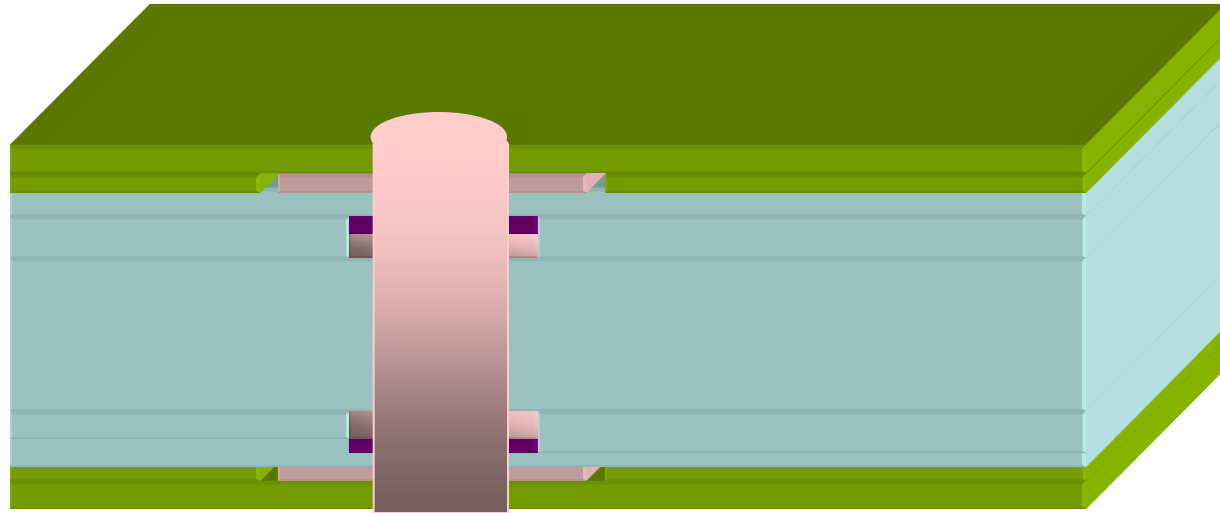
Devloping



Etching



Strip Photo-Resist

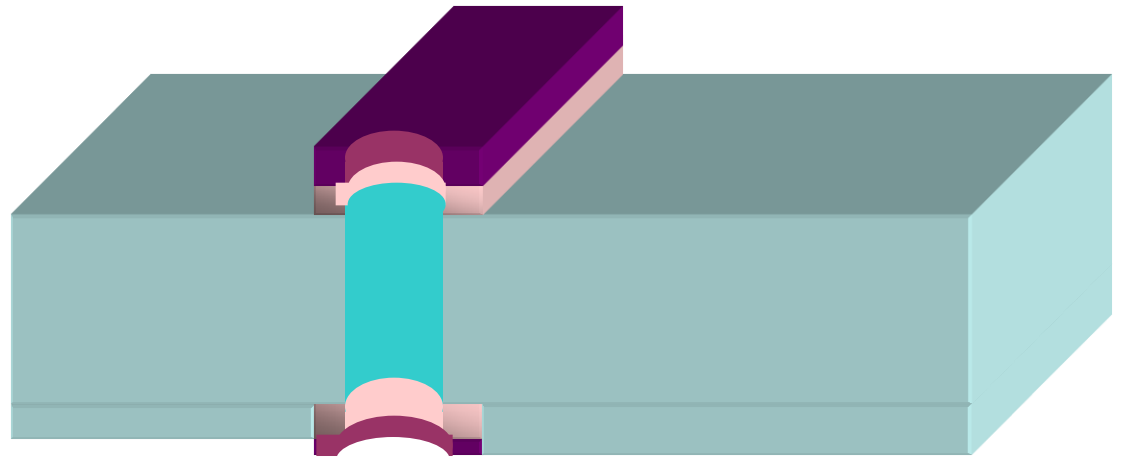
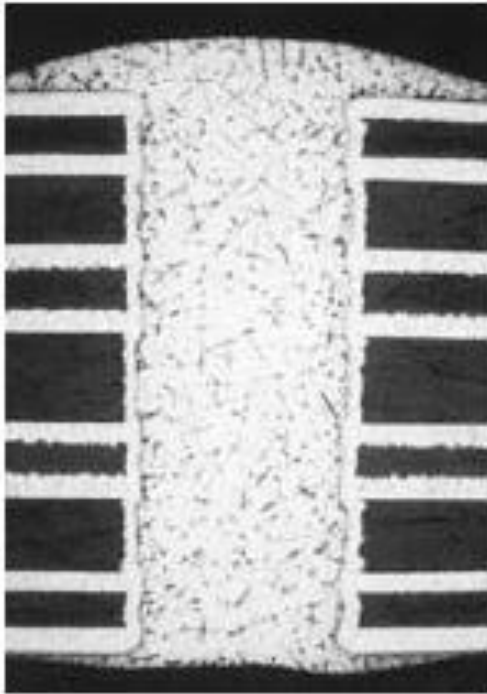


Solder Mask Printing

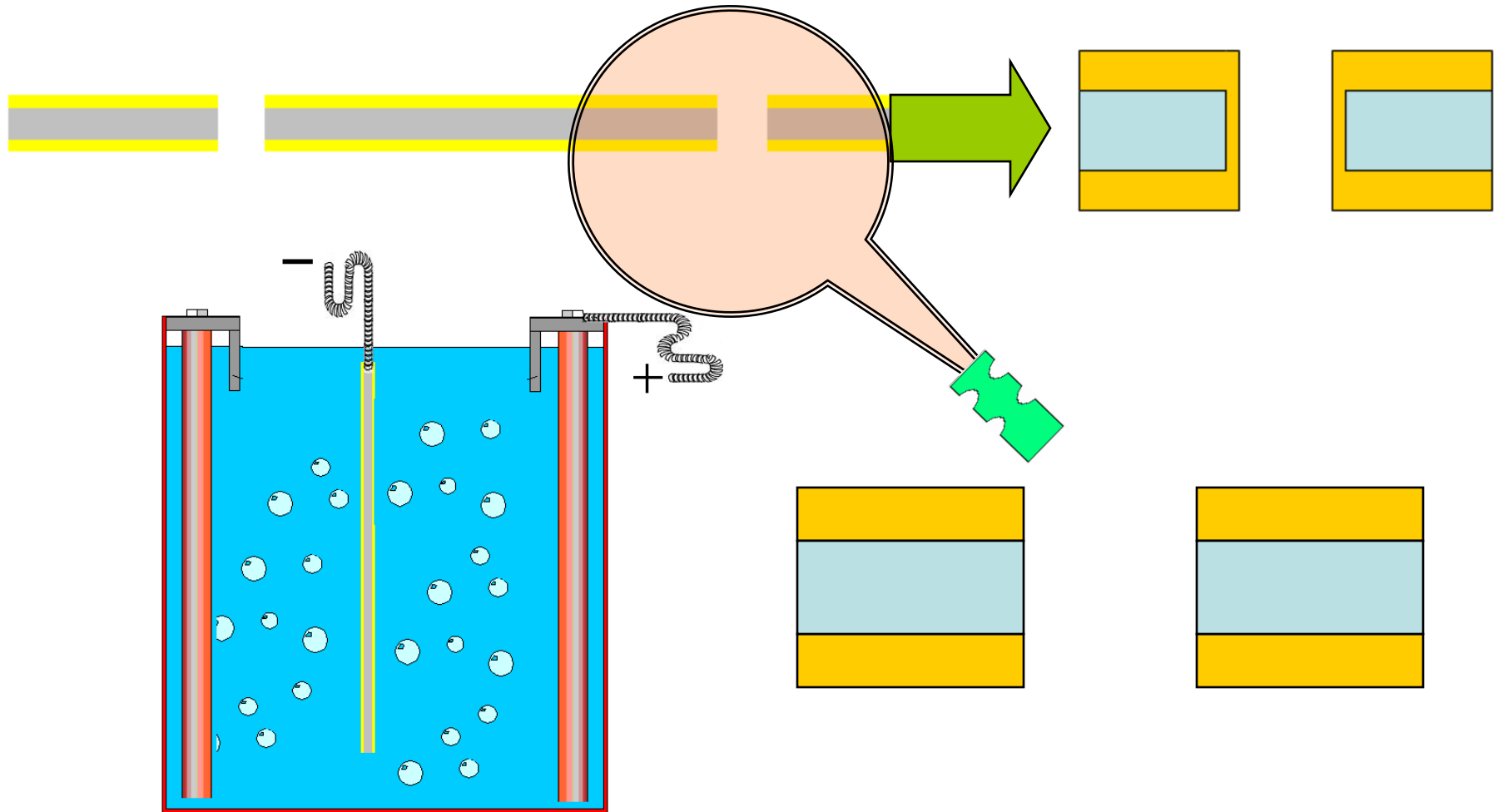
The image features a magnifying glass with a silver handle and rim, positioned in the lower-left quadrant. The lens is focused on a grid of binary code (0s and 1s) that recedes into the distance. The background is a grid of binary code, with a color gradient from red on the left to blue on the right. The text "Track Transformation" is centered in the middle of the image in a green, sans-serif font.

Track Transformation

Conventional process



The problem



Direct metallization technology (DMT).



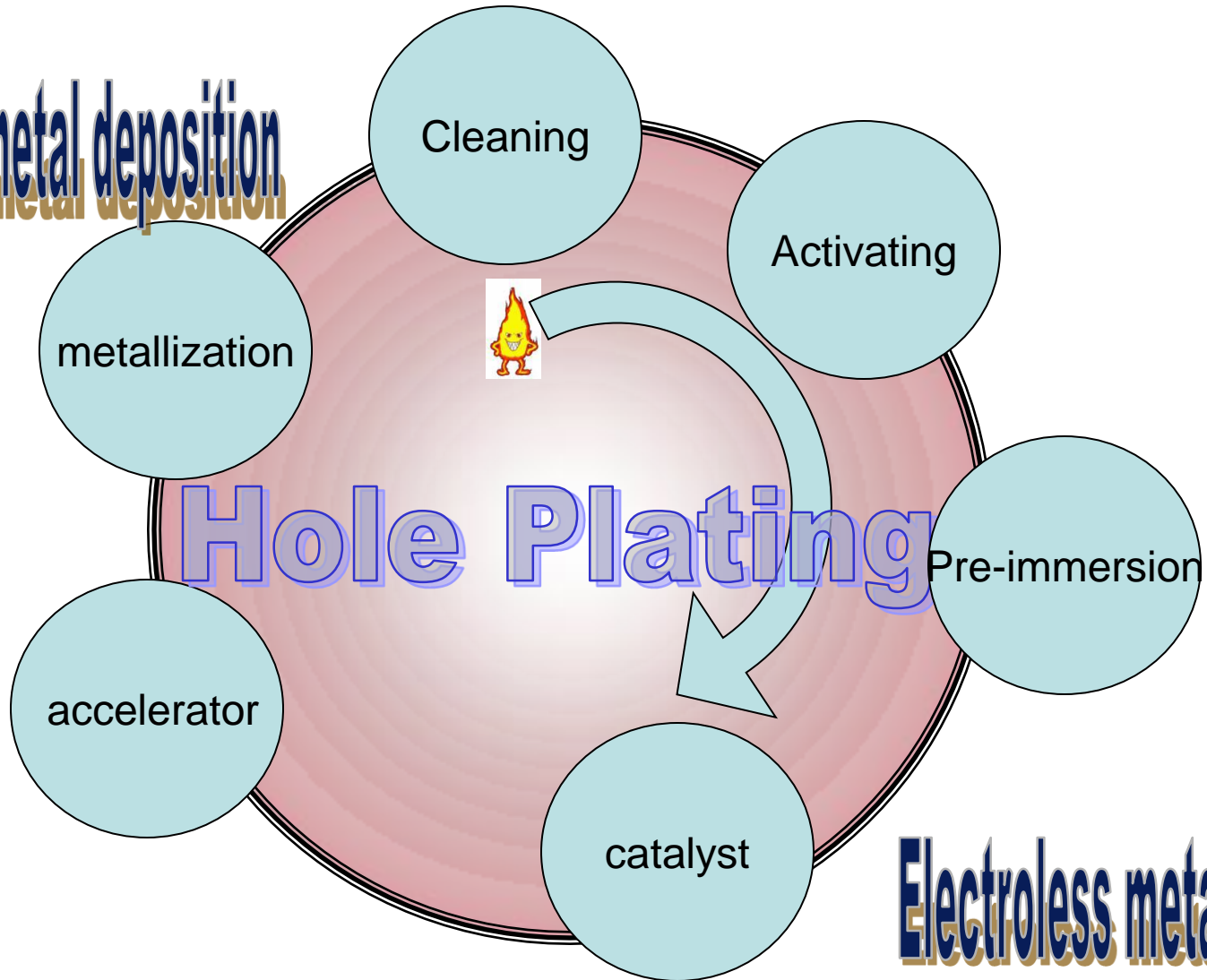
1. Cleaning/conditioning
2. Rinsing
3. Activating/initial etching
4. Rinsing
5. Pre-immersion solution
6. Application of the catalyst
7. Rinsing
8. Addition of an accelerator
9. Rinsing
10. Galvanic metallization
11. Rinsing
12. Drying.



Plating Gear



Galvanic metal deposition



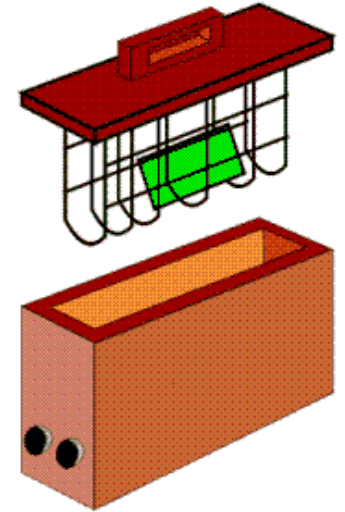
Electroless metallization

Rinsing



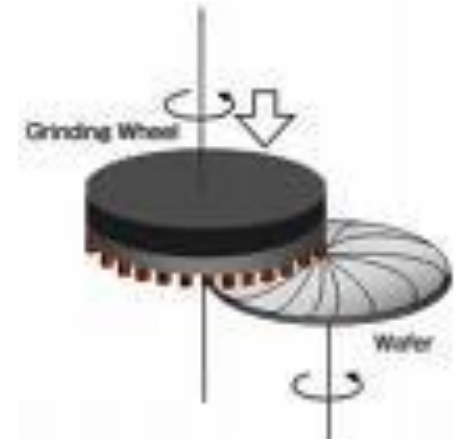
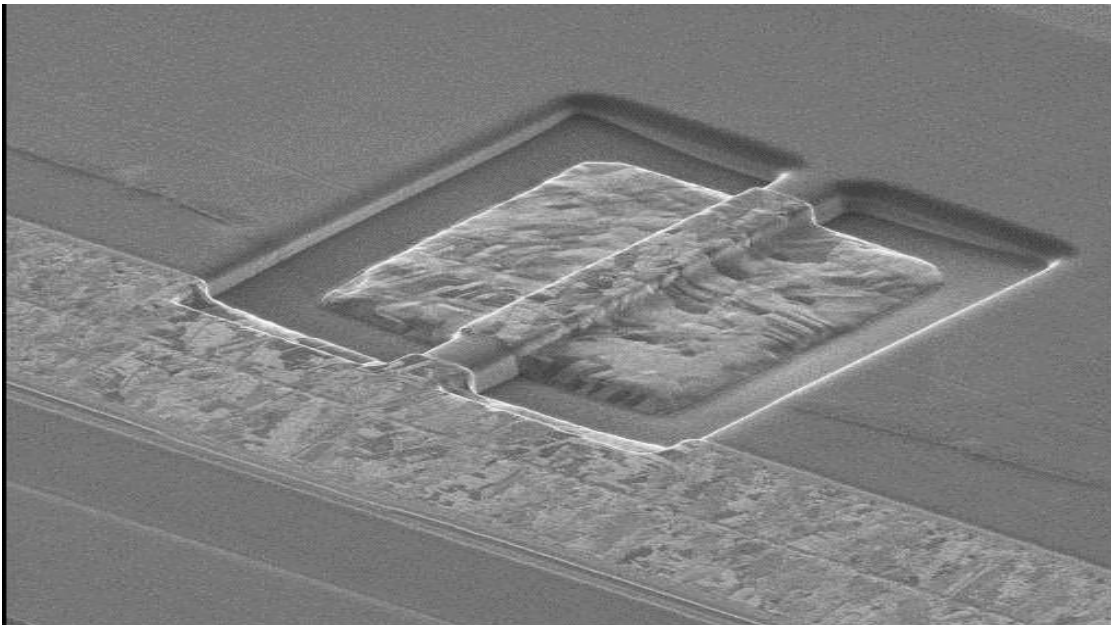
Rinsing the substrate to remove any

- Residual oxidizing solution
- Residual acid solution



Cleaning and initial etching

- The quality of the final product, is dependent on the methods of pre-treatment which precede catalysis



Catalyst and pre-immersion

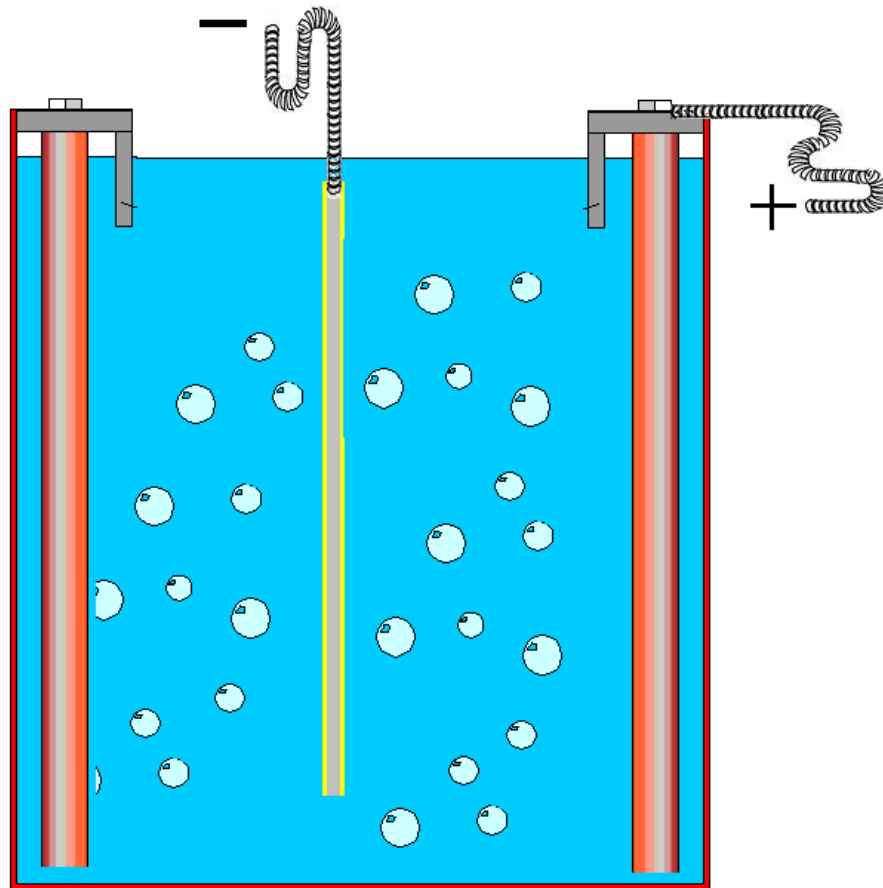


- **Catalysis solution consisting of a heterocyclic compound**

methanol, ethanol, n-propanol, isopropanol, higher alcohols, polyalcohols, DMF (dimethyl formamide), ketones, ..etc

- **Oxidative employ catalysis solution to deposit metals on non conductive materials**

Metallization



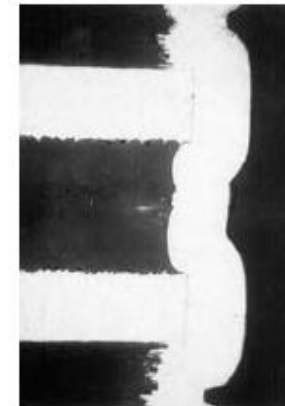
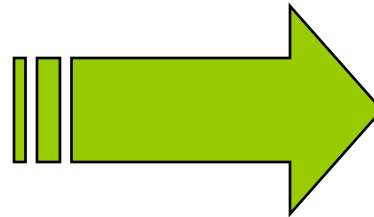
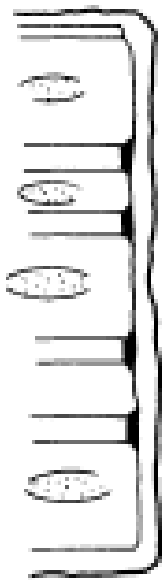
Smear Removal



Drill smear: the epoxy resin that coats the innerlayer copper surface



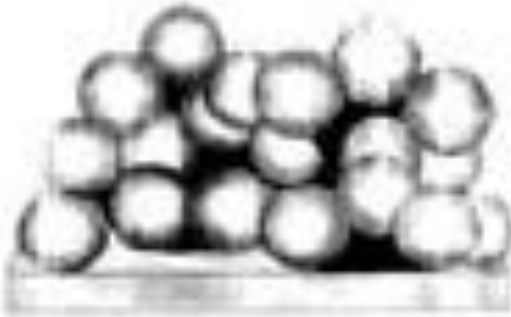
Heating during the drilling operation



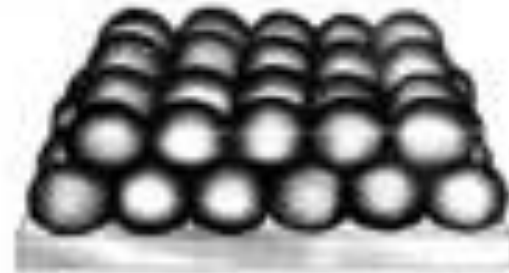
Carrier



Carriers are large-molecular-weight



>4 micron



1 micron



Uniform Plating

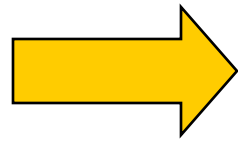


2 micron filter

Disadvantages



- Dependence of the nucleation density



defective spots

- The uncertainty in the stabilization of the systems



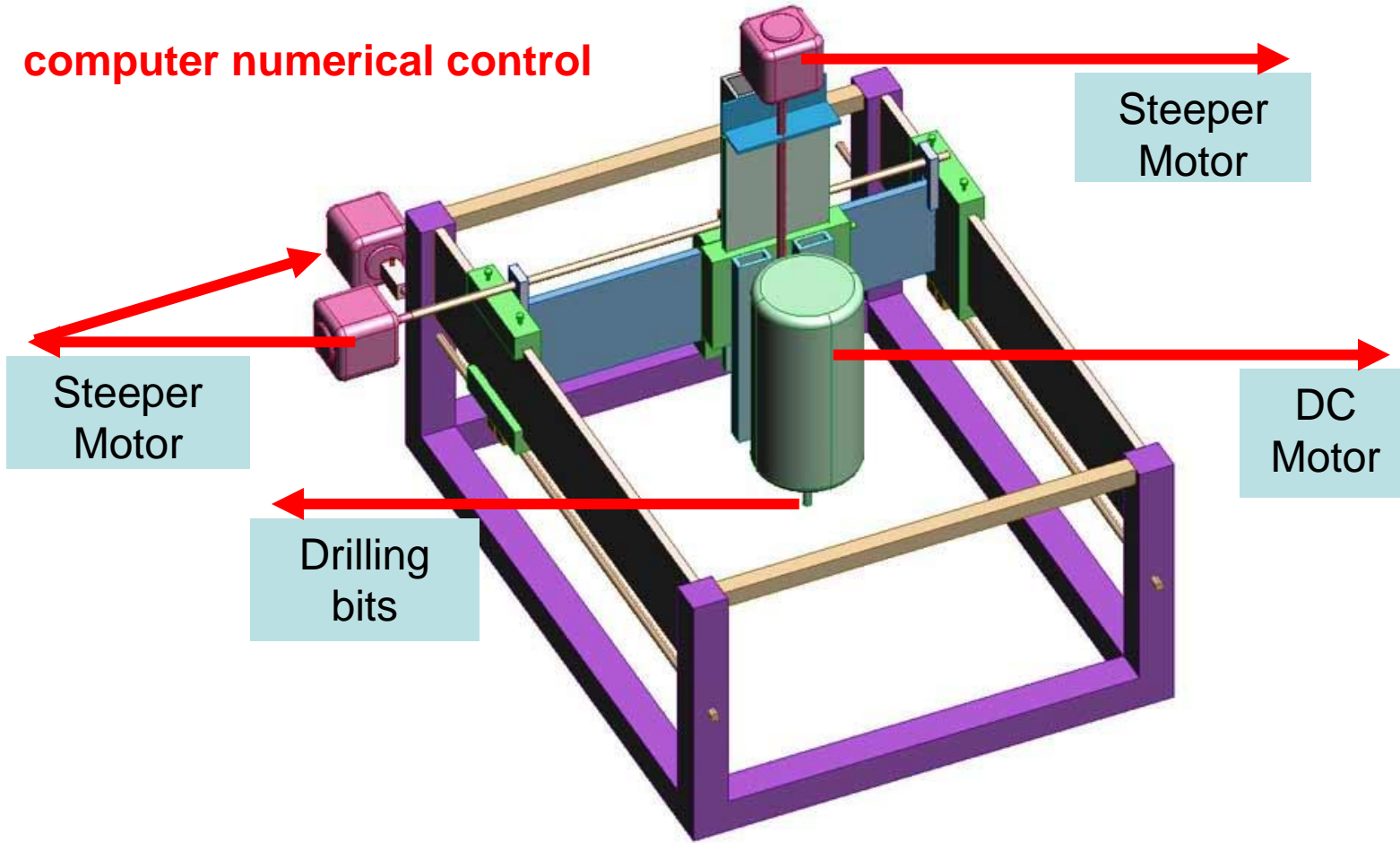
voids

- Noble metal-containing catalyst systems is the high price of the metals used (palladium)

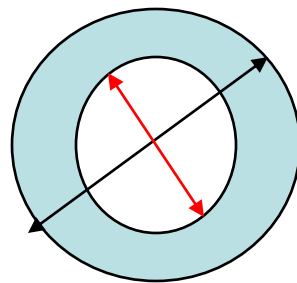
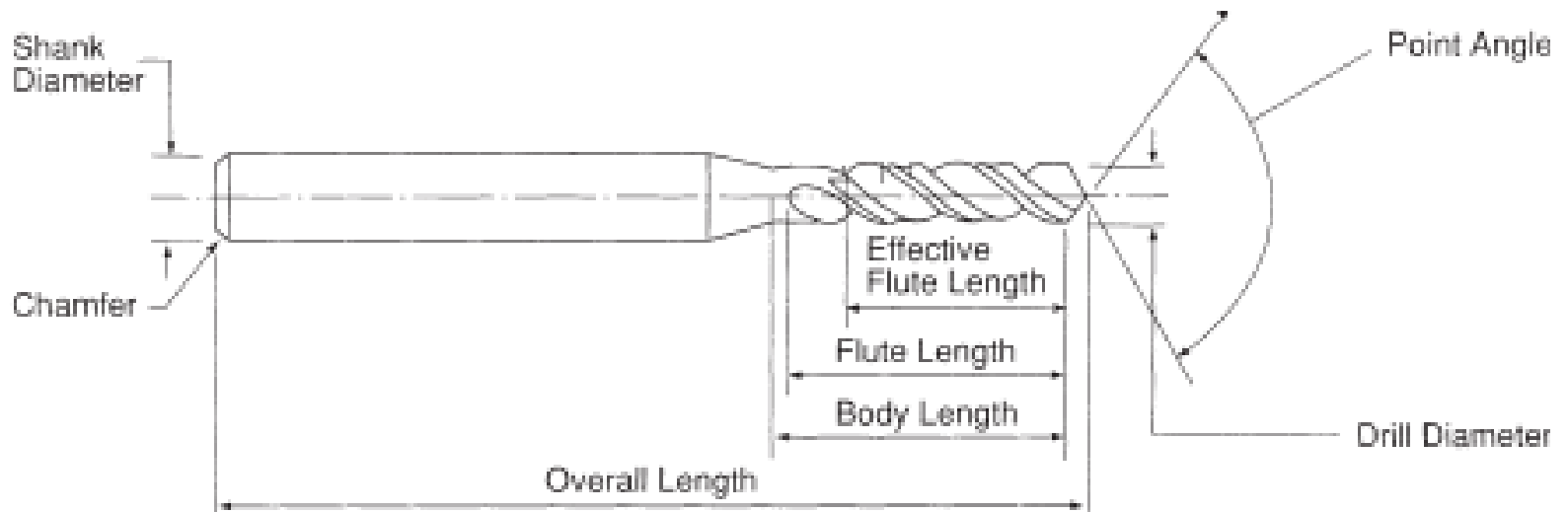
CNC machine



computer numerical control

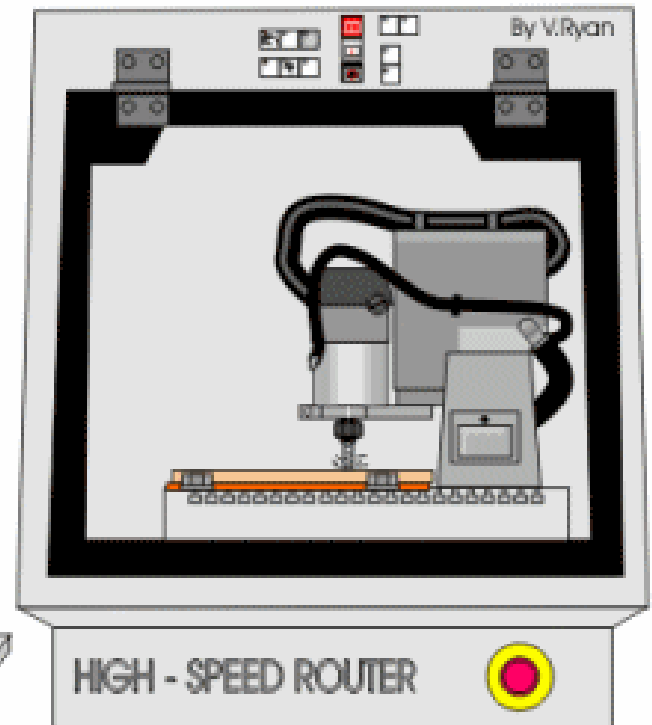
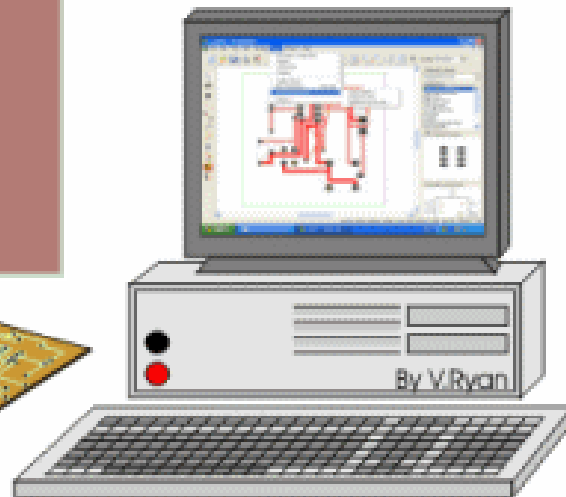
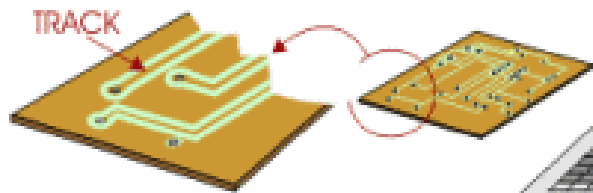
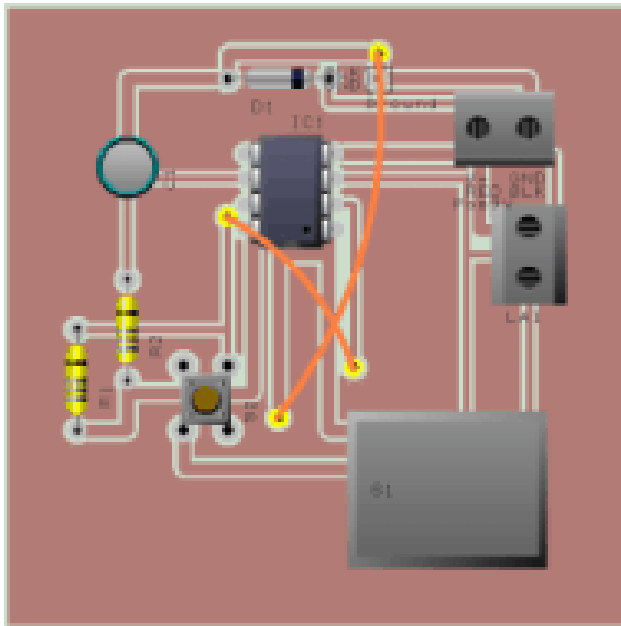


Drilling bits



$$D_{\text{inner}} = .65 D_{\text{outer}}$$

Isolation





Photoplot Artworks



Check and Align Artworks



CNC Drill



Dry Film Laminate



Through Hole Plate



Brush Clean



UV Exposure



Spray Develop



Spray Etch



Cut to size



Dry Panel



Resist Strip/Immerse Tin

The image features a magnifying glass with a silver handle and a clear lens. The lens is positioned over a grid of binary code (0s and 1s) that is slightly out of focus. The background is a gradient of blue and red, with a grid pattern overlaid. The text "PCB Assembly Processes" is centered in the image, overlaid on the magnifying glass and the binary code.

PCB Assembly Processes

PCB Assembly Process

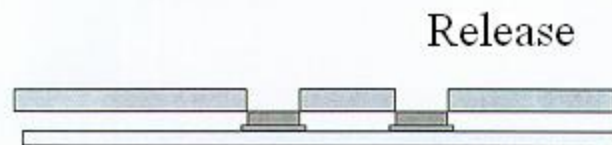
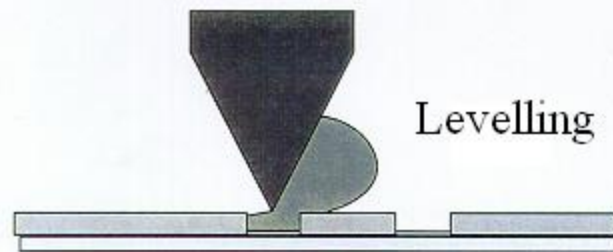
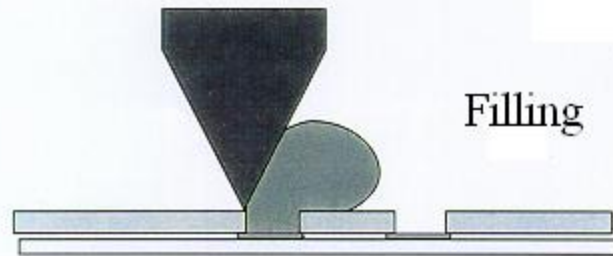
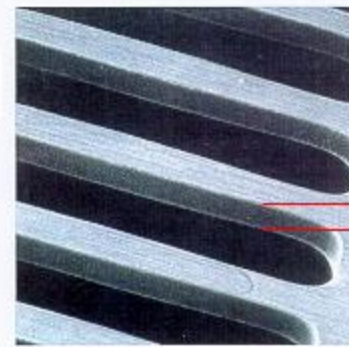
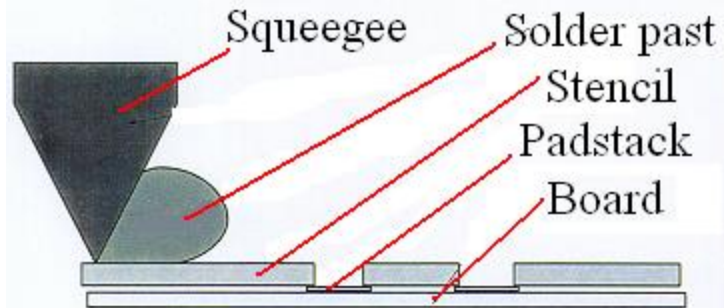


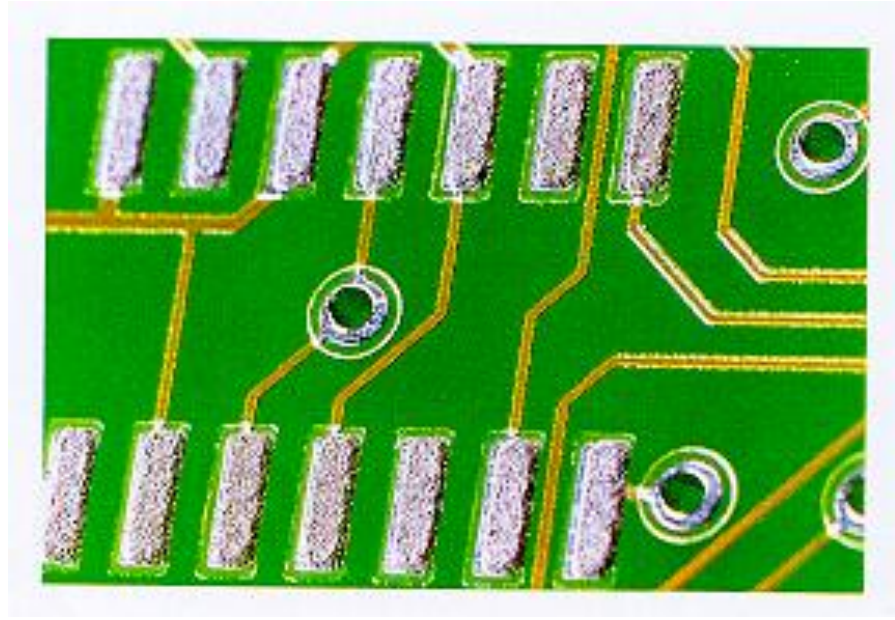
- SMT Soldering:-
 - Glue Dispensing Flow.
 - Wave Soldering Machine.
 - Solder Paste Flow.
- Through Hole Assembly:-
 - Sequencing.
 - Jumper Wire.
 - Axial.
 - Radial.



Solder Paste Printing Flow

Solder Paste Printing





After Printing

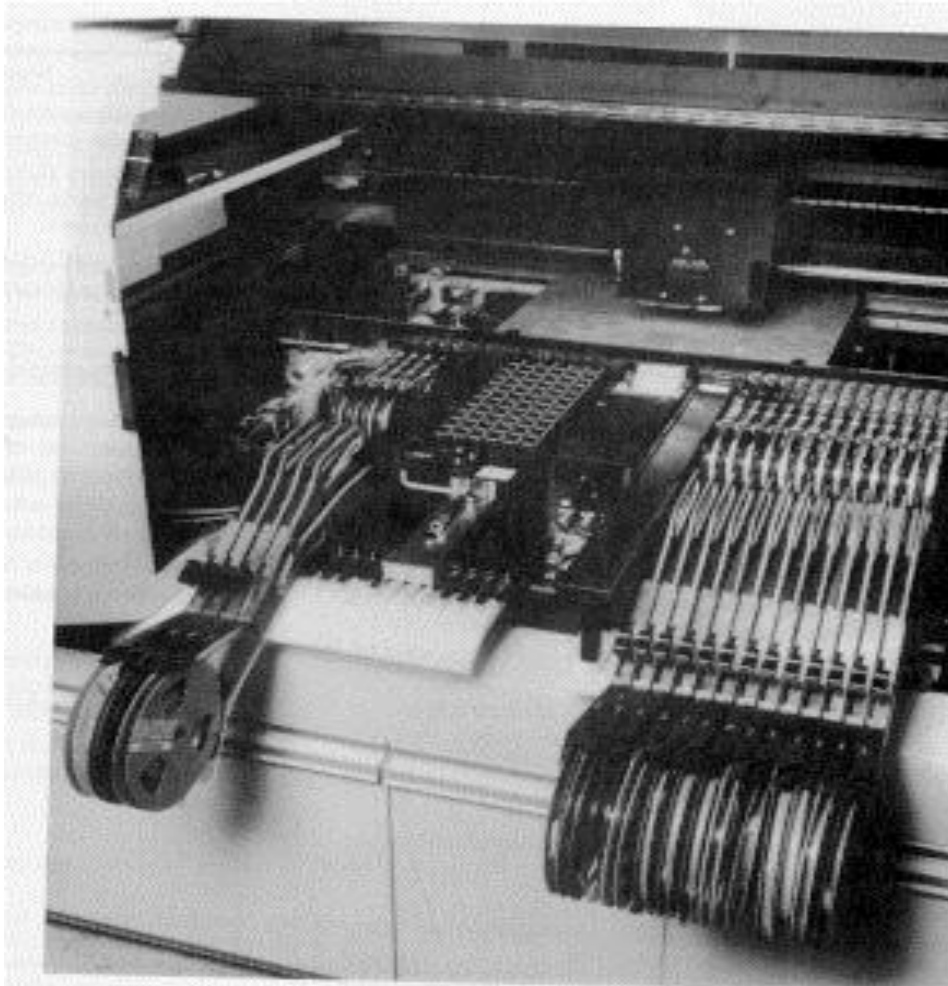
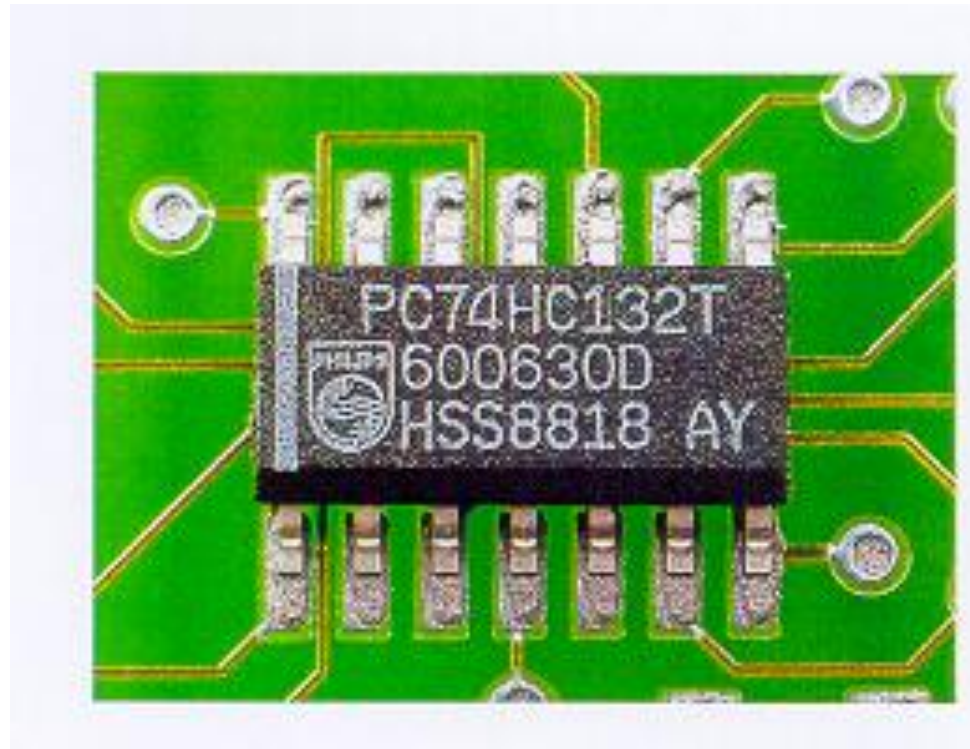


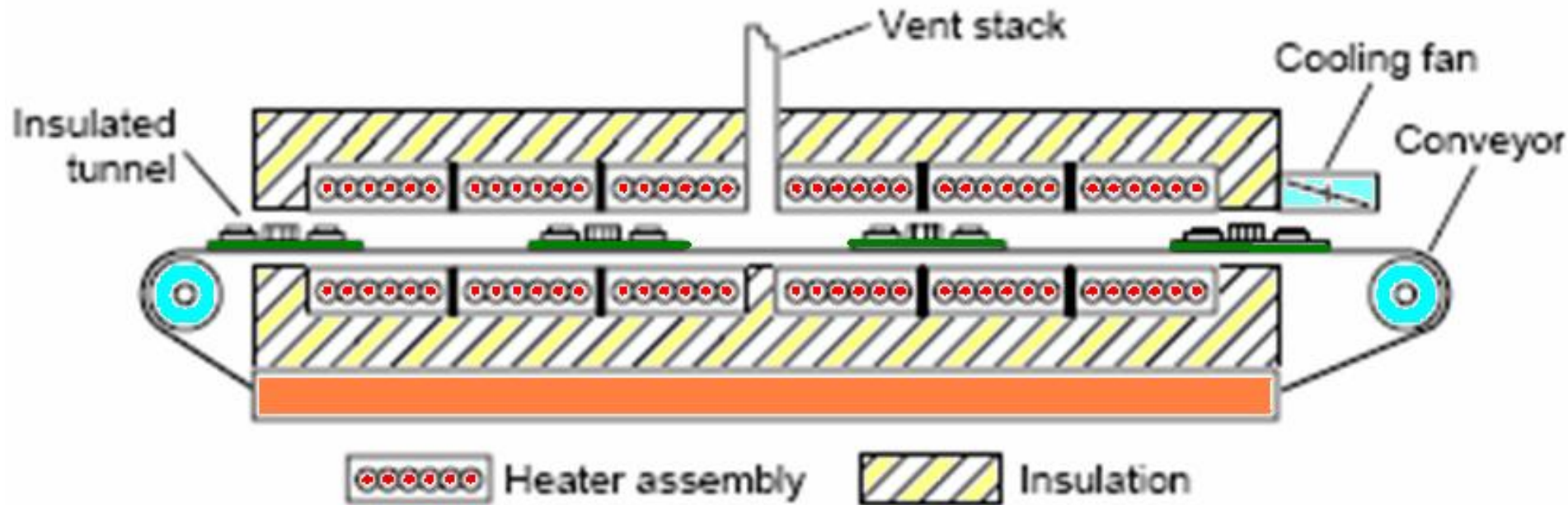
FIGURE 27.11 Flexible placement machine showing tape- and tray-fed components, a four-spindle placement head, an upward-locking vision camera, and a...

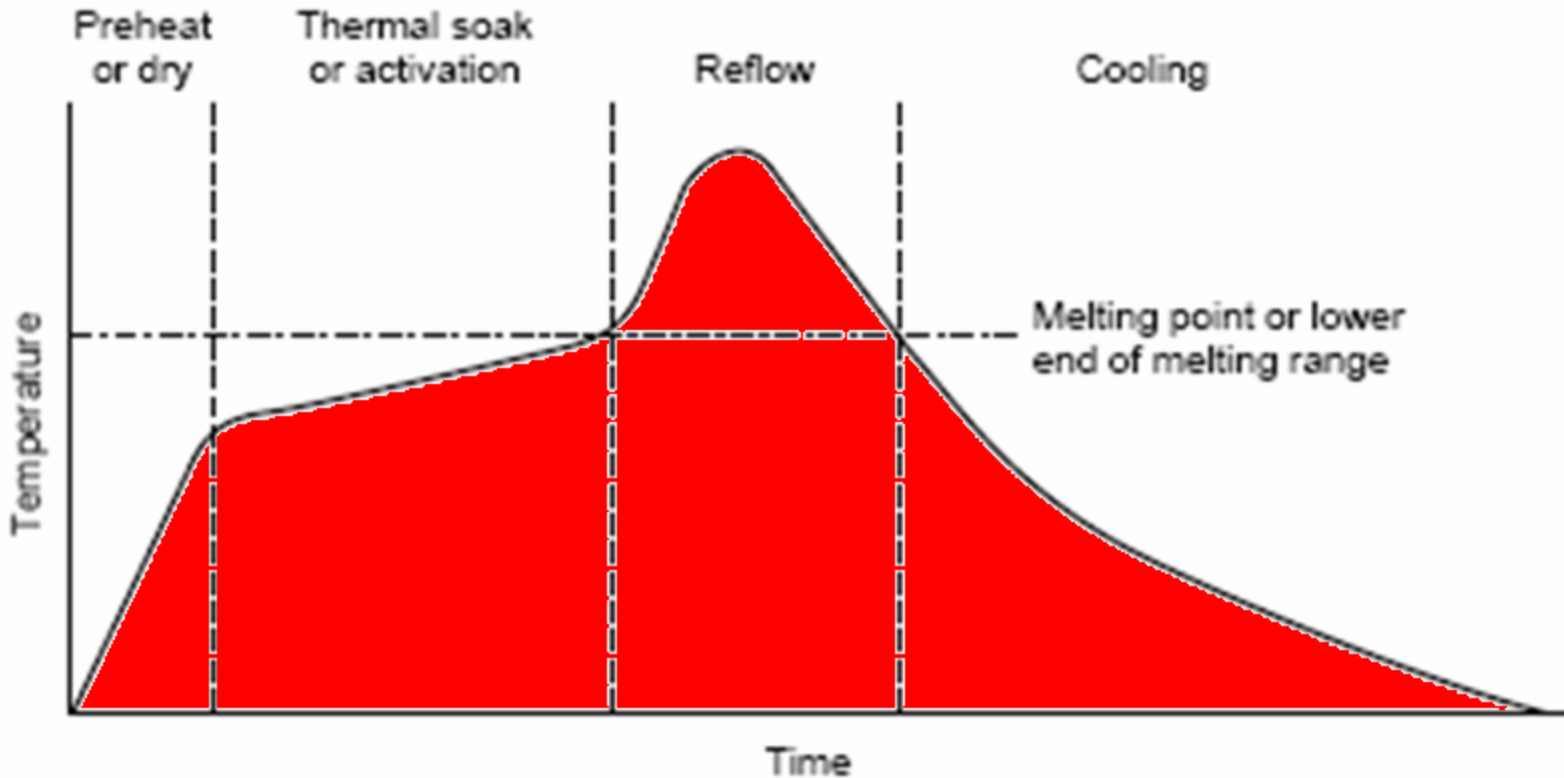
Tape/Tray Feeders



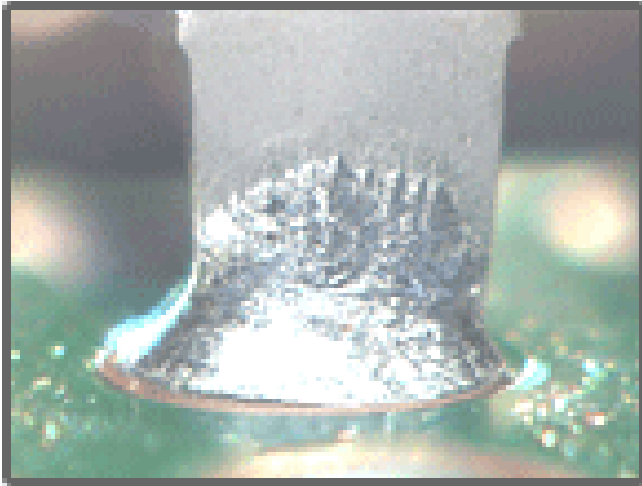
Pick & Place

Reflow Oven



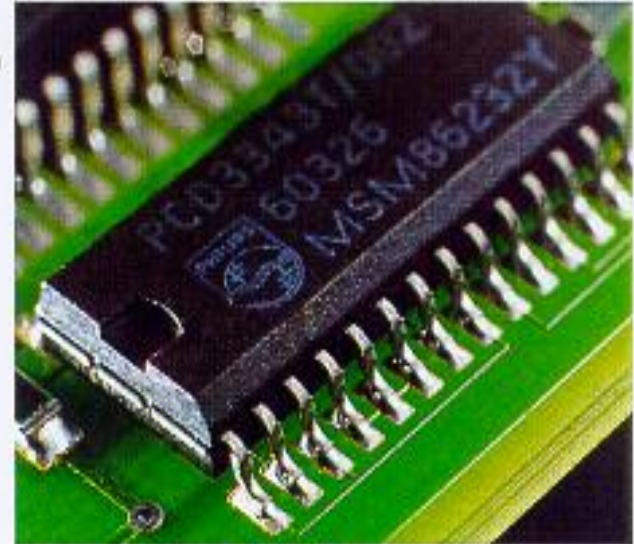


Thermal Profile in the Reflow Oven



PREFERRED

The height of the meniscus in the heel is at least equal to the thickness of the lead.



After Re-Flow Soldering

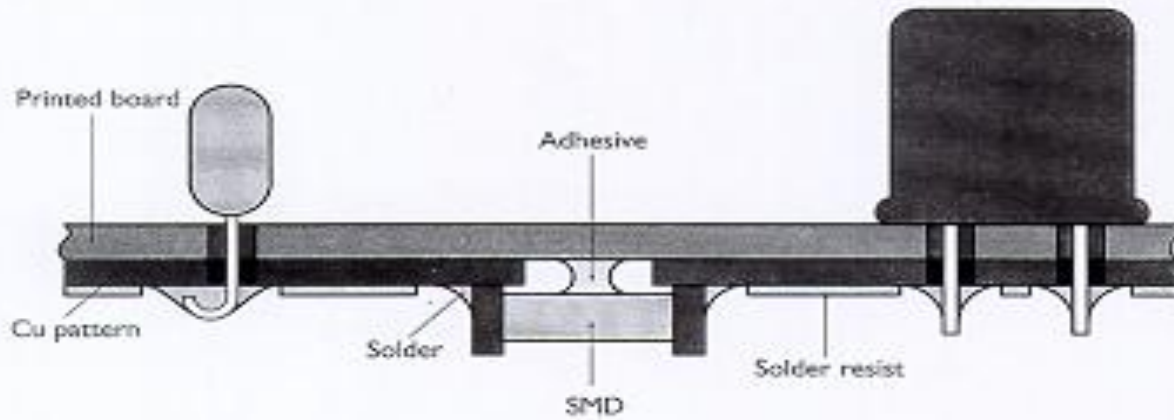


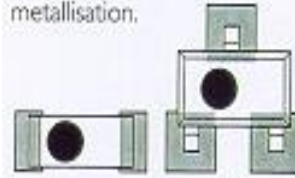
Figure 1 Assembly of mix print

Glue Dispensing Flow

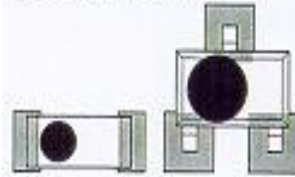
Glue Appearing under the component



metallisation.

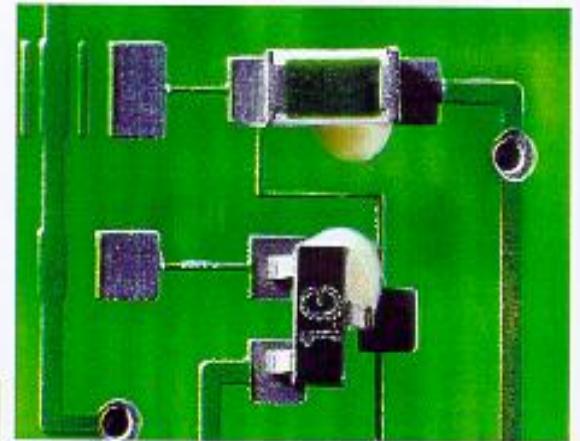
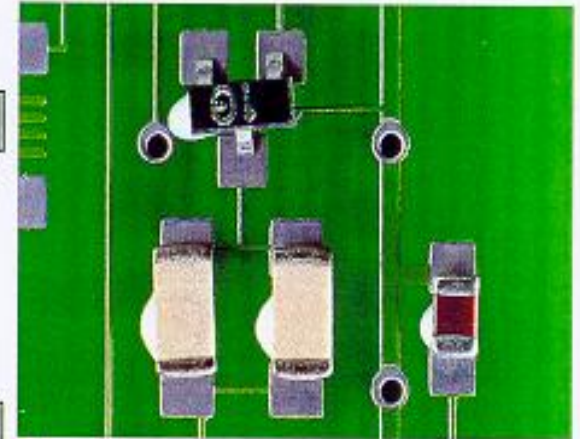
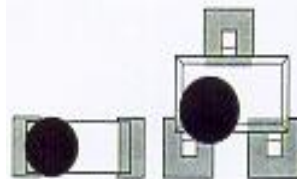


Adhesive dot touches solder land, but does not adversely affect soldered joint.



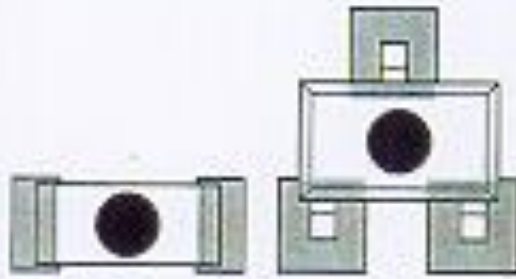
REWORK

Adhesive dot adversely affects soldered joint.



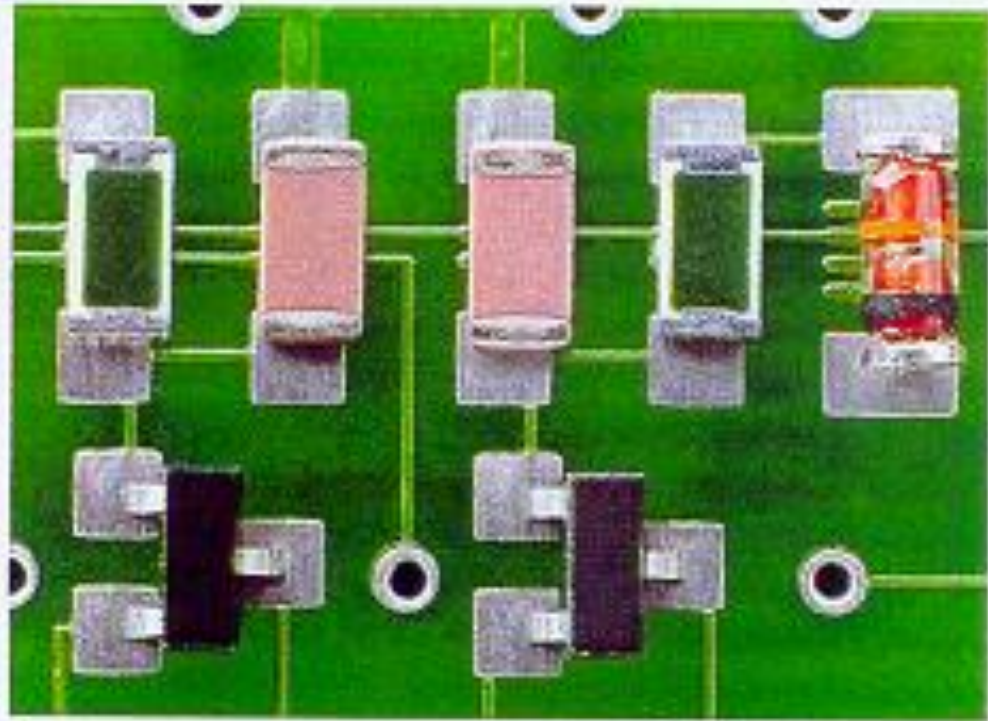


PREFERRED



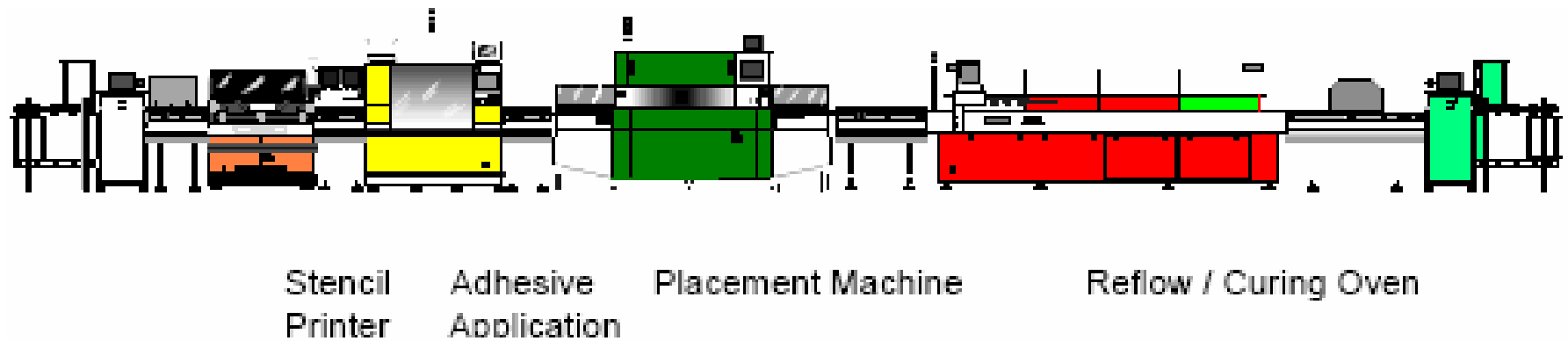
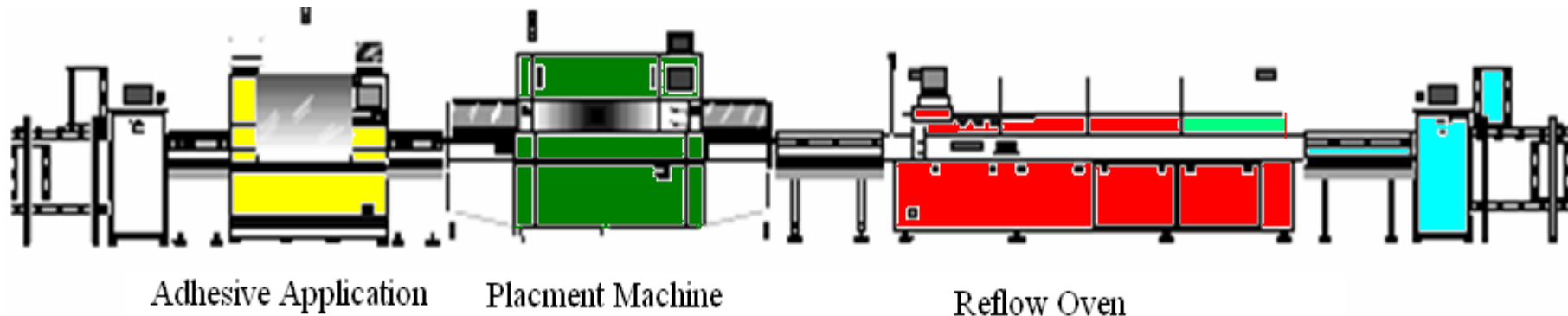
ACCEPTABLE

Eccentric placed adhesive dot.
Adhesive does not touch
solder land and/or component
metallisation.



Component Placement

SMT assembly line



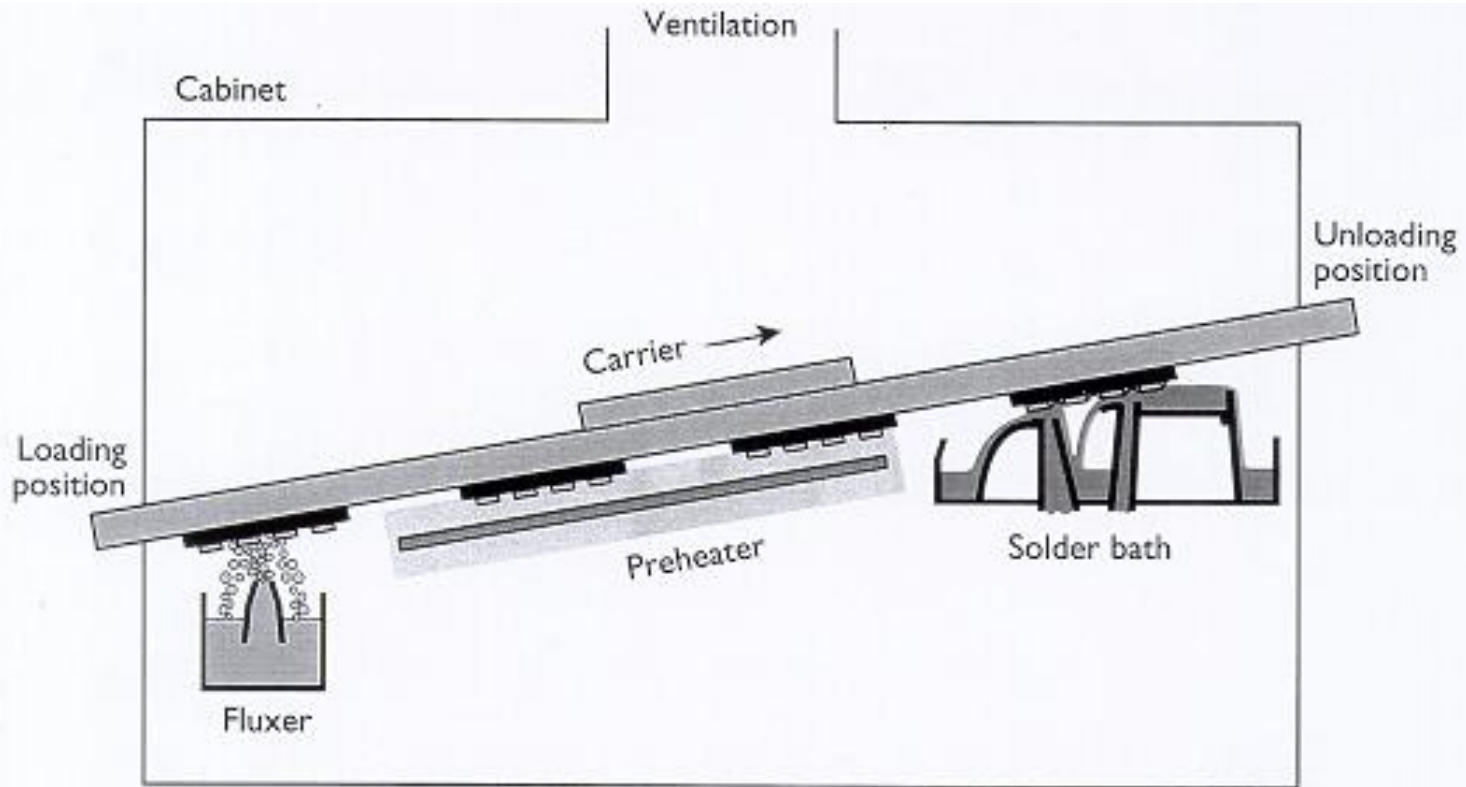


Figure 8 Basic of a wave soldering machine.

Wave soldering

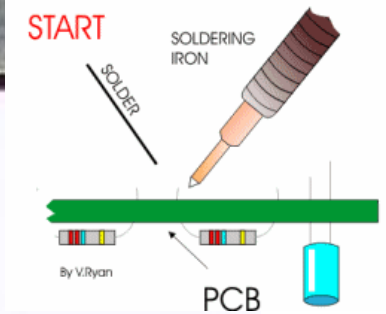
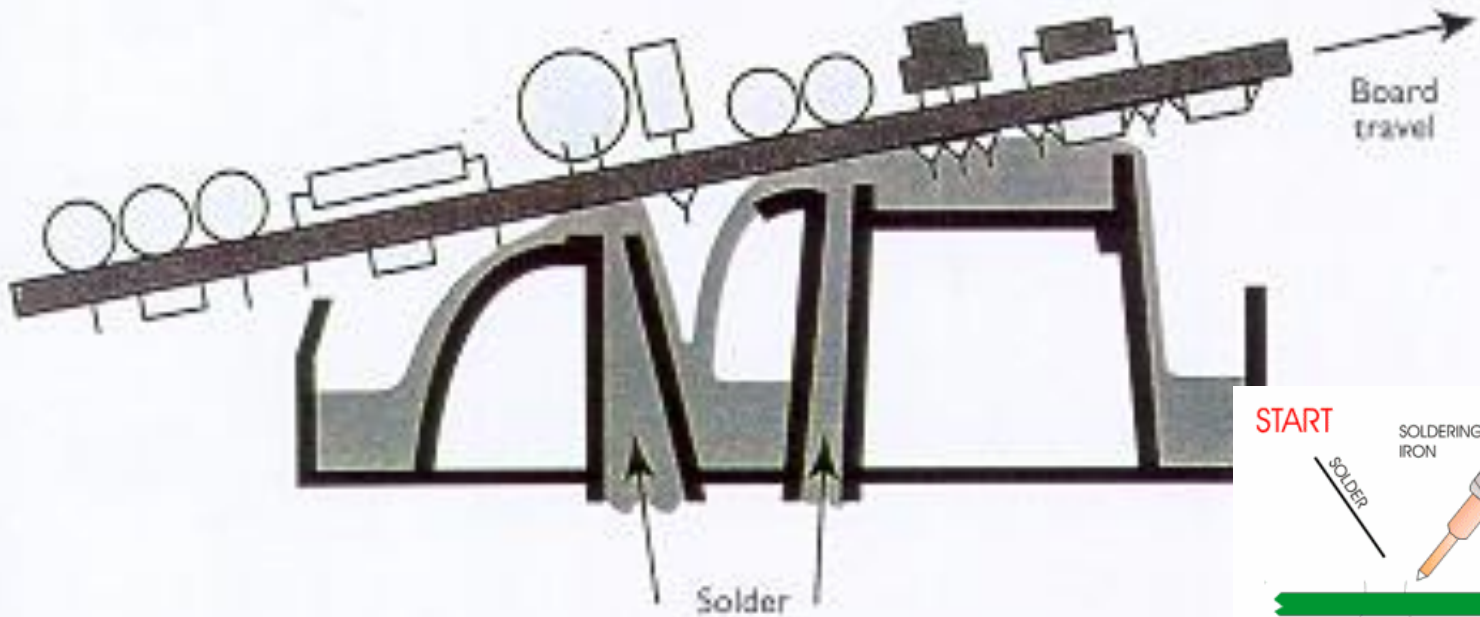


Figure 6 Double wave soldering principle.

Wave Soldering Machine



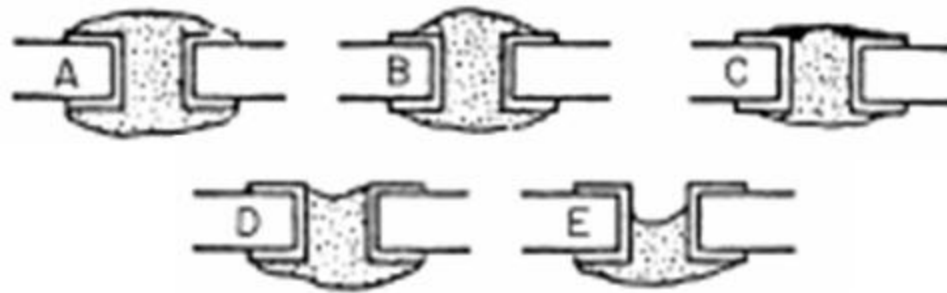
Figure 7 A double-wave soldering machine.

Double Wave

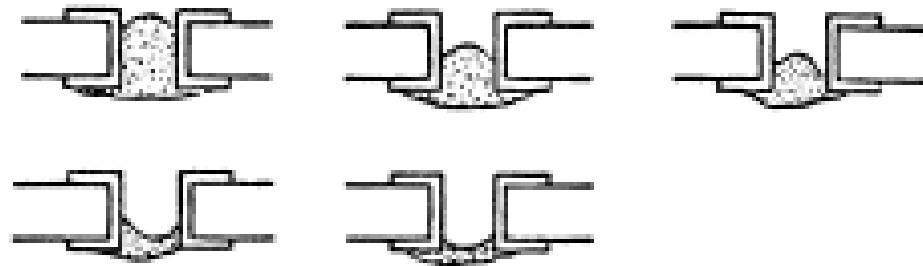
Soldering



Acceptable condition



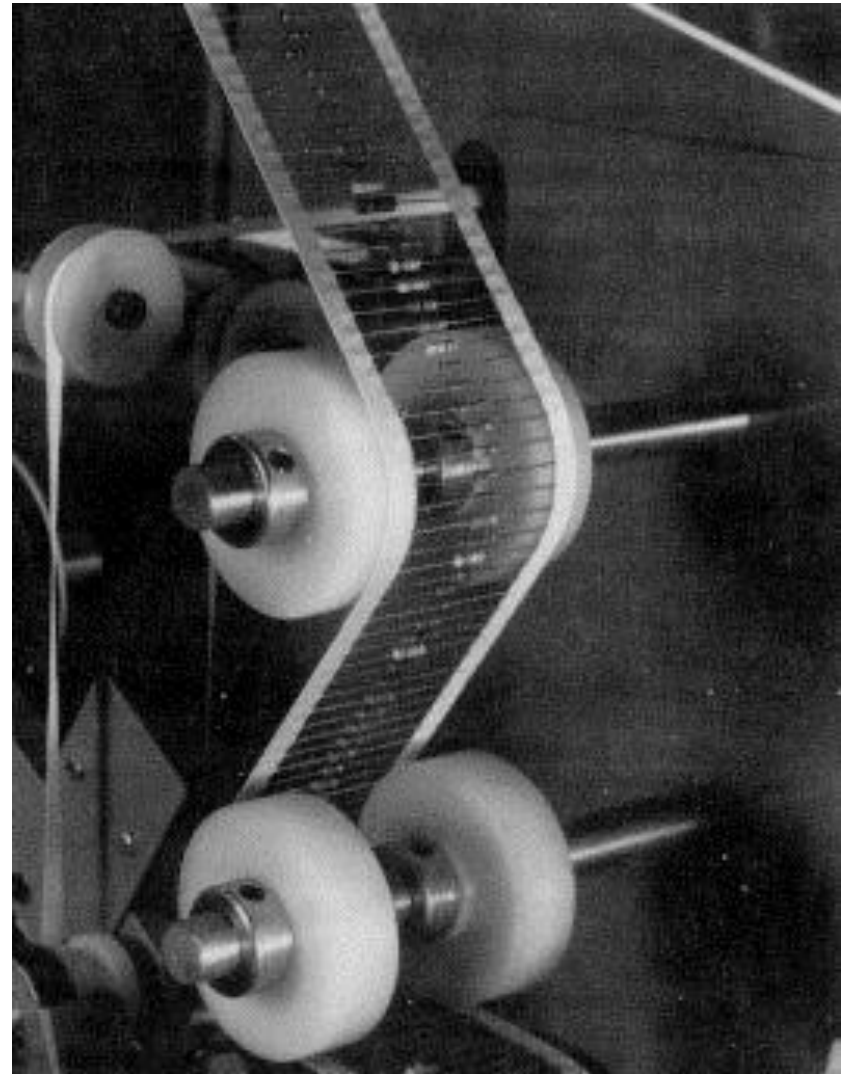
Not Accepted

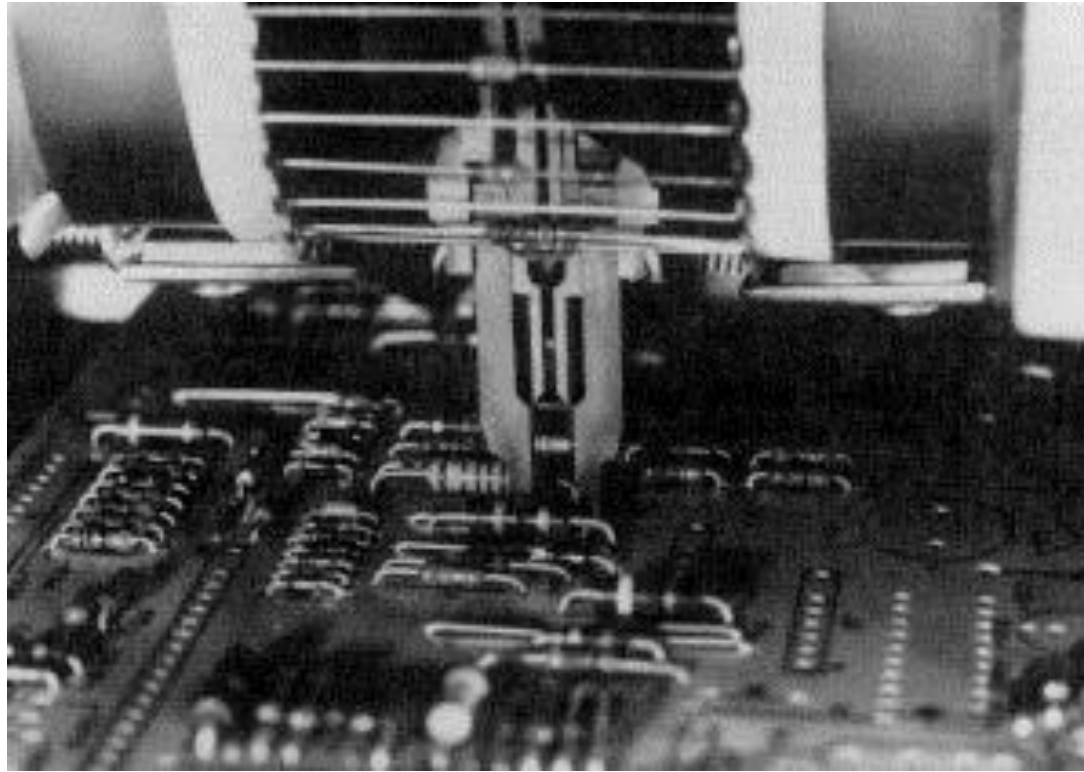




Through Hole Flow

Components Sequencing



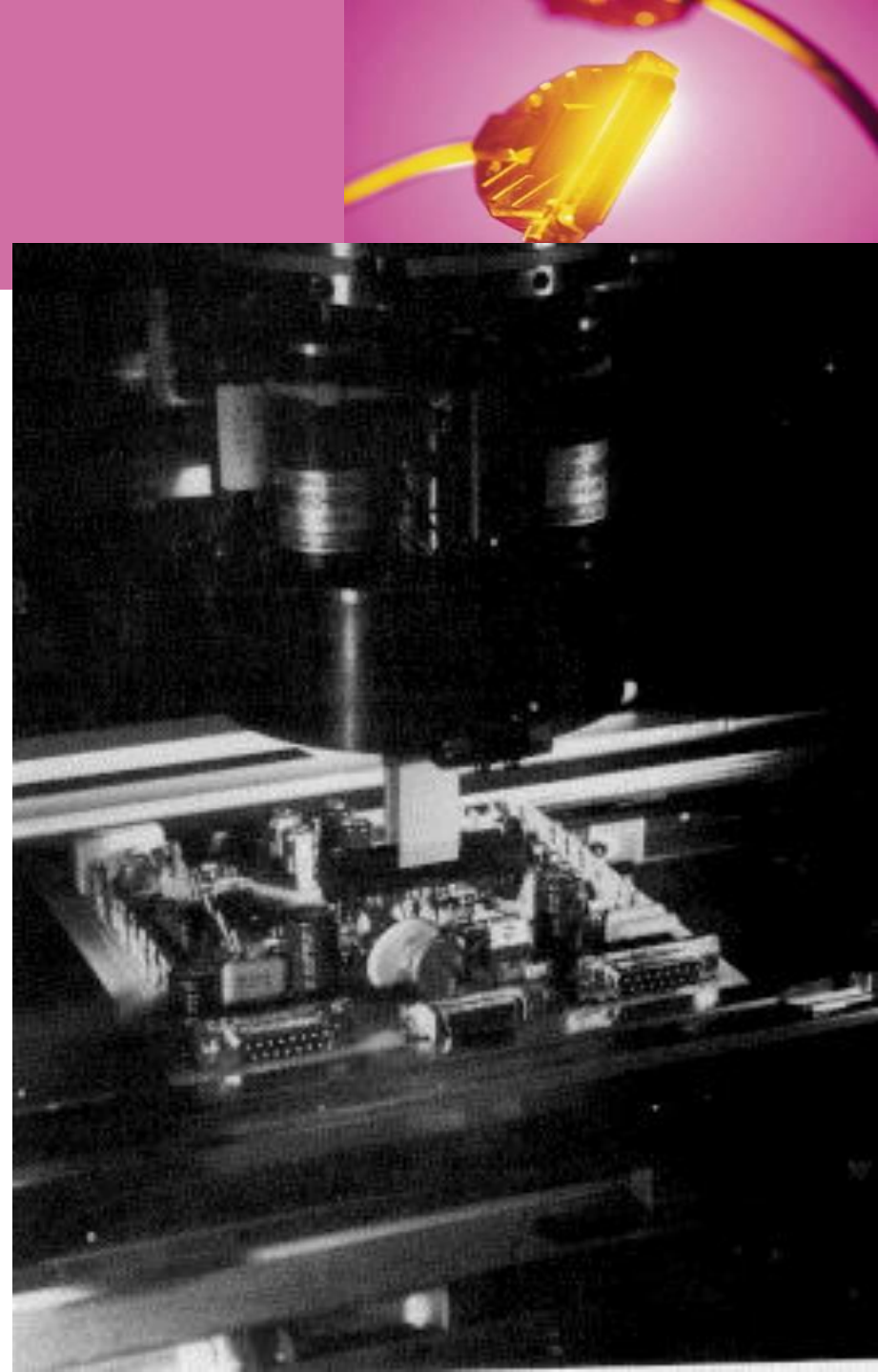


Axial Components Placement

Radial Components Placement



Loose Component Placement





END