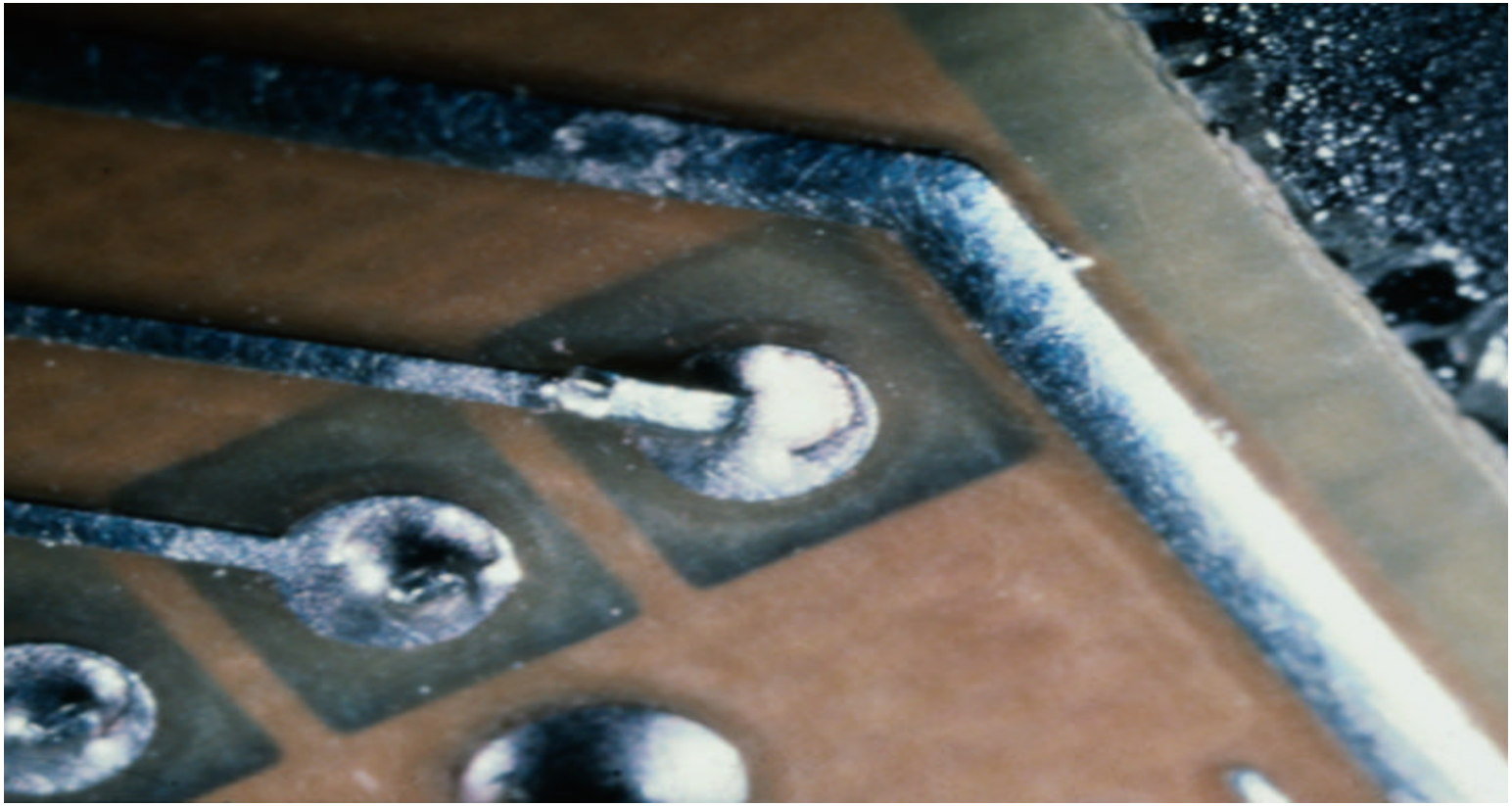
Types of Wave Solder Defects

- Non-Wetting
- Dewetting
- Pin Holes
- Webbing
- White Haze
- Solder Balls
- Icycling
- Bridging
- Excess Solder
- Dull/Grainy Joints
- Cold/Disturbed Joints

Non-Wetting

- Recognized by pull back of solder to expose the surface to be soldered

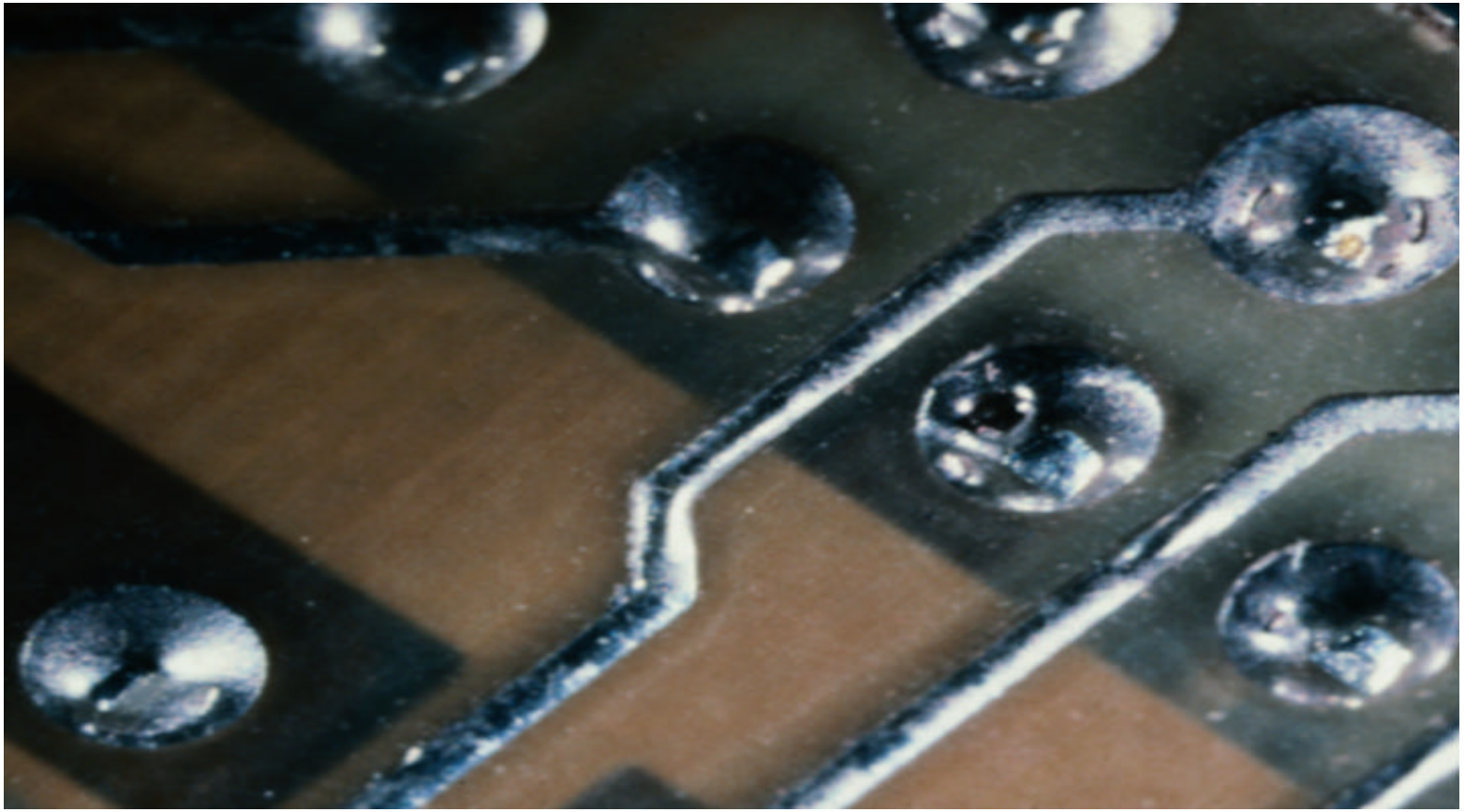


Non-Wetting

- Possible Causes:
  - Grease, oil or dirt on the pre-soldered surface
  - Bleeding or misregistered soldered mask
  - Low temperature solder
  - Contaminated solder
  - Surfaces too heavily oxidized for flux being used
  - Contaminated flux
  - Poor application of flux
- Remedy
  - Investigate each possible cause and correct suspected discrepancies one at a time until solderability is restored

Dewetting

- Recognized by metal wetting initially, then pulling back to form droplets of solder on the surface.

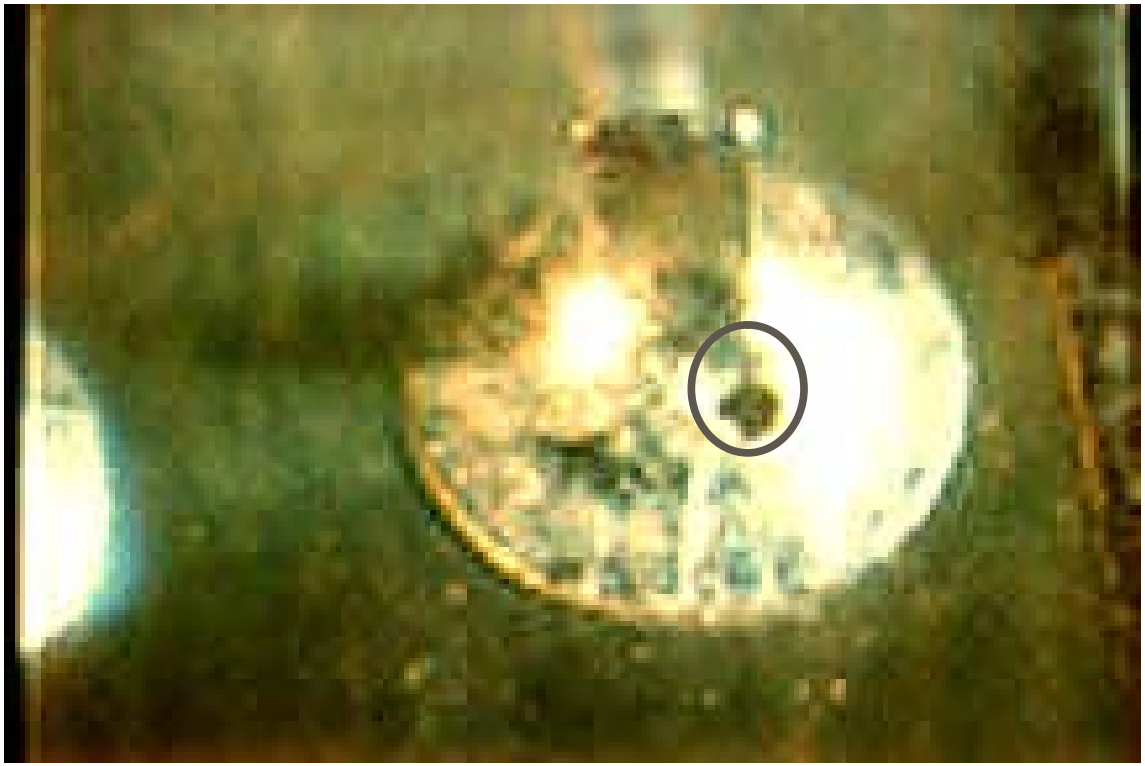


Dewetting

- Possible Causes:
  - Contamination of surface by abrasives
  - Poor plating
  - Poor hot air solder leveling during PCB manufacture
- Remedy
  - Restore solderability of the surface

Pin Holes

- Recognized by small holes or eruptions in the solder fillet.



Pin Holes

- Possible Causes:
  - Moisture or plating solution in the PCB laminate
  - Inadequate preheat to evaporate flux solvent
  - Flux has absorbed water
  - Physical blockage due to foreign body in hole
  - Top of Plated Through Hole prematurely solidifying

Pin Holes

- Remedy
  - Increase preheat to see if it eliminates problem
  - Put in new flux to see if it eliminates problem
  - Increase topside preheat and/or solder temperature to correct premature topside Plated Through Hole freezing
  - If all of these fail to correct the problem, have the PCBs baked and cross sectioned.

Webbing

- Recognized by a spider web like extension of solder across the non conductive portion of the PCB.

Webbing

- Possible Causes:
  - Improper curing of the laminate or solder mask
  - Inadequate flux (when accompanied by bridging or icycling)
  - Dross in the solder wave
- Remedy
  - Baking the PCB will sometimes correct the improperly cured mask or laminate condition
  - Substituting a more viscous flux or increasing the quantity of flux put on the PCB
  - Correcting the drossing problem in the wave

White Haze on Solder Mask

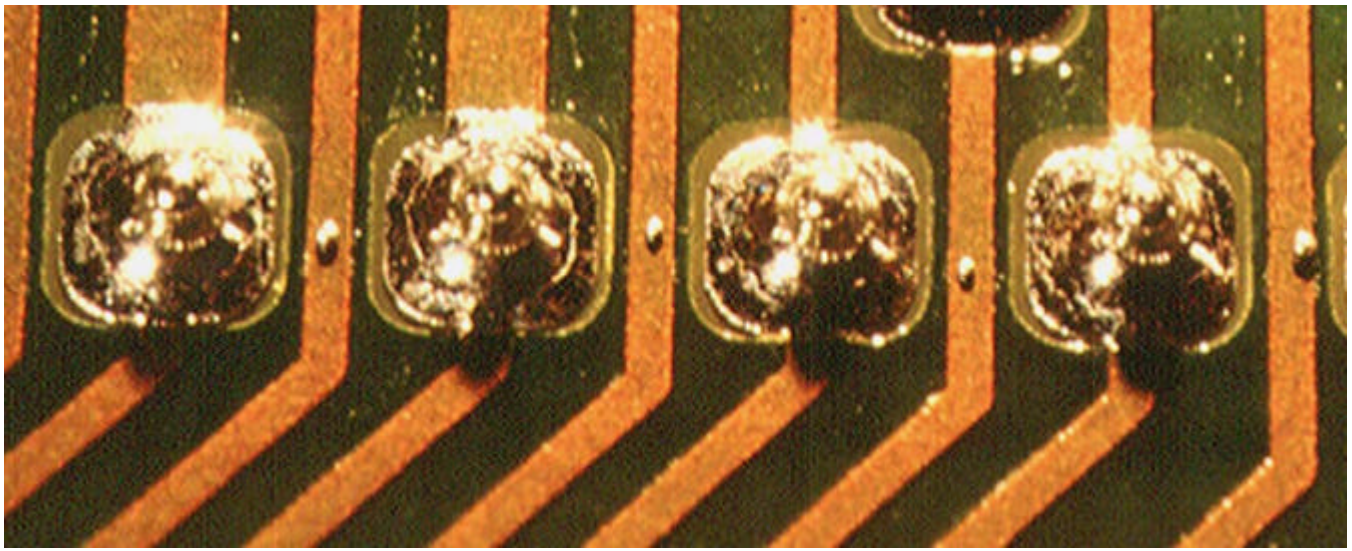
- Recognized by a white haze on the non-conductive portion of the PCB that cannot be removed by washing.

White Haze on Solder Mask

- Possible Causes:
  - Improper curing of the laminate or solder mask
- Remedy
  - Baking the PCB will sometimes correct the improperly cured mask or laminate condition

Solder Balls

- Recognized by tiny spherical shapes of solder dispersed over the surface of the PCB



Solder Balls

- Possible Causes:
  - Insufficient preheat
  - Plated Through Hole conditions that create pin holes, resulting in Solder Balls
  - High humidity in the manufacturing area
    - Moisture in the flux

- Remedy:
  - Investigate each possible cause, correcting suspect causes one at a time until the problem is corrected.

Icycling

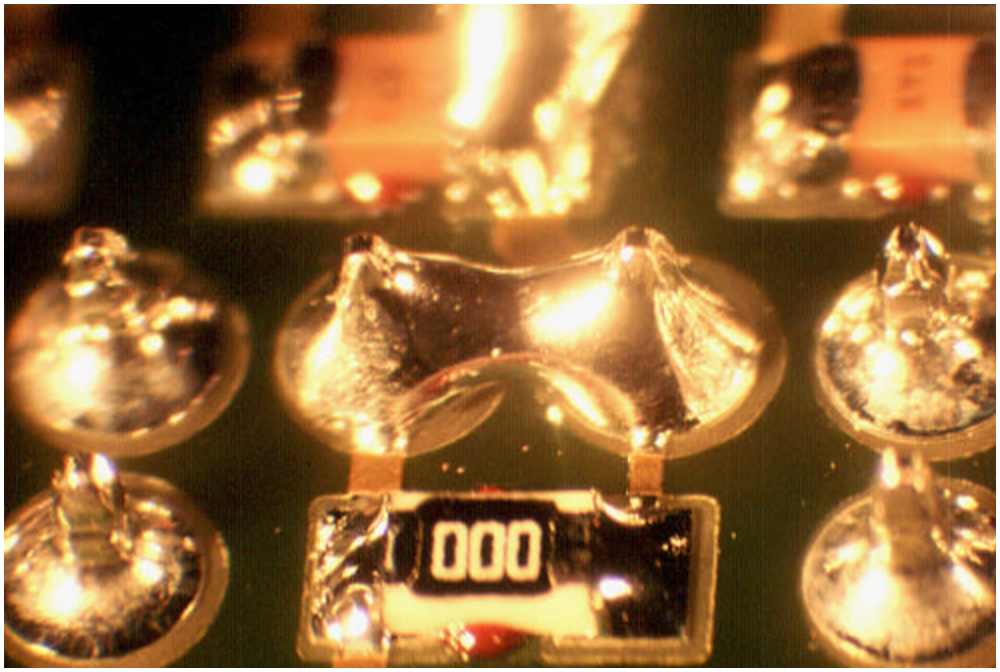
- Recognized by conical or flag shaped extensions of the solder fillet

Icycling

- Possible Causes:
  - Any condition that causes the solder to solidify while in the process of draining, such as:
    - inadequate flux to promote quick drainage
    - pot temperature too low
    - soldering surface unusually heat absorbent
    - leads picking up dross in the wave
    - wrong Plated Through Hole to wire ratio
- Remedy:
  - Investigate each possible cause and correct the suspect conditions one at a time until the problem is eliminated

Bridging

- Recognized by solder extending from one lead to an adjacent lead, causing a short circuit



Bridging

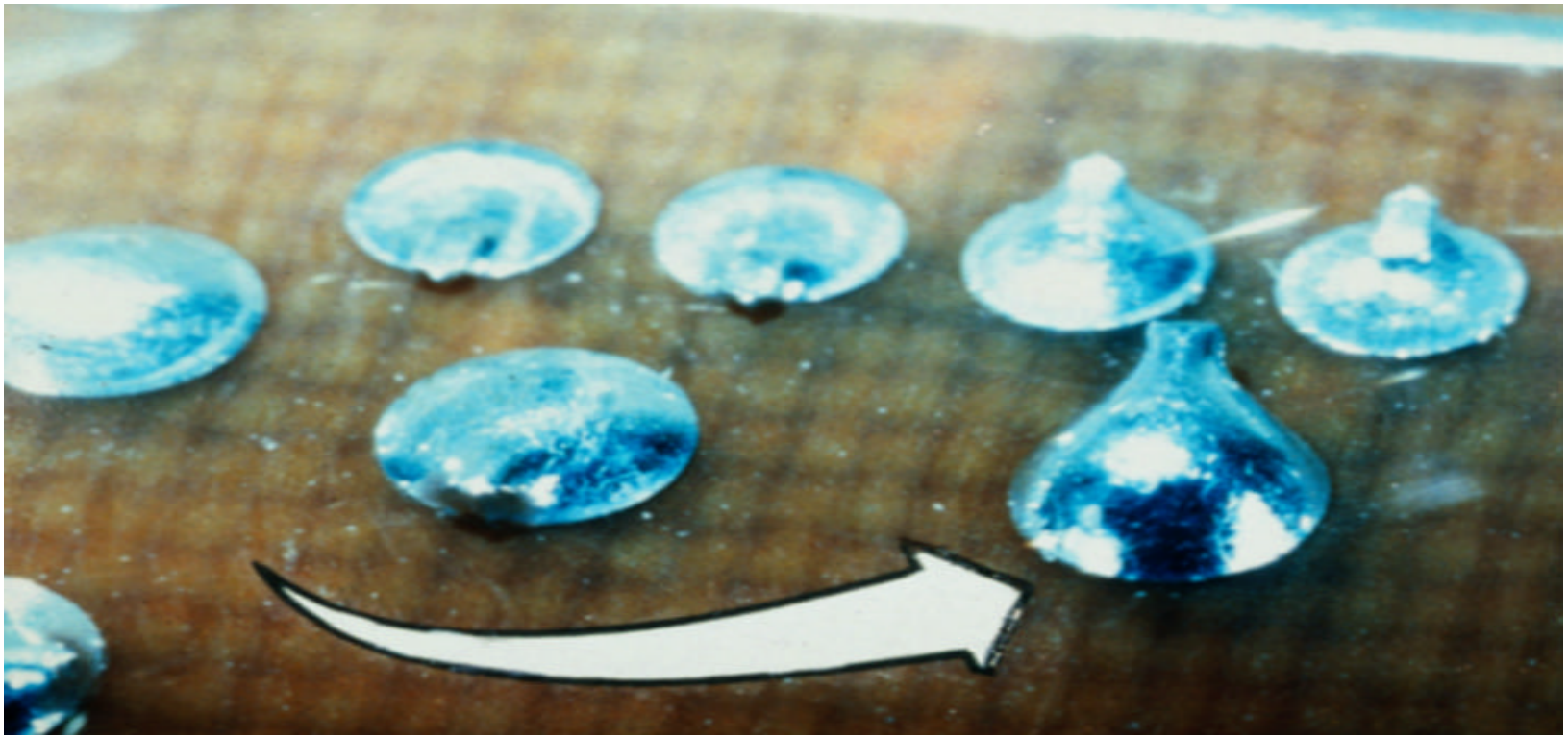
- Possible Causes:
  - Component leads that are bent or too closely spaced
  - Excess solder
  - Inadequate flux remains to promote drainage
  - Board immersed too deep in the wave
  - Leads picking up dross in the wave
  - Contaminated solder
  - Poor component solderability

Bridging

- Remedy:
  - Investigate each possible cause and correct suspect conditions one at a time until the condition is eliminated

Excess Solder

- Recognized by:
  - Bulbous appearance of fillet.
  - Unable to see contours of lead and land.



Excess Solder

- Possible Causes :
  - Any condition that contributes to poor drainage of the solder
  - Low temperature of solder or preheat
  - Contamination of solder
  - Insufficient flux to promote drainage
  - Incorrect wave exit angle or speed
- Remedy:
  - Investigate suspected causes and correct them one at a time until the problem is corrected

Dull or Grainy Joints

- Recognized by dark, non reflective, rough surfaces from an alloy that is normally bright and shiny.

Dull or Grainy Joints

- Remedies:
  - Determine that the alloy is normally a shiny alloy
  - Examine a recent pot analysis or get one done
  - Conduct electrical and mechanical evaluation to see if rework is necessary
  - If solder meets J-STD-006 Purity Standards and joints are mechanically sound, there is no reason for rejection or touch up
  - If solder does not meet standard, it is a *cold joint* and should be replaced

Cold/Disturbed Solder Joints

- Recognized by rough and dull finish on the fillets in conjunction with unacceptable mechanical strength of the joint

Cold/Disturbed Solder Joints

- Possible Causes:
  - Movement while joint is still molten caused by:
    - Conveyor mechanism erratic
    - Solder Temperature too high
- Remedy:
  - Look for causes of vibration being transmitted to the PCB and correct them
  - Insure that solder reaches solidus temperature immediately after joint is completed