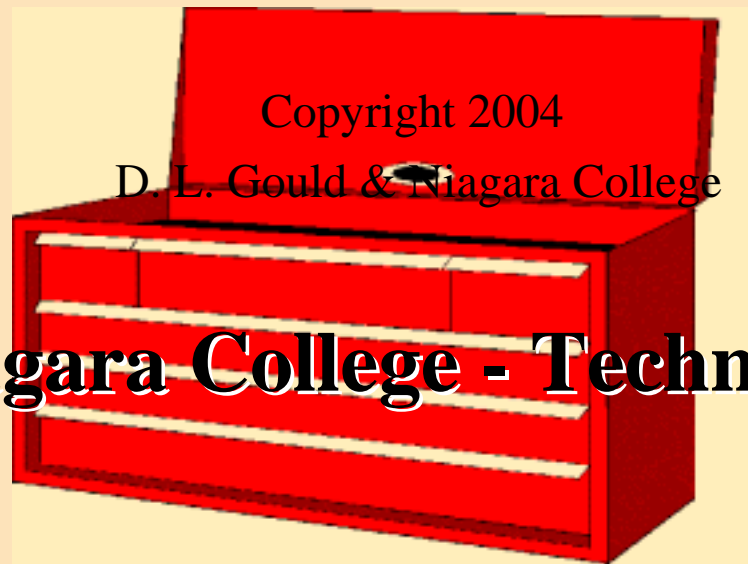


Tools And Techniques



Niagara College - Technology

Judged By Your Tools

- Your choice and care of the tools you select for the mechanical and electrical work you do will reflect your work habits
- Select tools that are of good quality with life time warranties.
- Never substitute one tool for another.



- **Common types:** (manual & power)

Blade

Phillips

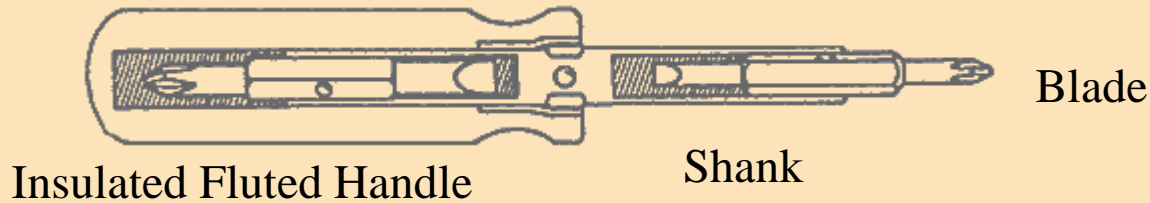
Allen

Torx

Robertson

- **Alignment between the screwdriver and the head of the screw must be exact**

Screwdrivers



- **Variations:**

Jewelers

Stubby

Offset

Magnetic

Ratchet

- Shank, driver style & size, may also vary.



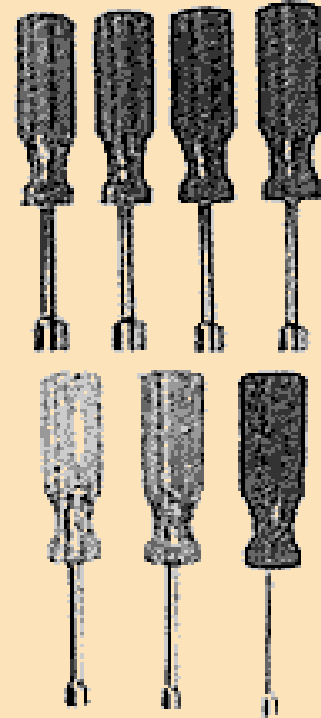
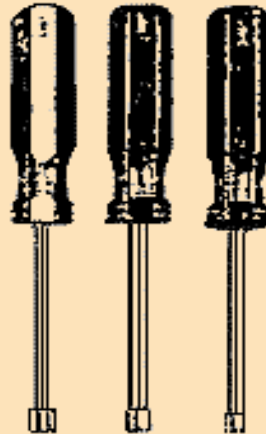
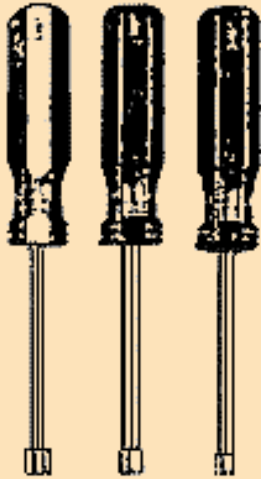
Shank

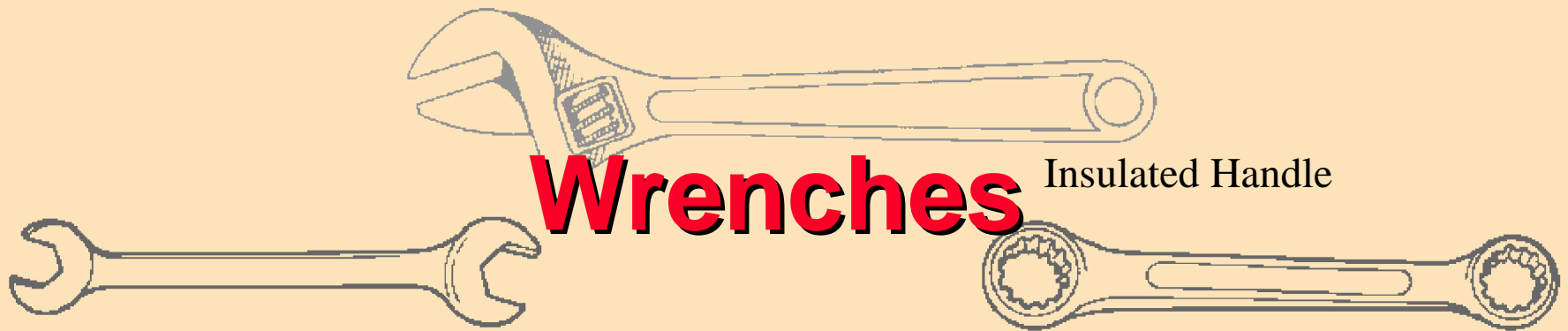
Insulated Handle

● **Common Styles: (manual & power)**

Hollow Shaft

Magnetic Insert





- **Adjustable** - distance between the jaws can be adjusted to various sizes. The pulling force is always applied to the stationary jaw.
- **Open-End** - primarily used on square nuts. Allows adjustments to be made in confined areas.
- **Box-End** - minimizes shearing or rounding providing a snug grip on hex hardware.
- **Allen Wrench** - a hexagonal bar of steel which fits the socket of a screw or bolt.





- **Long-Nose** - positioning of small parts on the printed circuit board & setting bend allowance.
- **Slip-Joint** - to grip large hardware that may be inserted in a chassis.
- **Rib-Joint** - uses a larger jaw opening to grip large hardware that may be inserted in a chassis.
- **Needle-Nose** - for positioning extremely delicate small parts in very tight places.

Insulated Handle



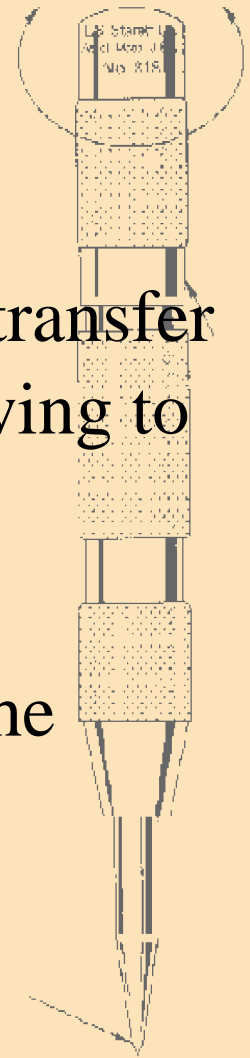
Insulated Handle

- **Diagonal Cutters** - to remove excess component lead length, and wire length after soldering a component or wire to a printed circuit board. (10 cm diagonal cutter will cut 24 AWG and smaller)
- **Wire Strippers** - to remove insulation from wires, to prepare the wire for electrical connection during assembly or service of electronic equipment.

Layout Tools



- **Combination Square** - to assist in the transfer of dimensions from the chassis layout drawing to the chassis
- **Center Punch** - used to make a conical indentation on the metal chassis to locate the center of a hole for a drill bit.

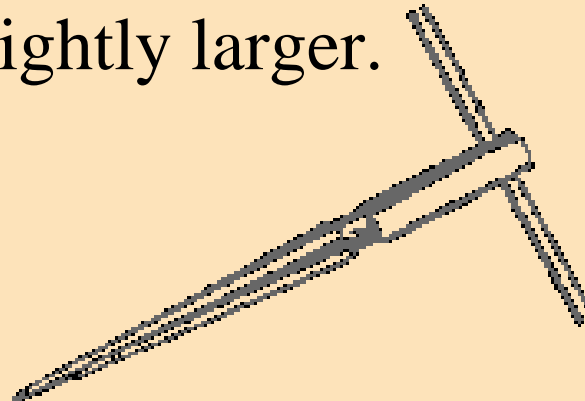


Tools For The Chassis And The Printed Circuit Board

- **Ball Peen Hammer** - used for driving center punches, and shaping and straightening thin metal.

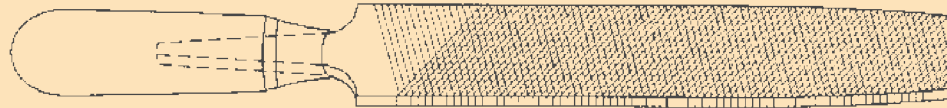


- **Reamer** - used to expand the diameter of a drilled hole to make it slightly larger.



Tools For The Chassis And The Printed Circuit Board

- **Files** - used to improve the appearance of a hole in a chassis, and eliminate burrs and sharp edges.

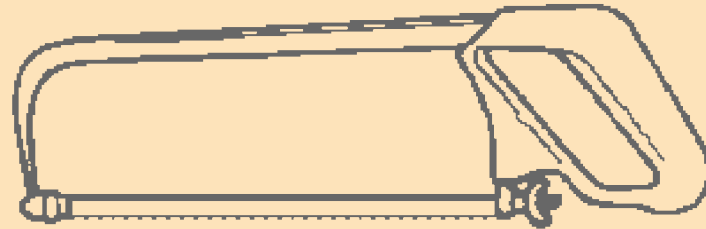


- **Chassis Punch** - to make holes in a chassis larger than 13 mm up to 76 mm with precision and negligible burr.



Tools For The Chassis And The Printed Circuit Board

- **Hacksaw** - used to cut small shafts, pipes and thin pieces of metal.



- **Nibbler** - a miniature hand shear used to cut internal openings in a chassis.



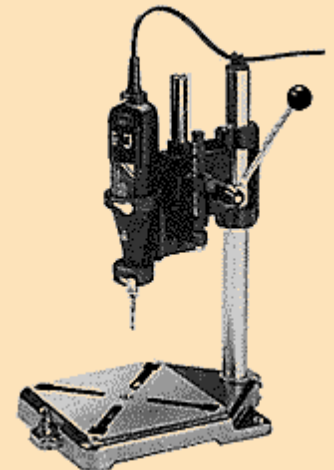
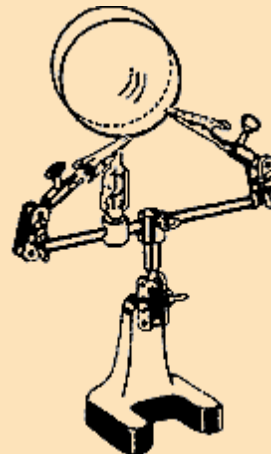
Tools For The Chassis And The Printed Circuit Board



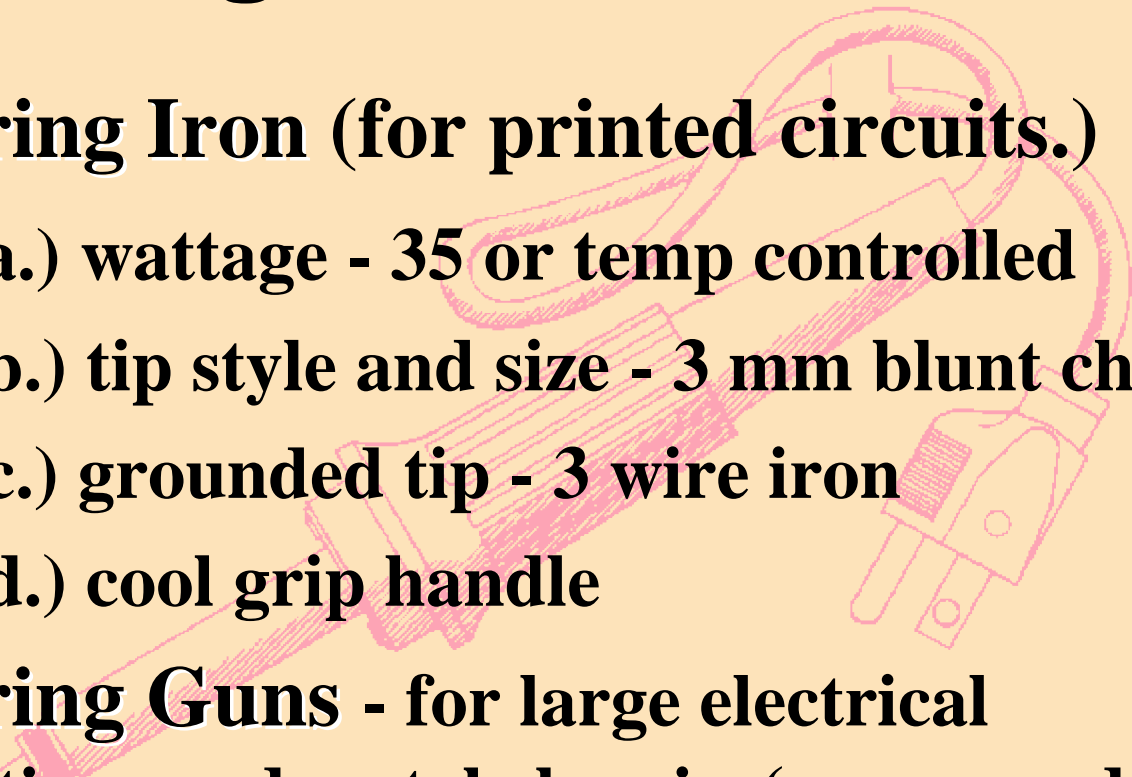
- **Drill Bits** - made of high-speed steel used to cut round holes of 1mm to 13mm in a metal chassis.
- **Hand Drill** - used with a drill bit to drill holes in a metal chassis. Variable speed control, auto forward/reverse, chuck capacity of 9.5mm and a grounded three-wire cord are essential.
- **Drill Press** - used with a drill bit to drill holes in a metal chassis. Variable speed control, chuck capacity of 13mm and a grounded three-wire cord are essential.

Tools For The Chassis And The Printed Circuit Board

- **Dremel Tool** - to drill printed circuit boards to allow components to be mounted on the board. A high speed drill that uses drill bits ranging in size from #80 to #30.
- **Third Hand** - to hold the circuit board during project assembly.



Soldering and Desoldering

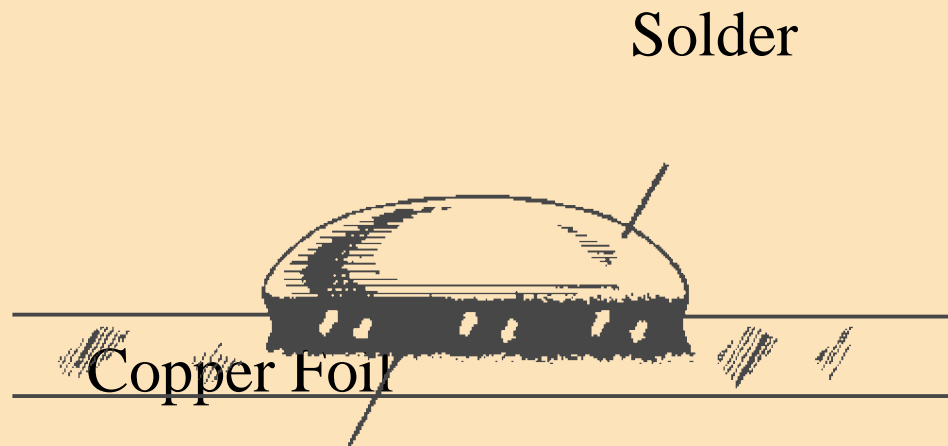
- **Soldering Iron (for printed circuits.)**
 - a.) wattage - 35 or temp controlled
 - b.) tip style and size - 3 mm blunt chisel
 - c.) grounded tip - 3 wire iron
 - d.) cool grip handle
 - **Soldering Guns - for large electrical connections and metal chassis. (never used on printed circuits)**
- 

Soldering Techniques

- **Soldering** - to join two metals together to form an electrically mechanically secure bond using heat and a third metal alloy known as solder.
- **Solder** - a metal alloy of tin and lead (60/40) with a low melting point of 187°C & rosin core.
- **Solder Properties** -
 - a.) melting point
 - b.) mechanical resistance to fractures
 - c.) cost

Soldering Techniques

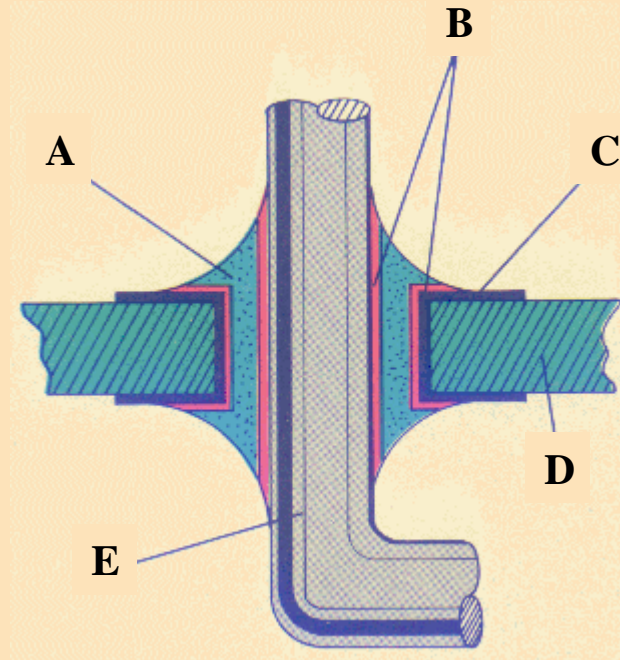
- **Wetting Action** - a metal solvent action that takes place when sufficient heat is applied to a connection allowing the solder to liquefy combining the molecules of all the materials in the bond.



Soldering Procedure

- **Safety Glasses**
- **Clean all parts to be soldered**
- **Plug in the iron to allow it to reach temp**
- **Apply a small amount of solder to the iron tip**
- **Heat the connection with the iron**
- **Apply solder to the connection opposite the iron**
- **Allow the solder to completely wet the connection**
- **Remove the solder & the iron tip from the connection**
- **Allow the solder to cool and solidify undisturbed**
- **Use diagonal cutters to remove the excess lead**
- **Remove flux residue from the connection**

The Perfect Solder Connection



A typical cross section of a printed circuit board, with a plated through hole.

- A) Solder
- (B) Intermetallic Layer
- (C) Plated Hole
- (D) P.C. Board
- (E) Lead

Poor Solder Connections

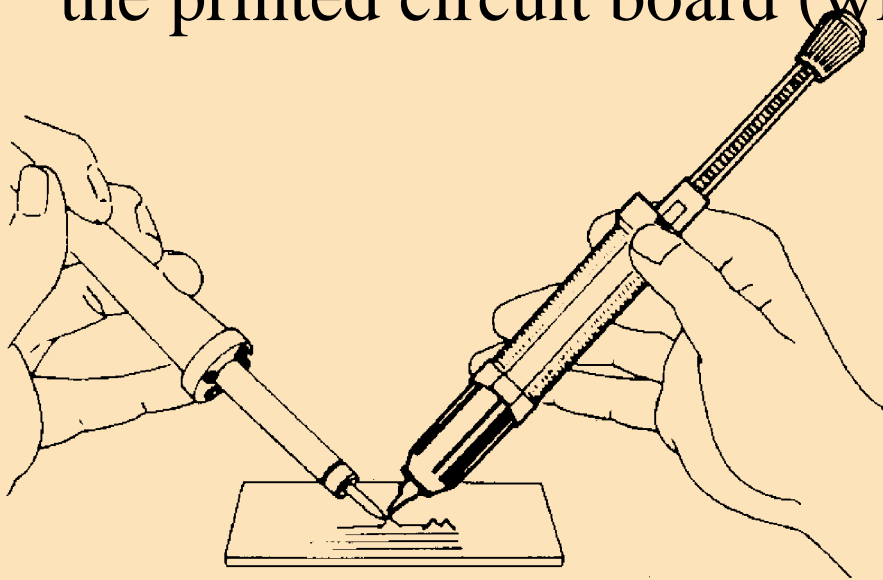
- **Fractured Joint** - movement of the joint during the plastic state of the solder.
- **Rosin Joint** - insufficient heat to melt the solder so that the joint is coated with flux only.
- **Wicking** - (solder creep) the capillary action of liquid solder solidifying a stranded wire.
- **Cold Solder Joint** - a dull-gray, grainy appearance of solder that has not properly wetted the joint.

Poor Solder Connections

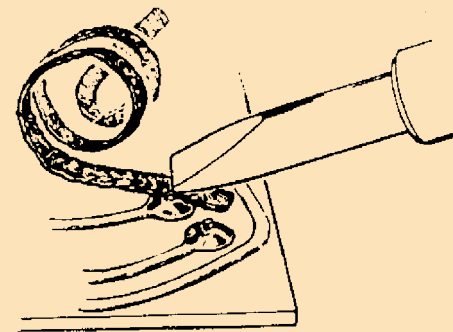
- **Excessive Solder Joint** - too much solder applied to the joint resulting in shorts between adjacent terminal pads
- **Insufficient Solder Joint** - portions of the joint have not been alloyed with the solder and remain visible.
- **Excessive Heat** - causes the foil traces and pads to be lifted from the insulating base of the printed circuit board.
- **Solder Peaking** - a sharp point of solder protruding from the connection, caused by the rapid removal of the soldering iron from the joint.

Desoldering Techniques

- **Desoldering** - to remove the solder from a connection without damaging the component or the printed circuit board (wire or the terminal).



Solder Sucker (Pullet)



Solder Wick (Dry Wick)

Desoldering Procedure

- **Safety Glasses**
- **Plug in the iron to allow it to reach temp**
- **Remove excess solder on the iron tip with a damp sponge**
- **Charge the “Solder Sucker”**
- **Place the tip of the iron on the joint to be desoldered**
- **Once the solder on the joint liquefies, insert the tip of the “Solder Sucker” into the molten solder and trigger it**
- **Use “Solder Wick” to remove the last residue of solder**
- **Use a screw driver & long nose pliers to help remove the component or wire from the printed circuit or terminal**

Summary

- Tools and electrical/electronic projects
- Layout tools for chassis fabrication
- Tools for the chassis and the printed circuit
- Tools for soldering and desoldering

Where to get more information

- Electronic Fabrication Second Edition
by Gordon Shimizu
- Electronic Project Design and Fabrication Third Edition
by Ronald A. Reis
- Electronic Techniques Shop Practices and Construction
Fifth Edition
by Robert S. Villanucci.
- [Antex Soldering Products](#)
- [Soldering Tips](#)
- [How to Solder](#)
- [Steps to Better Soldering](#)