ELECTRONIC CONSTRUCTION TECHNIQUES

Lesson 21

EET 150

Learning Objectives

- In this lesson you will:
- be introduced to a construction method called wire wrapping
- see the proper method from making wire wrapped connections
- identify the tools required for wire wrapping
- identify the parts necessary for wire wrap construction
- see examples of wire wrap construction
- define surface mount technology (SMT)
- see a comparison of SMT advantages and disadvantages
- review the assembly techniques for SMT

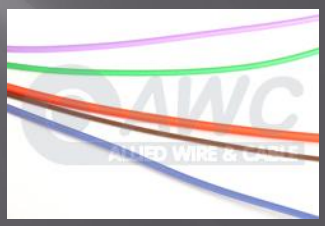
Wire Wrapping

Electronic construction method that does not require a printed circuit board or soldering

Popular production construction method in 1960's and 70's

Still used for short runs and prototyping

More reliable than PCBs in high vibration/physical stress applications



Typical wire wrap wire
30 – 22 AWG

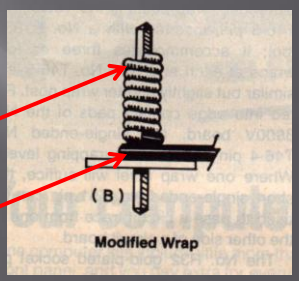
Wire Wrapping Technique

Silver plated copper wire wound under high pressure onto a gold plated copper post

Correct wire wrap technique

7 turns bare wire

1-1.5 turns insulated wire



Wire cold-welded to post due to plating and high pressure

Wire Wrapping Tools

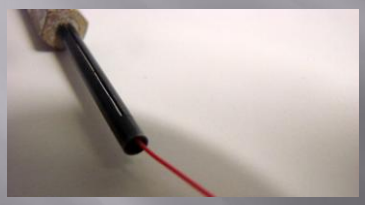
Manual wire wrapping tool

Automatic tools
"Wire Wrap Gun"

Wire Wrapping Procedure

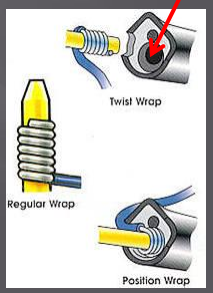
Size wire to length

Strip wire ends 0.5 in.

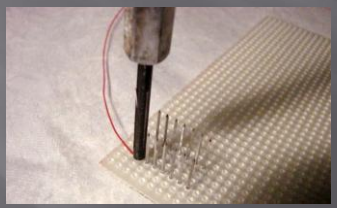


Insert wire into tool

Place large hole on pin



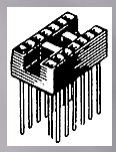
Twist tool



Photos taken from http://blog.makezine.com/archive/2009/07/lost-knowledge-wire-wrapping.html

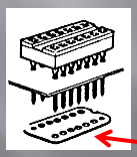
Wire Wrapping Assemblies

All components mounted in sockets (ICs and other parts)



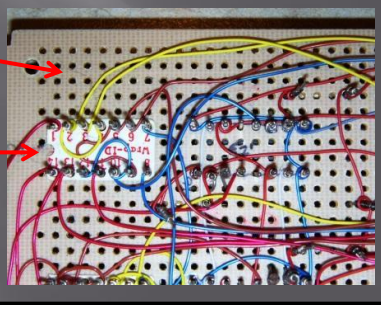
Long posts provide space for three wires

Typical pin labels



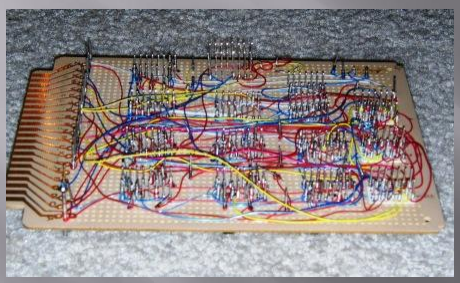
Place sockets through perforated board (0.1 in centers)

Install pin label

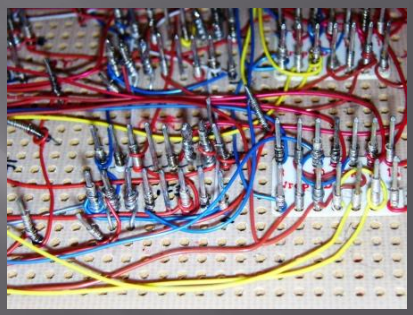


Colored wire identifies signals and power wiring

Wire Wrap Construction Examples



Completed assembly
Bottom side



Close-up of assembly

Wire Wrap Advantages-Disadvantages

Advantages

Easy to learn
Very good connections
Circuit easily modified/ repaired
Prototype can become finished product

Disadvantages

All components must be in sockets
Sockets require thicker boards
Fine-pitched pins (<0.1 in) and surface mount components unusable

Surface Mount Technology

Surface Mount Technology (SMT) is a method of constructing electronic circuits where components are solder directly to the surface of printed circuit boards

Surface Mount Devices (SMDs) are components designed for SMT construction

SMD Characteristics
- Very small
- Light weight
- No leads

SMT well suited for high speed automated assembly

Surface Mount Technology

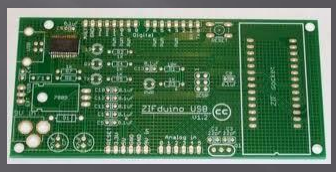
Advantages

- Smaller lighter components
- higher component and connection densities
- Fewer drilled holes needed
- Automated assembly easier
- Small component placement errors self-correcting (surface tension of solder)
- Two-sided component placement
- Lower resistance and inductance at connections (better high frequency performance)
- Parts cost less

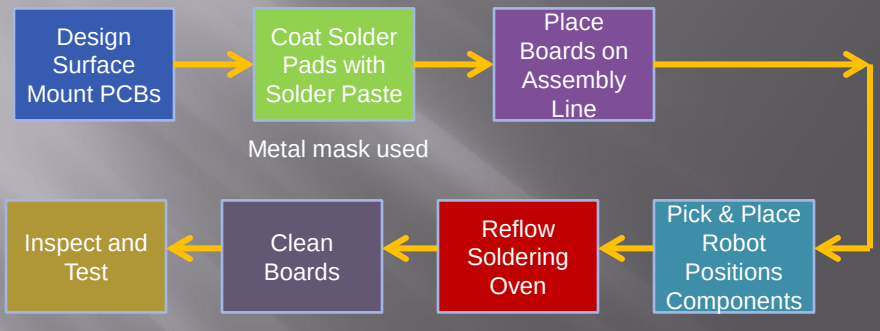
Surface Mount Technology

Disadvantages

- Higher initial cost of manufacturing facilities
- Manual prototyping and repair more difficult
- SMDs can not be used on solderless experimenters boards
- SMDs solder can be damaged by thermal cycling
- Smaller joint dimensions in SMT (ultra fine pitch) undermine the solder connection integrity.



Surface Mount Technology Assembly Steps



Metal mask used

Components delivered on reels and trays

Techniques
Infrared
Hot Gas Convection
Vapor Phase

Remove excess flux and solder

Electronic Construction Techniques

End Lesson 21

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