

# 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

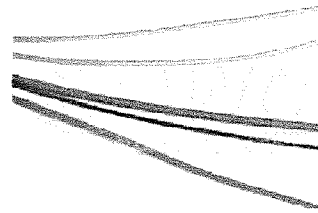
## Wire Wrapping

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



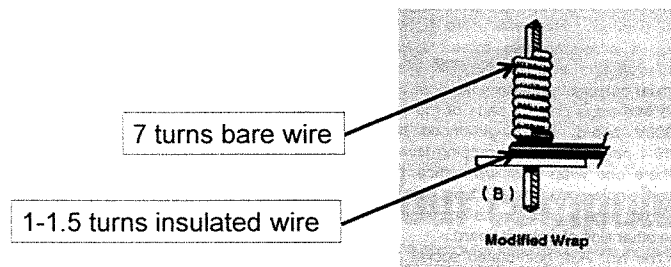
Typical wire wrap wire  
30 – 22 AWG



## Wire Wrapping Technique

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

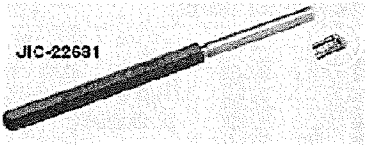
Correct wire wrap technique



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



# Wire Wrapping Tools



JIC-22691

Manual wire wrapping tool

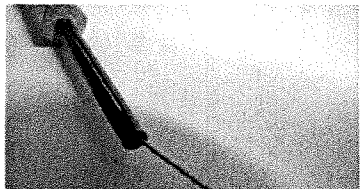


Automatic tools  
"Wire Wrap Gun"

# Wire Wrapping Procedure



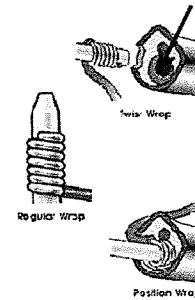
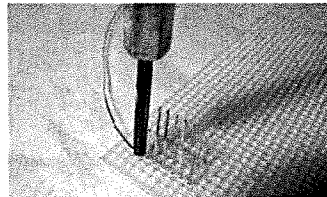
Size wire to length  
Strip wire ends 0.5 in.



Insert wire into tool

Place large hole on pin

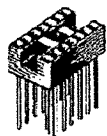
Twist tool



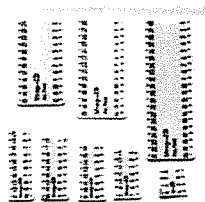
Photos taken from <http://blog.makezine.com/archive/2009/07/lost-knowledge-wire-wrapping.html>

## Wire Wrapping Assemblies

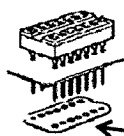
All components mounted in sockets (ICs and other parts)



Long posts provide space for three wires



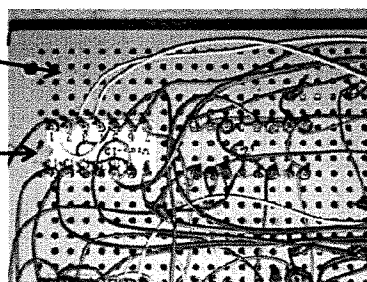
Typical pin labels



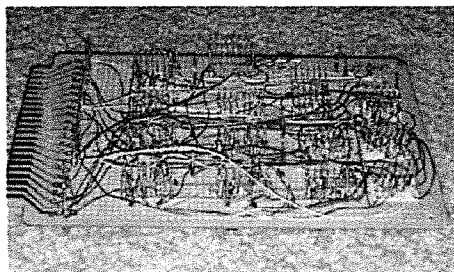
Place sockets through perforated board (0.1 in centers)

Colored wire identifies signals and power wiring

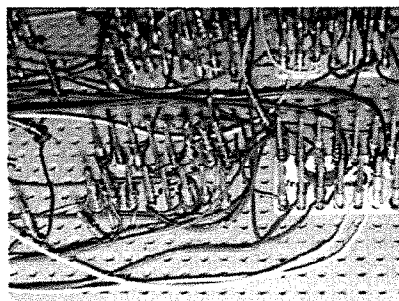
Install pin label



## 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



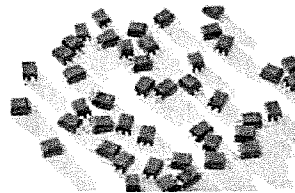
## Surface Mount Technology

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

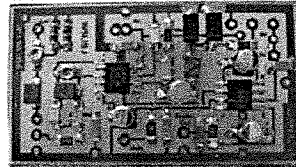
Automated assembly easier

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

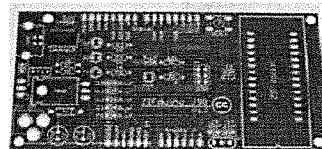
Higher initial cost of manufacturing facilities

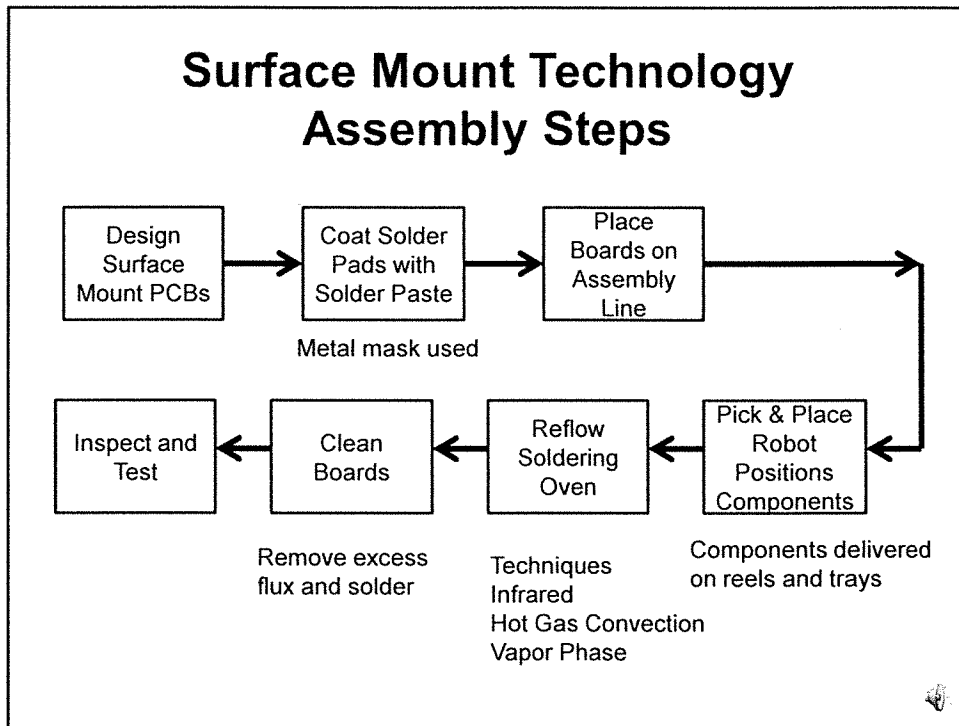
Manual prototyping and repair more difficult

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.





## Electronic Construction Techniques

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