

# *Radio Mechanics*

## *Fourth Year*

### *Module 2*

### *Strike While the Iron is Still Hot*

### *(Soldering Techniques)*

#### *What this module is about*

Every electronic technician should know the rules on how to solder properly. The importance of doing a good soldering job that can contribute to the normal operation and service of the radio receiver, TV receiver or other electronic equipment, and project or kit. About 90% of all kit assembly and service problems relate to poorly soldered connections, particularly on printed circuit board. This module guides readers in the proper way of soldering wire or component lead to the PCB. Moreover, it provides soldering rules, recommends the correct wattage of soldering iron for PCB, selection of solder and soldering precautions.

At the end of this module, you should be able to do the following:

1. Learn the different soldering techniques.
2. Explain the correct tinning procedure of soldering iron, type of soldering lead and characteristics of a good solder.
3. Perform an acceptable soldering job.

#### *How to learn from this module*

Here are some tips on how to use this module. This will guide you in learning the different lessons. I'm sure you will find this very helpful as you read it.

1. Read the objectives so you will know what you expect to learn from this module.
2. Be sure to work on each activity because each activity prepares you for the next.
3. Answer the pretest before going over the module to determine what you already know about the topics.  
Use the key to correction at the end of this module to check your answers, but do not do this only after completing the module.
4. Always answer the self-check portion after each activity to determine whether you understood what you have read.
5. Read the lessons again if you were not able to answer the questions correctly.

Before going through this module, try to answer the succeeding pretest. This will enable you to find out what you already know and what you still need to know about soldering techniques. Good luck!

## PRETEST

Directions: Read each statement carefully and write the letter of the best answer on the blank before each number.

- \_\_\_\_\_ 1. The ideal wattage of soldering iron for beginners.
  - a. 100 watts
  - b. 30 watts
  - c. 40 watts
  - d. 60 watts
  
- \_\_\_\_\_ 2. The best type of soldering lead used in soldering components.
  - a. 40/60
  - b. 60/40
  - c. 30/70
  - d. 50/50
  
- \_\_\_\_\_ 3. Normally used to hold components and serves as heat sink.
  - a. diagonal cutter
  - b. mechanical plier
  - c. long or needle nose plier
  - d. electrical plier
  
- \_\_\_\_\_ 4. Tool used in desoldering of components.
  - a. brush
  - b. flux remover
  - c. file
  - d. desoldering pump
  
- \_\_\_\_\_ 5. Cleaning supply needed in soldering.
  - a. flux remover
  - b. file
  - c. sandpaper
  - d. desoldering adaptor

Did you fare well? If not, don't worry. Anyway you will be answering the same set of test after you have studied all the lessons in this module. By that time you shall have been able to answer all the questions correctly.

Take note, if you need any assistance in carrying out the different activities, don't hesitate to ask the help of your teacher.

For enrichment, read more about the topic from books which you will borrow from your school or any public library.

## Lesson 1

### Soldering Tools and Materials

In large and heavy metal work, welding is used in joining metals permanently. In electronics work, soldering is used to join pigtailed components, transistor leads, IC pins and among others. Soldering is the process of heating materials, and joints to be soldered and applying solder on the heated joints to ensure permanent connection.

The materials used in this process are soldering iron 30 to 35 watts for transistors or IC; soldering gun 100 to 140 watts for chassis work, soldering tip-pretin new heating it and melting solder around heated tip; sponge to damp off extra solder of tip; re-wet every now and then. Solder resin core (does away with using soldering paste; 60% tin and 40% lead, 60:40).

#### Soldering Tools

1. Long or needle nose pliers hold components and serve as heat sink.
2. Side or diagonal cutter which cuts excessive length of component leads, pares or strips off wire ends.
3. Cleaning supplies such as flux remover which is used with brush or spray.
4. Desoldering tools such as desoldering pump.

#### Activity 1

##### Soldering Iron Assembly

##### Materials Needed:

- 1 handle (wood)
- 1 filament tube holder
- 1 soldering iron filament 30w
- 1 soldering tip

- 1 AC cord with plug
- 1 electrical tape

Procedure:

1. Prepare the needed materials.
2. Insert the filament tube holder into the wood handle as shown in figure 1 below.
3. Insert the soldering iron filament inside the tube holder.
4. Connect the AC cord with a plug to the soldering iron filament.
5. Be sure to use electrical tape for the two joints which are connected to 220 VAC.
6. Insert the soldering tip 30w to the soldering iron filament.
7. The soldering iron is now ready for testing.

Self-check:

1. What is the purpose of soldering?
2. How do we assemble soldering iron?
3. How many watts does a soldering iron use for transistor work?
4. What is the power rating in watts of a soldering gun used for chassis work?
5. What possible problems do you encounter in this activity?

## Lesson 2

### Characteristics of a Good Solder

1. Clean the material or joint to be soldered. See that the solder does not stick to dirty joints or surfaces.
2. Heat the joint or part to be soldered with the tip.
3. Apply the solder on the part or joint to be soldered, not on the tip.
4. Once the solder melts and flows around ( some flows on tip) remove the iron tip.
5. Avoid disturbing the solder as it cools off.
  - a. Do not apply heat longer than necessary (not more than 5 seconds in 1 spot).
  - b. Prolonged heat can ruin components including the foil of PCB.
  - c. If possible, keep the iron at a 30° to 40° angle to the point.

- d. Apply only enough solder to coat the joint and circuit board pad.
  - e. Avoid sharp peaks “bridges” between foils.
- 6. Use heat sink whenever possible.
  - 7. Use soldering iron 30 watts and 60 by 40 soldering lead.

## Activity 2

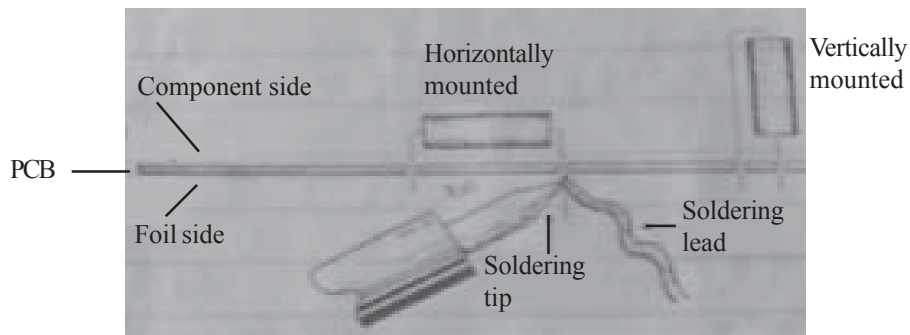
### Tinning of the Soldering Iron

#### Materials Needed:

- 1 soldering iron 30 w
- 1 sand paper # 240
- 1 flat file
- 1 wire brush
- 1 philips screwdriver

#### Procedure:

- 1. To ensure maximum heat to the tip of the soldering iron, it must always be properly tinned.
- 2. Use sandpaper or wire brush in tinning the soldering tip of iron.
- 3. For gold plated tips, use sponge, instead of a file or wire brush to avoid destroying the soldering tip.
- 4. Be sure that the soldering tip is always pitted. Use a screwdriver to tighten the screw.



Soldering and Tinning

### Activity 3

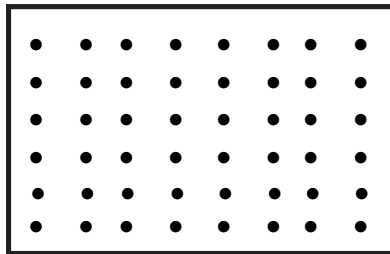
#### Soldering of Components on PCB

##### Materials:

- 1 universal PCB
- 20 assorted resistors
- 1 meter soldering lead, 60:40
- 1 soldering iron
- 1 extension cord 220 V

##### Procedure:

1. Mount all the resistors on the PCB board as shown below. Follow the correct mounting procedure.



2. One at a time, solder the resistor properly.
3. Use at least 5 seconds in soldering every joint to avoid damage on PCB foil.
4. Do not leave solder nuggets that can provide nuggets or bridges between foils.
5. Be sure to cut all excess wire to avoid short circuits.

##### Self-check:

1. What is the composition of the most commonly used soldering lead?
2. How do you clean or tin a tip when soldering?
3. Why must the material or joint to be soldered must be cleaned very well before soldering?
4. What materials are needed in tinning?

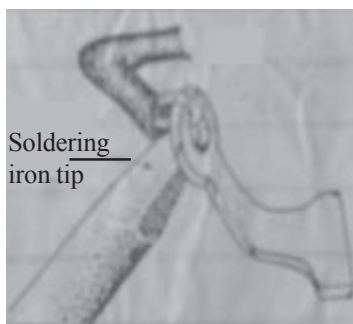
## Lesson 3

### Acceptable Soldering Jobs

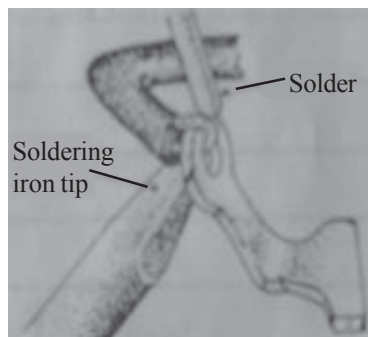
Always remember to keep the soldering iron tip clean. Wipe often on a wet sponge or cloth, then apply the solder to it to give the entire tip a wet look. This tinning process protects the tip and enables you to make good connections. When the solder tends to “ball” or does not stick to the tip, the tip needs to be cleaned and re-tinned. Use resin core radio - type solder (60:40 or 50:50 tin lead content) for all soldering.

#### Soldering A Connection

1. Position the circuit board with the plain side up (not the foil side).



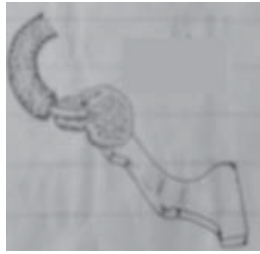
2. Apply only enough solder to wet both tip and the connection thoroughly.



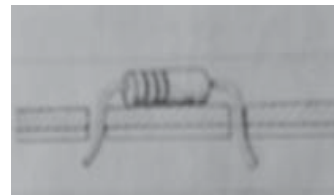
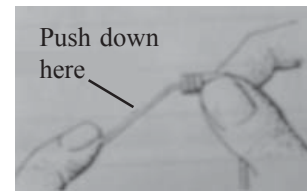
3. Let the connection harden before moving the wire. The connection should be smooth and bright.



4. Check the connection. Poor connections look crystalline and grainy as the solder tends to blob. Heat the connection if it does not look smooth and bright.

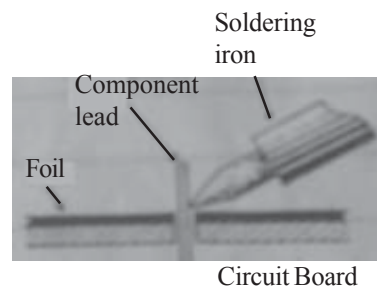


1. Position the circuit board with the plain side (not the foil side) up.
2. Hold the resistor by the body as shown, and bend the leads straight down.
3. Push the leads through the holes at the proper location on the circuit board. The end with color bands may be positioned either way.
4. Press the resistor against the circuit board. Then bend the leads outward slightly to hold the resistor in place.



## Soldering a Connection

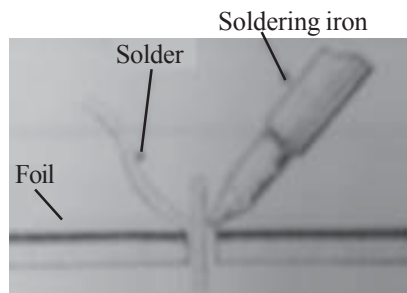
1. Place the soldering tip against both the lead and the circuit board foil. Heat both for 2 to 3 seconds.





2. Then apply the solder to the other side of the connection.

NOTE: Let the heated lead and the circuit board melt the solder.



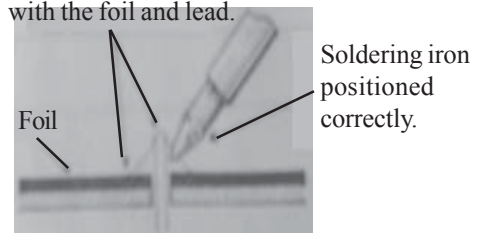
3. As the solder begins to melt, let it flow around the connection. Then remove the solder and the iron and let the connection cool.
4. Hold the lead with one hand while cutting off the excess lead length close to the connection. This keeps you from being hit in the eye by the flying lead.



### Checking Connection

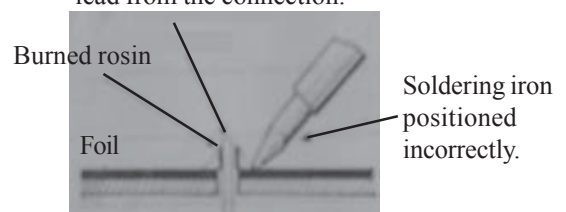
Be sure the solder makes a good electric connection. When both the lead and the circuit board foil are heated at the same time, the solder will flow onto the lead and the foil evenly. The solder will then make a good electrical connection between the lead and the foil.

Solder flows outward and gradually blends with the foil and lead.

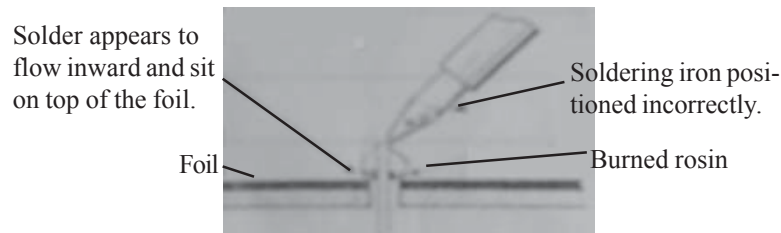


When the lead is not heated sufficiently, the solder will not flow onto the lead as shown in the picture. Reheat the connection and, if necessary apply a small amount of additional solder to obtain a good connection.

Solder does not flow onto lead. A dark bead surrounds and insulates the lead from the connection.



When the foil is not heated enough, the solder will blob on the circuit board as shown. Reheat the connection and, if necessary, apply a small amount of additional solder to obtain a good connection.



Be sure you did not make any solder bridges. Due to the small foil area around the circuit board holes and the small areas between foils, you must use utmost care to prevent solder bridges between adjacent foil areas.



A solder bridge between two adjacent foils.

A solder bridge may occur if you accidentally touch an adjacent connection. If you use too much solder or “drag” the soldering iron across other foils as you remove it from the connection. Always take a good look at the foil area around each lead before you solder it. Then, when you solder the connection, make sure the solder remains in this area and does not bridge to another foil. This is important when the foils are small and close together.

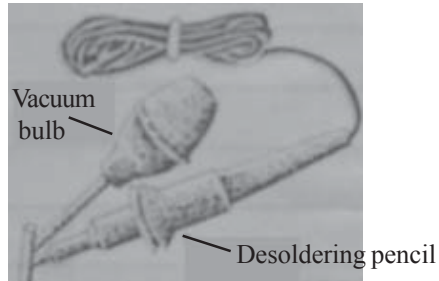


How the connection should appear

## Printed Circuit Desoldering

It is sometimes necessary to remove a defective part from a printed circuit board. This can be difficult to do when the part has several leads. Several tools and aids have been developed to make the job easier. There are two popular vacuum type tools for this job. The vacuum desoldering pencil melts the joints, and then

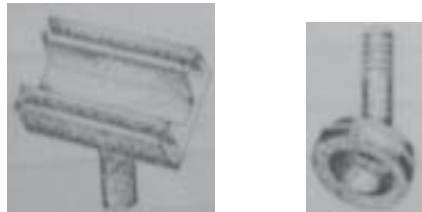
the bulb is released to draw the solder off of the board.



After all the leads have been desoldered, the part can be removed. A separate vacuum desoldering bulb can be used with a separate soldering pencil to accomplish the same job.



Some technicians prefer to heat all the connections of a component at the same time. This will also allow removal of the part. Special desoldering tips are available to accomplish this. Different tip styles are needed for the various transistor and integrated circuit parts.



Yes, another technique is to use finely braided wire.

Self-check:

1. What precautions should be observed to avoid “bridges” between foils?
2. What precautions should be observed to avoid damage to the foil on PCB?
3. What is the effect of leaving solder nuggets on PCB?
4. Why is there need to practice soldering?

## LET'S SUMMARIZE

To develop accurate soldering, be sure the solder made a good electric connection. When both the lead and the circuit board foil are heated at the same time, the solder will flow onto the lead and the foil evenly. The solder will then make a good electrical connection between the lead and the foil. When the lead is not heated sufficiently, the solder will not flow onto the lead. Reheat the connection and if necessary apply a small amount of additional solder to obtain a good connection.

## POSTTEST

Directions: Read each statement carefully and write the letter of the best answer on the blank before each number.

- \_\_\_\_\_ 1. The ideal wattage of soldering iron for beginners.
  - a. 100 watts
  - b. 40 watts
  - c. 30 watts
  - d. 60 watts
  
- \_\_\_\_\_ 2. The least type of soldering lead used in soldering components.
  - a. 30-70
  - b. 40-60
  - c. 50-50
  - d. 60-40
  
- \_\_\_\_\_ 3. Tool used in desoldering of components.
  - a. flux remover
  - b. file
  - c. sandpaper
  - d. desoldering pump
  
- \_\_\_\_\_ 4. Tool used to hold components and serve as heat sink.
  - a. long or needle nose plier
  - b. electrical plier
  - c. diagonal cutter
  - d. mechanical plier
  
- \_\_\_\_\_ 5. Cleaning supply needed in soldering.
  - a. flux remover
  - b. file

- c. sandpaper
- d. desoldering adaptor

## KEY TO CORRECTION

### Pretest

- 1. b
- 2. b
- 3. c
- 4. d
- 5. a

### Posttest

- 1. c
- 2. d
- 3. d
- 4. a
- 5. a