

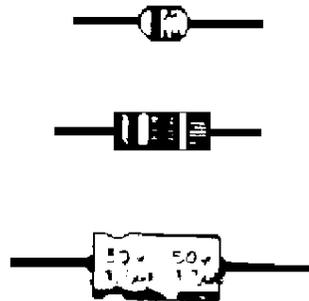
Printed Circuit Board Assembly Techniques

Component Identification and Mounting:

Axial and radial lead components (resistors, capacitors, inductors - passive components) are commonly used on PCBs. Lead configuration is dependent on available real-estate.

Axial - leads from opposite ends of the component.

Radial - leads from one end of the component.



Radial Lead

Axial Lead

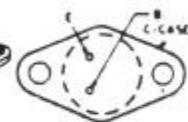
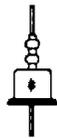
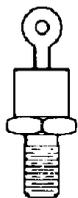
Diodes, transistors and integrated circuit (ICs) components are identified by a standardized package identification system.

Example: semiconductor diodes — DO (diode outline) i.e. DO-7

transistors — TO (transistor outline) i.e. TO-3, TO-5

integrated circuit — DIP (dual-in-line-package)

LSI (large-scale-integration)



DO Cases

TO5

TO3

Populating the PCB:

(1) Prior to component assembly the PCB, and component leads, must be cleaned. Oxidation builds up over time, and must be removed. Poor soldering connections will result, if the component leads and PCB pads are not free from oxides.

(2) Place the printed circuit board in a clamp or PCB Holder (third hand). This will help to hold the PCB steady while you complete the soldering operation. All components are normally mounted to one side (insulated side) of the PCB.

(3) Normally the first components populating the PCB are the smallest axial lead types - resistors, capacitors, diodes. On single sided boards these components normally lay flush against the insulated side of the printed circuit board. Where space is extremely critical on a PCB, axial lead components may be mounted vertically.

(4) All axial lead components must have a bend allowance formed at each end prior to insertion, to minimize stress on the component and their leads, and to allow the component to pass through predrilled holes to the foil for electrical connection. Bending the component lead against the body of the component may destroy the component. Long Nose pliers may be used to create this bend allowance.

(5) There are two methods to hold the component in the board for the purpose of soldering, (a) Once through the board, the leads are (clinched) bent (30°) in the direction of the terminal pad entry, which will keep the component from slipping out. Full clinching of the leads of the component is not recommended as this will make it much harder to remove the component for possible service.

(b) Once through the board, place a thin soft static free sponge or foam on the top of the components. This will keep the component from slipping out as you turn the board and sponge face down on the bench.

(6) Only components that weigh $\frac{1}{16}$ ounce or less and/or dissipate less than 1 watt should be considered for flush mounting against the PCB. Heavier components must be provided with some type of mechanical clamp.

(7) Components that generate more than 1 watt must be mounted above the PCB, since heat from these components tends to weaken the foil bond. Generally the distance above the board should be half the diameter of the body of the component.

- (8) Some semiconductor devices that generate heat will require a heat sink. The heat sink will absorb heat from the component and dissipate it through normal air convection. Heat sinks come in a variety of configurations and sizes.
- (9) Special attention must be paid to components which are marked with a specific polarity (capacitors, diodes), or a notch/number/letter (1C) for orientation.
- (10) Placing disc ceramic capacitors presents mounting problems due to their physical design. Whenever possible they should be mounted with the edge between the leads flush against the insulated side of the PCB with the leads passing straight through the board before bending. It may be necessary to fully clinch the leads of disc capacitors to secure them to the PCB prior to soldering.
- (11) Radial lead components were specifically designed for more efficient use of real-estate on the PCB. These components are normally mounted flush to the insulated side of the PCB, so that the access holes align with the base layout of the component, and the leads feed straight through the PCB. Where space is extremely critical on a PCB, radial lead components may be mounted horizontally.
- (12) On double sided PCBs where foil traces and pads appear on both sides of the PCB, insulated device spacers may be required for components that have metal case configurations, to prevent possible shorts between the component and the foil traces.
- (13) Device sockets should be used when mounting components to the PCB whenever possible. Device sockets allow for easy service, and prevent possible damage to components during the soldering operation.
- (14) If possible components which have identification stenciled on their bodies should be positioned on the PCB with the identification turned up to assist in the future service of the PCB.
- (15) Mounting small trim-pots and thumb-pots requires special consideration. The leads are in the form of rigid pins or tabs and may not be bent to hold them in place on the PCB prior to soldering. Usually the access holes for the pins are drilled for a press fit.
- (16) All components mounted on the PCB should be oriented in the same direction to facilitate reading component identification and/or values.