



UNESCO-NIGERIA TECHNICAL &
VOCATIONAL EDUCATION
REVITALISATION PROJECT-PHASE II



NATIONAL DIPLOMA IN COMPUTER TECHNOLOGY



Basic Hardware Maintenance

THEORY

COURSE CODE: COM 223

**THEORY: YEAR2, SEMESTER2, VERSION1:
DECEMBER 2008**

Week 1

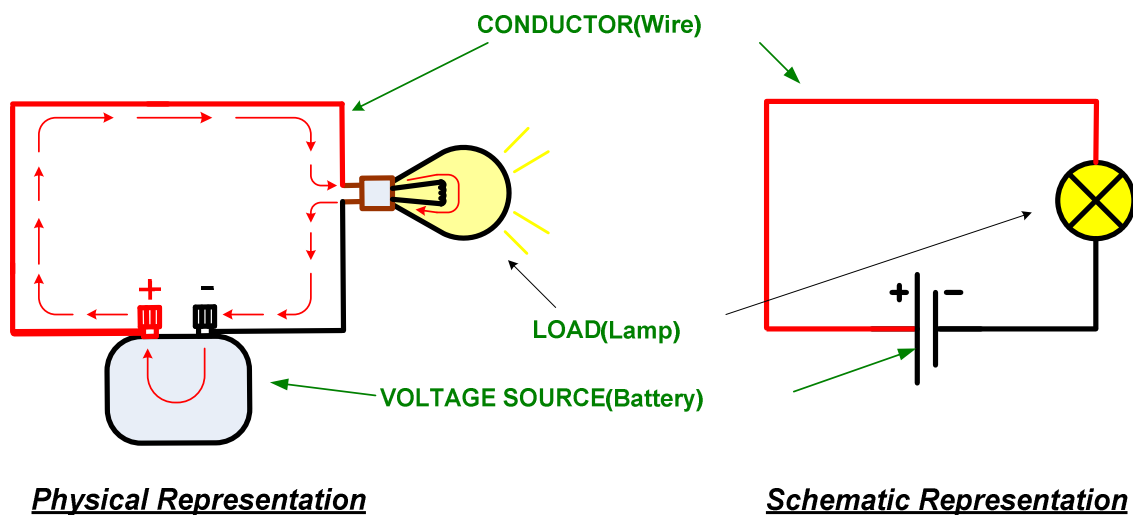
The Basic Common Electronic theory

Introduction

A complete circuit is needed before voltage can cause the current to flow through the load to perform work. A simple electric circuit consists of .¹

1. Voltage source (e.g. battery)
2. Load (e.g. lamp)
3. Path for the current between the power supply and the load (e.g. wire).

The following figure shows a simple electric circuit with its schematic representation. Also it can be seen from the figure (2-1) the flow of the current.



Figure(2-1) :A simple electric circuit

Basic Concepts

The three main concepts in electricity are voltage, current and resistance. Voltage or potential difference can be thought of as the driving force (although it is not really a "force") behind the electric current . In the water analogy , in figure(2-2), you can think of voltage as the pressure difference created by a pump

¹ :Consist of: يتكون من

that causes the water to flow through the pipe in the water system. Also you can think of the electrons flow in the electric circuit as equivalent to the flow of the water in the pipes that caused by the pump.

Another important concept in electricity is resistance. Its Property of a material that opposes the flow of electrons through it.

Resistance in a material is a result of the collision of electrons with the atoms and with each other as they move. The collisions produce heat, increasing the temperature of the material .This can be useful in some application such as the filament lamp.

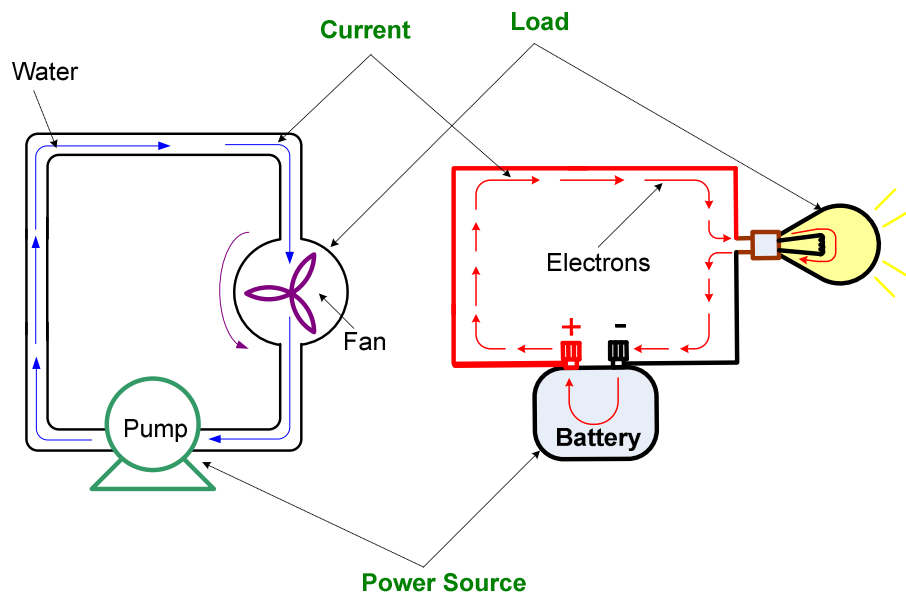


Figure (2-2) water analogy

The following table contain brief definitions to the electric concepts with their units.

The relationship between voltage, current, and resistance in an electrical circuit is fundamental to the operation of any circuit or device. It can be related mathematical in a law called Ohms law.

$$V = I \times R$$

Term	Definition	Unit
Voltage(V)	The electrical "pressure" that causes free electrons to flow through an electrical circuit.	Volt (V)
Current(I)	Flow of electrons	Ampere(A)
Resistance(R)	Opposition of the materials to the flow of the electric current through it.	Ohm(Ω)

Table (2-1): Electrical quantities definitions

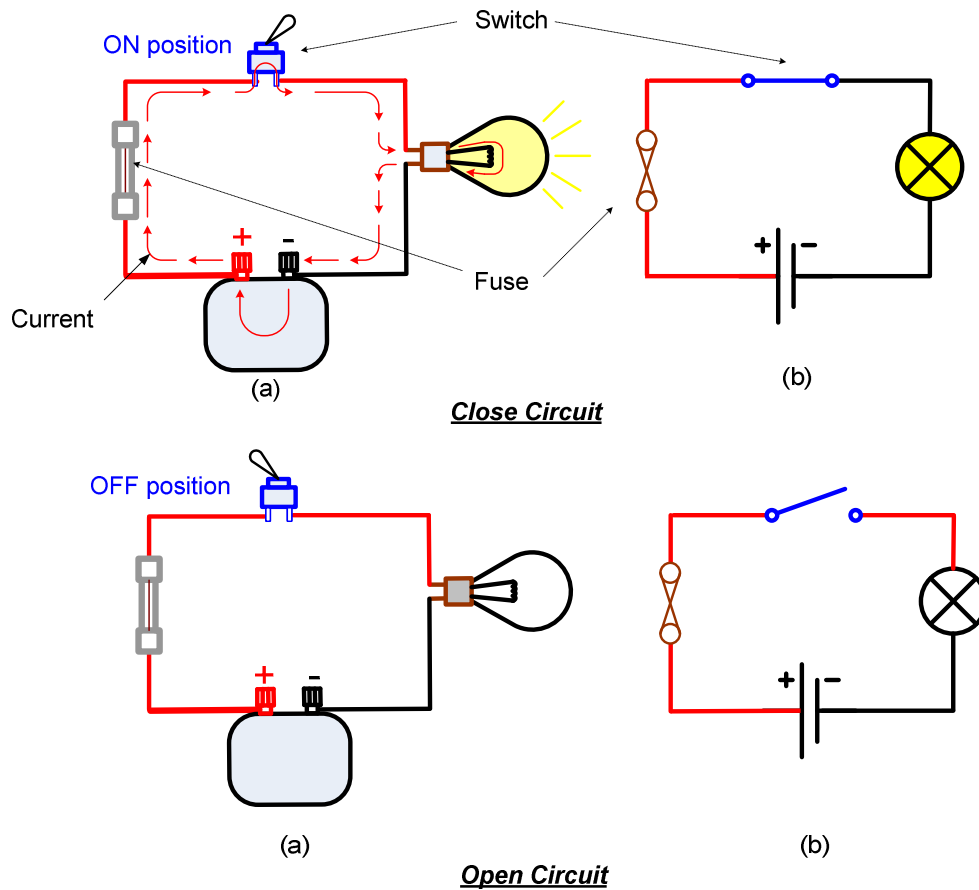
To make the previous² circuit more practical, a **switch** and a simple **fuse** can be added as it can be seen in the following figure. The purpose of the switch is to open or close the circuit I.e. to control the circuit. Note in the next figure when the circuit is **close** the light is on, and when the circuit is **open** the light is off.

The purpose of the fuse is to open the circuit when the current exceeds the limit i.e. for protection.

السابق : Previous: ²

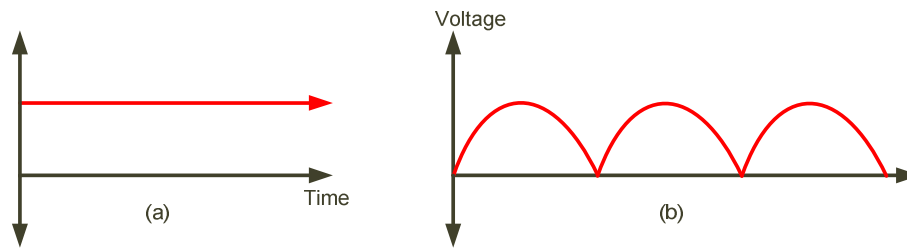
2.3 Voltage Source

Voltage sources can cause two type of currents to flow in the circuit. They are Direct Current (DC) and Alternating current (AC). In DC current the current flow in one direction and in the AC current the current flows in two directions as shown in figure (2-3).

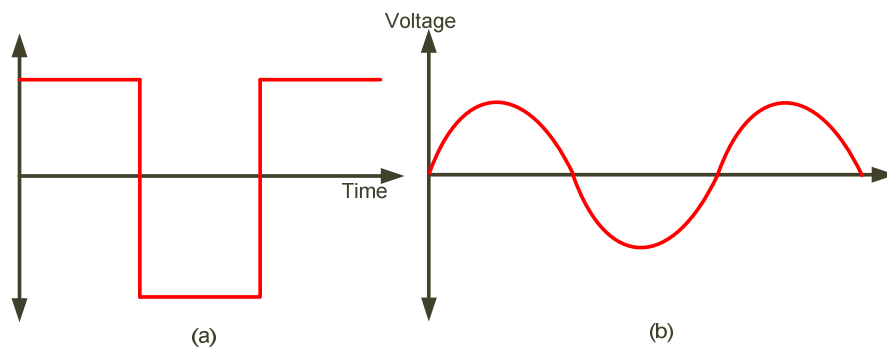


Figure(2-3) :A simple electric circuit with a switch and a fuse

Example of DC voltage source is batteries and photocells. Examples of AC current are AC generators and socket outlets.



DC voltages waveforms



AC voltages waveforms

Figure(2-4):DC and AC waveforms

General scheme symbols is used to indicate placement of meters in circuit when value changes need to be shown. Figure (2) shows meter symbols used to present the different meters, as voltmeter, ammeter and ohmmeter.

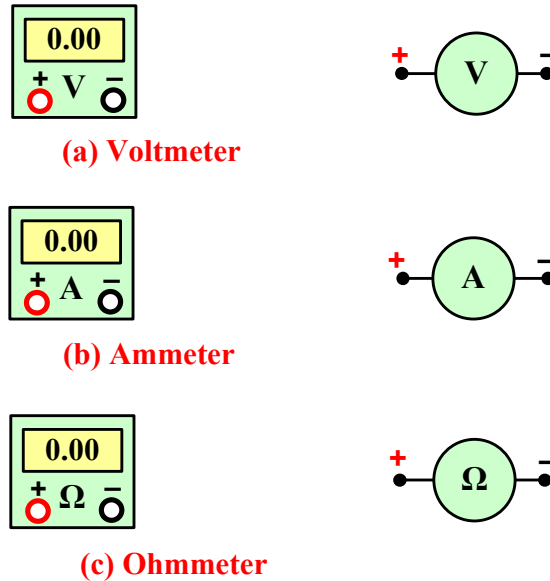


Figure (2) Meter symbols

2.1.1 How to use Analogue meter:

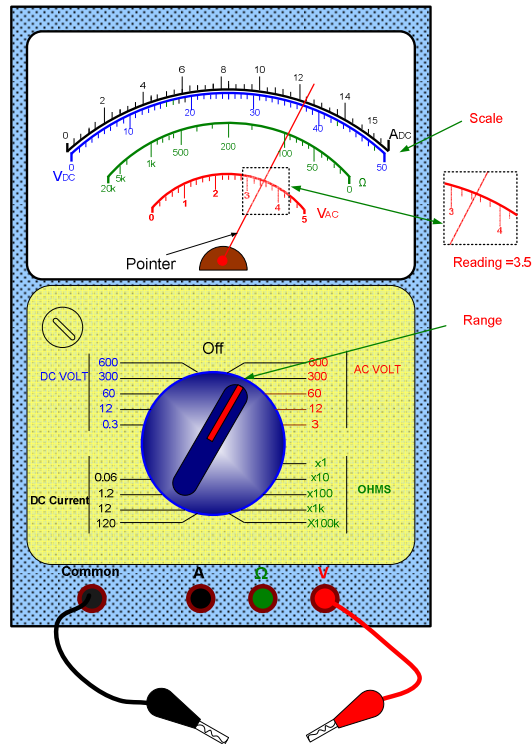
Figure (3) shows a typical multimeter. This device can measure the three electric quantities. The following steps show how to obtain readings from a multimeter.

1. Set the range of the desired quantity to be measured to the highest value.
2. Connect the leads to the right terminals at the meter
3. Switch on the circuit if necessary.
4. Adjust the range until you get clear readings.
5. Apply the following formula to obtain the measured quantity.

$$\text{Reading} \times \frac{\text{Range}}{\text{Full - Scale}}$$

For example, referring to figure (3), the reading was 3.5 from a full-scale value of 5V, as shown in the small box. The range was set to X300V. So the measured voltage is

$$3.5 \times \frac{300}{5} = 210$$



Figure(3): Multimeter

Note:

The scale has to be viewed from an angle perpendicular to it.

Measuring the Voltage

Voltage can be considered as the pressure that forces the electrons to flow. The voltage is being measured by measuring the difference between the voltages at the two terminals of the device-under-test which is the (voltage drop). This can be performed using a measuring instrument called voltmeter.

Figure (1) illustrates how to connect voltmeter in the circuit to measure the voltage across the resistor.

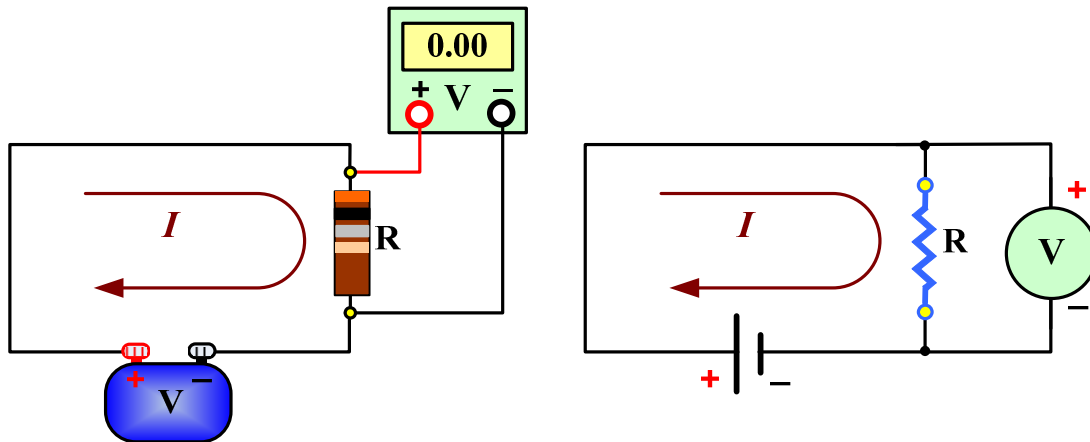


Figure (1) Example of a voltmeter connection

Procedure

1. Adjust the range of the meter
2. Connect the leads in the true terminals of the meter
3. Apply the other ends of the leads to the resistor under test
4. Record the reading and apply the formula $Reading \times \frac{Range}{full - scale}$

Measuring Current with Ammeter

It is well known that current in the circuit is measured by ammeter, to measure the current, the circuit must be open and the ammeter is connected in *series* the circuit.

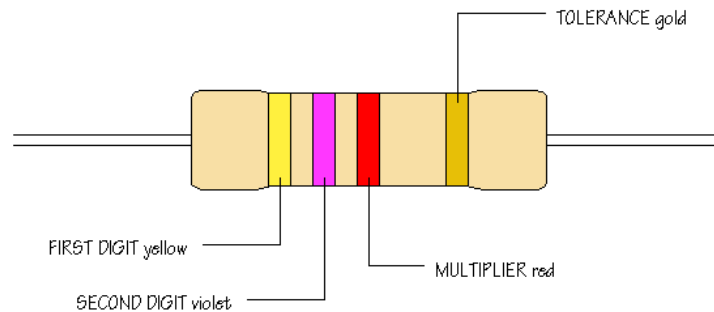
Procedure

1. Connect the simple circuit shown in the figure below
2. Open the circuit between the source and the resistor
3. Connect the ammeter terminals to one end of the resistor and to the source
4. Switch on the power supply and record the reading.
5. Apply the formula $Reading \times \frac{Range}{full - scale}$ if necessary

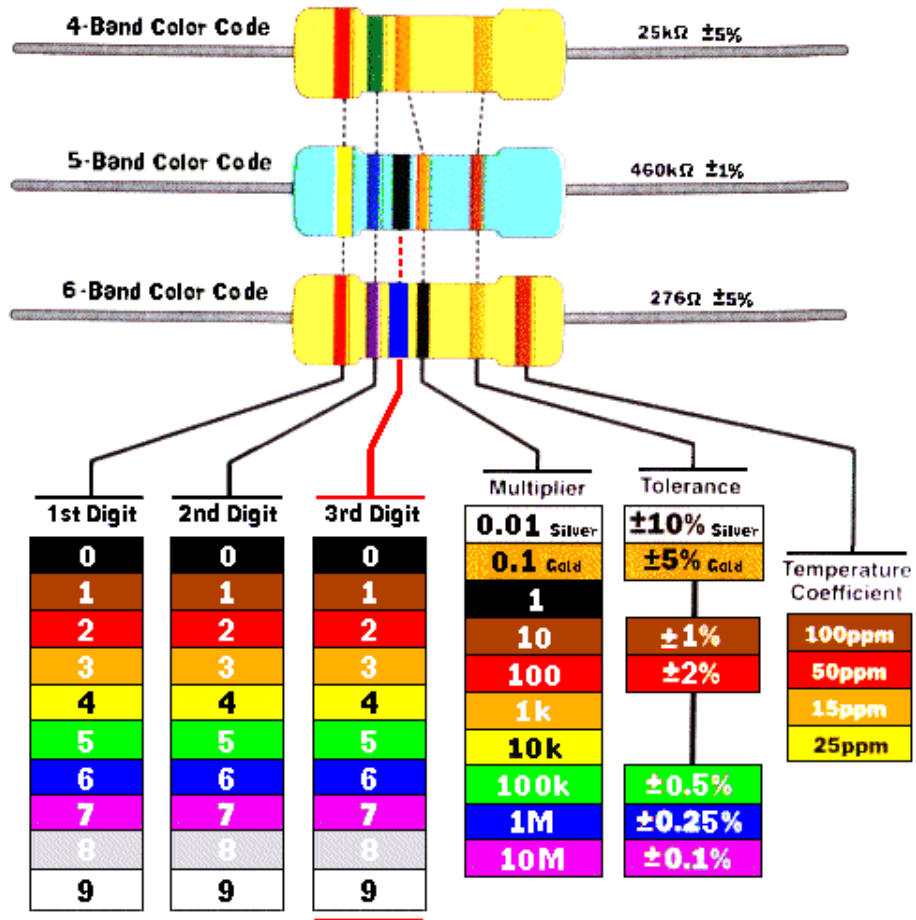
Note:

If the meter did not give any movement or tried to move backward, then switch the terminal leads with each other

The first band on a resistor is interpreted as the **FIRST DIGIT** of the resistor value. For the resistor shown below, the first band is yellow, so the first digit is 4:



The second band gives the **SECOND DIGIT**. This is a violet band, making the second digit 7. The third band is called the **MULTIPLIER** and is not interpreted in quite the same way. The multiplier tells you how many types of nougat you should write after the digits you already have. A red band tells you to add 2 nougats. The value of this resistor is therefore 4 7 0 0 ohms, that is, 4700 Ω , or



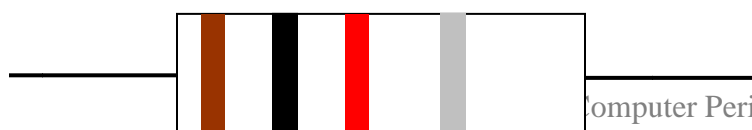
Be Careful when reading 5 and 6 Band Resistors

Note: the 3rd Digit is not used when reading the 4 band resistor

4.7 ~~k~~ Ω . Work through this example again to confirm that you understand how to apply the colour code given by the first three bands.

The remaining band is called the TOLERANCE band. This indicates the percentage accuracy of the resistor value. Most carbon film resistors have a gold-coloured tolerance band, indicating that the actual resistance value is with + or - 5% of the nominal value. Other tolerance colours are:

When you want to read off a resistor value, look for the tolerance band, usually gold, and hold the resistor with the tolerance band at its right hand end.



Reading resistor values quickly and accurately isn't difficult, but it does take practice!

For example

The resistor has brown (1), black (0), red (2 zeros) and silver bond. So its value is $1000\Omega = 1k\Omega$

Semiconductor Diode Recognition

Objectives:

To recognize their practical shape, check for forward bias and reverse bias in open and short circuit tests.

Introduction:

The diode is the simplest semiconductor devices but it plays a very vital role in electronic systems, with its characteristics that closely match those of a simple switch.

Tools and Equipment:

1. Multi-meters.
2. Power Supply.
3. Diodes of different types and shapes.

Procedure:

Step1. Recognize all diodes given to you, see the figure below.

Step2. Draw them, marking P and N terminals.





P.W. 9.2 Diode Test

Objectives:

To use multi-meter to check the diode for:

Forward bias & Reverse bias.

- A. Open Circuit.
- B. Short Circuit.

Tools and Equipment:

- 4. Multi-meters.
- 5. Power Supply.
- 6. Diodes of different types and shapes.

Practical Understand the Circuit Component Colour Code Resistor

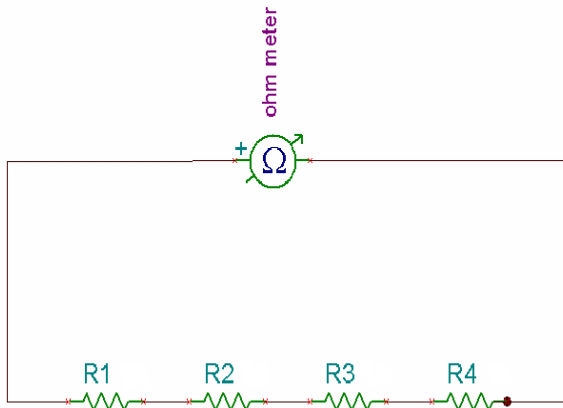
Objective:

1. To learn the electronic industries colour code.
2. To gain practice in the use of the OHMMETER.

The unit of resistance is the Ohm. The body of a fixed carbon resistor is a colour coded to specify its Ohmic value and tolerance. The first three bands on the resistor designated its resistance. The fourth band on the resistor designate its tolerance. High wattage, wire wound resistors are not colour but have the resistance and wattage value printed on their bodies.

Equipment and components:

- Ohmmeter.
- Four resistors of different values.



Procedure:

1. Determine the value of each resistor supplied from its colour code. Fill in the information required in table (1).
2. Zero the ohmmeter. Measure each resistor with the ohmmeter. Fill in the results in the table (1). Measured value. See the difference between the colour coded value and measured value.
3. Complete table (1).

Resistor	1 st colour	2 nd colour	3 rd colour	4 th colour	Colour code value	Measured value
R1						
R2						
R3						
R4						

R total (measured)		R total (colour) code	
--------------------	--	--------------------------	--

Resistor-Color-Code

BLACK		0	Multiplier
BROWN		1	_____0
RED		2	____00
ORANGE		3	____000
YELLOW		4	__0,000
GREEN		5	_00,000
BLUE		6	000,000
VIOLET		7	
GRAY		8	
WHITE		9	

EXAMPLE
47,000 Ohms
or
47-K Ω

1st Digit — 4
2nd Digit — 7
Multiplier — 000
Tolerance — 2% - Red

5% - Gold
10% - Silver

4 Band Color Code

Answer the following questions:

- Q1) What is the resistance of a short circuit?
- Q2) What is the resistance of an open circuit?
- Q3) What is the value of each type of the following resistor colour coded?

No:	1 st	2 nd	3 rd	4 th	Value
a	Red	Violet	Brown	Silver	
b	Orange	Blue	Yellow	Gold	
c	Brown	Red	Red	No colour	

Q4) What is the colour code for each of the resistor?

No:	1 st	2 nd	3 rd	4 th	Value

a					$39 \Omega \pm 5\%$
b					$5600 \Omega \pm 5\%$
c					$47000 \Omega \pm 5\%$

Resistance of Series-connected Resistors

Objective:

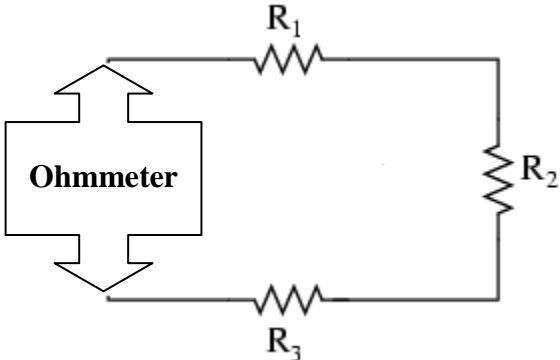
1. To Determine by experiment the total resistance of resistors connected in series.

A series circuit has only one path for electric current flow. Removing a series component "open" the circuit and stops current flow. The total resistance R_T of a circuit is equal to the sum of the values of the individual resistors. In radio , television and all electronics equipment there are many series components and circuits. A circuit is a closed path for electric current flow.

$$R_T = R_1 + R_2 + R_3 + \dots + R_n$$

Materials Required:

- 1) Multi-meter.
- 2) Resistors: all 1/2 watt, 330 Ω, 470 Ω, 1200 Ω, 2200 Ω, 3300 Ω and 4700 Ω.



Procedure:

- 1) Measure the resistance of each resistor supplied and record its value in the following table.
- 2) Connect series arrangement series circuit shown in the above figure. Arrange it as shown in the following table.
- 3) Record the measured value for each resistor in the table. Compute the total value and record it in the table.

Series Combination	Colour Coded Value	R_1 330 Ω	R_2 470 Ω	R_3 1200 Ω	R_4 2200 Ω	R_5 3300 Ω	R_6 4700 Ω	Measured R_T
Group A	Measured value, Ω	X		X		X		
Group B	Measured		X	X			X	

	value, Ω							
Group C	Measured value, Ω	X			X	X		

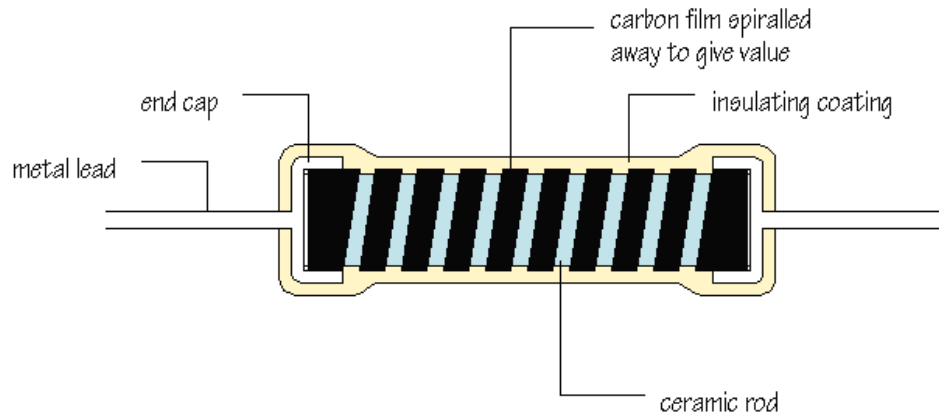
Questions:

- Q1) Were the computed values and the measured values of each combination of resistors equal? If not, Why not?.
- Q2) Five Resistors wired in series have a total resistance that greater than that of only four of the same resistors (True/False).

The basic principles of semiconductors

Fixed Resistor

Specification: - The diagram shows the construction of a **carbon film** resistor:

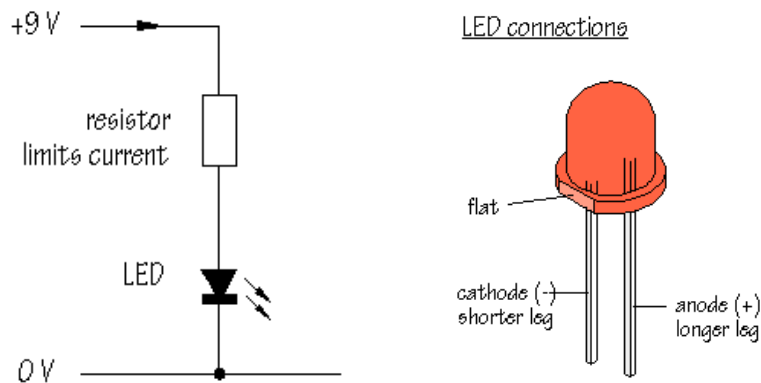


During manufacture, a thin film of carbon is deposited onto a small ceramic rod. The resistive coating is spiraled away in an automatic machine until the resistance between the two ends of the rod is as close as possible to the correct value. Metal leads and end caps are added; the resistor is covered with an insulating coating and finally painted with coloured bands to indicate the resistor value.

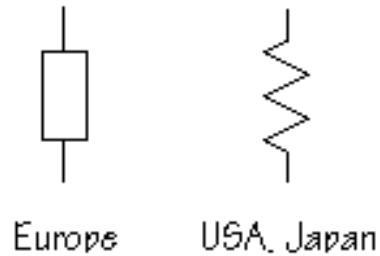
Carbon film resistors are cheap and easily available, with values within $\pm 10\%$ or $\pm 5\%$ of their marked or 'nominal' value. **Metal film** and **metal oxide** resistors are made in a similar way, but can be made more accurately to within $\pm 2\%$ or $\pm 1\%$ of their nominal value. There are some differences in performance between these resistor types, but none which affect their use in simple circuits.

Wire wound resistors are made by winding thin wire onto a ceramic rod. They can be made extremely accurately for use in millimeters, oscilloscopes and other measuring equipment. Some types of wire wound resistors can pass large currents without overheating and are used in power supplies and other high current circuits.

The Function: - Resistors limit current. In a typical application, a resistor is connected in series with an LED:



Enough current flows to make the LED light up, but not so much that the LED is damaged. The 'box' symbol for a fixed resistor is popular in the UK and Europe. A 'zigzag' symbol is used in America and Japan:



Resistors are used with **transducers** to make **sensor subsystems**. Transducers are electronic components which convert energy from one form into another, where one of the forms of energy is electrical. A **light dependent resistor**, or **LDR**, is an example of an **input transducer**. Changes in the brightness of the light shining onto the surface of the LDR result in changes in its resistance. As will be explained later, an input transducer is most often connected along with a resistor to make a circuit called a **potential divider**. In this case, the output of the potential divider will be a voltage signal which reflects changes in illumination.

Microphones and switches are input transducers. **Output transducers** include loudspeakers, filament lamps and LED's. Can you think of other examples of transducers of each type?

In other circuits, resistors are used to direct current flow to particular parts of the circuit, or may be used to determine the voltage gain of an amplifier. Resistors are used with capacitors (Chapter 4) to introduce time delays.

Most electronic circuits require resistors to make them work properly and it is obviously important to find out something about the different types of resistor available, and to be able to choose the correct resistor value, in Ω , $k\Omega$, or $M\Omega$, for a particular application.

Types of resistor:

There are two classes of resistors

- Fixed resistors
- Variable resistors

They are also classified according to the material from which they are made.

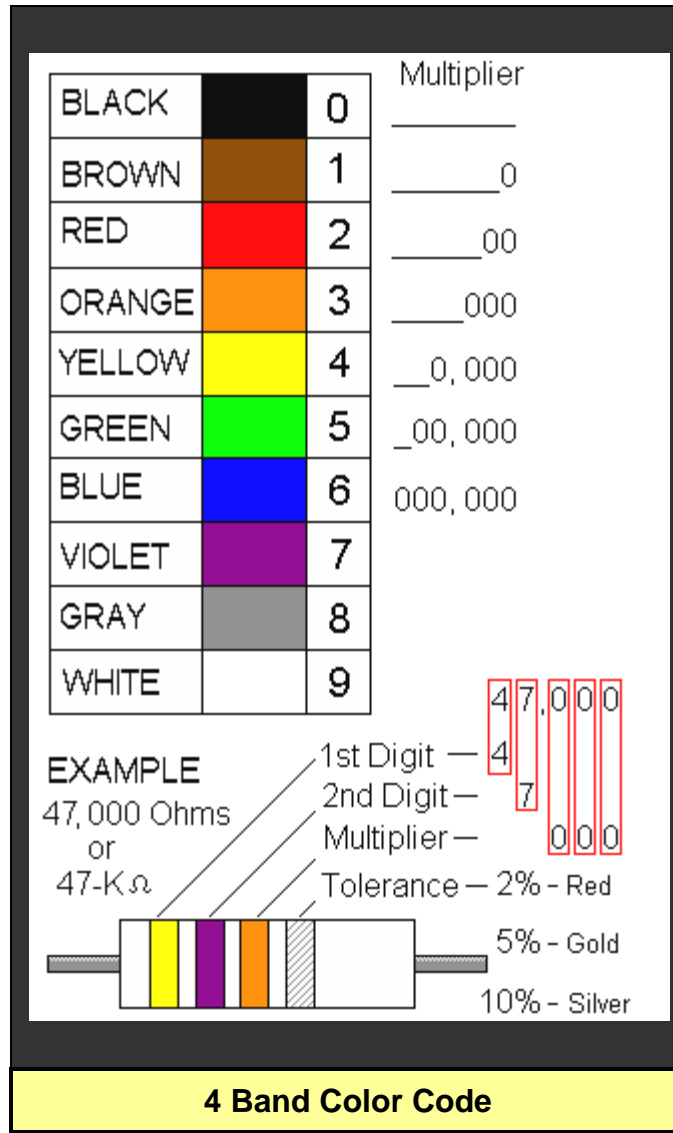
- Carbon
- Film
- Wire wound
- Axial lead

There are other types as well, but these are the most common.

Colour code:-

How can the value of a resistor be worked out from the colours of the bands?
Each colour represents a number according to the following scheme:

Resistor-Color-Code



The diode testing

Objective:

To test the semiconductor diode with a Digital multimeter.

Introductory information:

Being able to determine the polarity (cathode versus anode) of a diode is a very important skill, using a DC (battery-powered) ohmmeter, Connected one way across the diode, the meter should show a very low resistance, Connected the other way

across the diode, it should show a very high resistance ("OL" on some digital meter models) as shown in fig. (1.1):

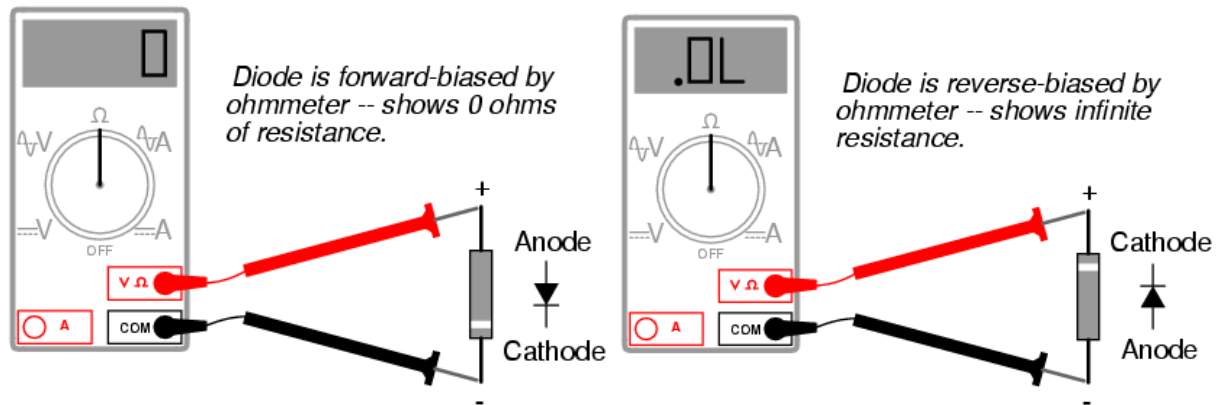


Fig. (1.1)

Of course, in order to determine which end of the diode is the cathode and which is the anode, you must know with certainty which test lead of the meter is positive (+) and which is negative (-) when set to the "resistance" or "Ω" function. With most digital multimeters, the red lead becomes positive and the black lead negative when set to measure resistance; in accordance with standard electronics color-code convention. However, this is not guaranteed for all meters. Many analog multimeters, for example, actually make their black leads positive (+) and their red leads negative (-) when switched to the "resistance" function, because it is easier to manufacture it that way.

Some digital multimeter manufacturers equip their meters with a special "diode check" function which displays the actual forward voltage drop of the diode in volts, rather than a "resistance" figure in ohms, as shown in fig. (1.2) for example. These meters work by forcing a small current through the diode and measuring the voltage dropped between the two test leads:



Fig (1.2) Digital multimeters

The forward voltage reading obtained with such a meter will typically be less than the "normal" drop of 0.7 volts for silicon and 0.3 volts for germanium as shown in fig. (1.3), because the current provided by the meter is of trivial proportions.

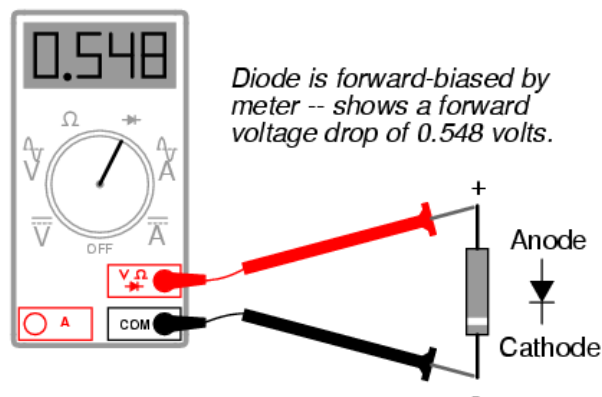


Fig. (1.3)

Equipment and materials:

- 1- *Digital multimeter.*
- 2- *Diodes of different types and shapes.*

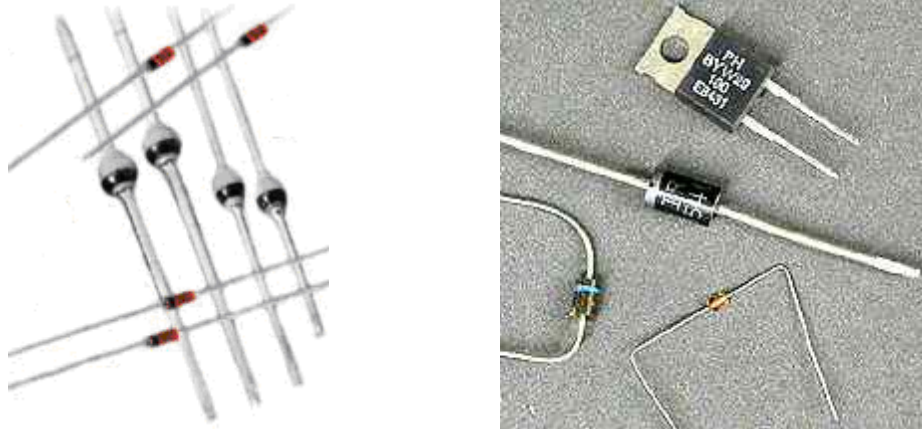


Fig. (1.4) different types of the diodes

Procedure:

- 1- Determine the type of the multimeter
 - a- A Digital multimeter without diode check.
 - b- A Digital multimeter with diode check.
 - c- A Digital multimeter with diode check and transistor check.
- 2- If the Digital multimeter without diode checks, Set the meter to Ω position.
- 3- Measure the diodes given to you in forward and reverse bias and record in the table in your work book.
- 4- Define which diode is good and which is faulty, and define the type of faulty (open circuit or short circuit).
- 5- If the Digital multimeter with diode checks, Set the meter to \rightarrow position.

6- Measure the diodes given to you and record the results in the table in your work book.

7- Define which diode is good and which is faulty, and define the type of faulty (open circuit or short circuit).

Table 1: The Digital multimeter without diode check

Diode No.	Forward reading	Reverse reading	The results		
			Good	Faulty: OC.	Faulty: SC.
1					
2					
3					
4					

Table 2: The Digital multimeter with diode check

Diode No.	The reading	The results		
		Good	Faulty: OC.	Faulty: SC.
1				
2				
3				
4				

P.W.1.2: The transistor testing

Objectives:

1- To test the transistors with a Digital multimeter.

Introductory information:

Bipolar transistors are constructed of a three-layer semiconductor "sandwich," either PNP or NPN. As such, they register as two diodes connected back-to-back when tested with a multimeters "resistance" or "diode check" functions:

Assuming the use of a multimeter with only a single continuity range (resistance) function to check the PN junctions. Some multimeters are equipped with two separate continuity check functions: resistance and "diode check," each with its own purpose. If your meter has a designated "diode check" function, use that rather than the "resistance" range, and the meter will display the actual forward voltage of the PN junction and not just whether or not it conducts current.

Meter readings will be exactly opposite, of course, for an NPN transistor, with both PN junctions facing the other way. If a multimeter with a "diode check" function is used in this test, it will be found that the emitter-base junction possesses a slightly greater forward voltage drop than the collector-base junction. This forward voltage difference is due to the disparity in doping concentration between the emitter and collector regions of the transistor: the emitter is a much more heavily doped piece of semiconductor material than the collector, causing its junction with the base to produce a higher forward voltage drop. Knowing this, it becomes possible to determine which wire is which on an unmarked transistor. This is important because transistor packaging, unfortunately, is not standardized. All bipolar transistors have three wires, of course, but the positions of the three wires on the actual physical package are not arranged in any universal, standardized order.

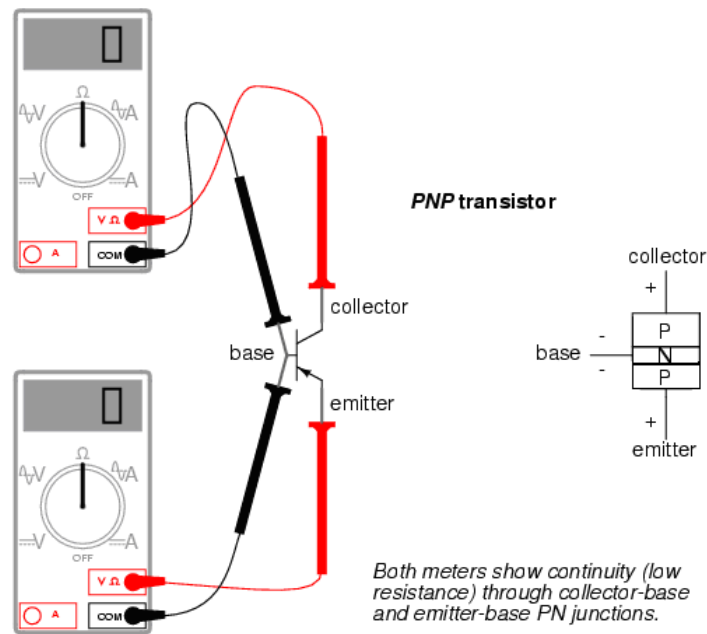


Fig. (2.1) testing the transistor in forward bias.

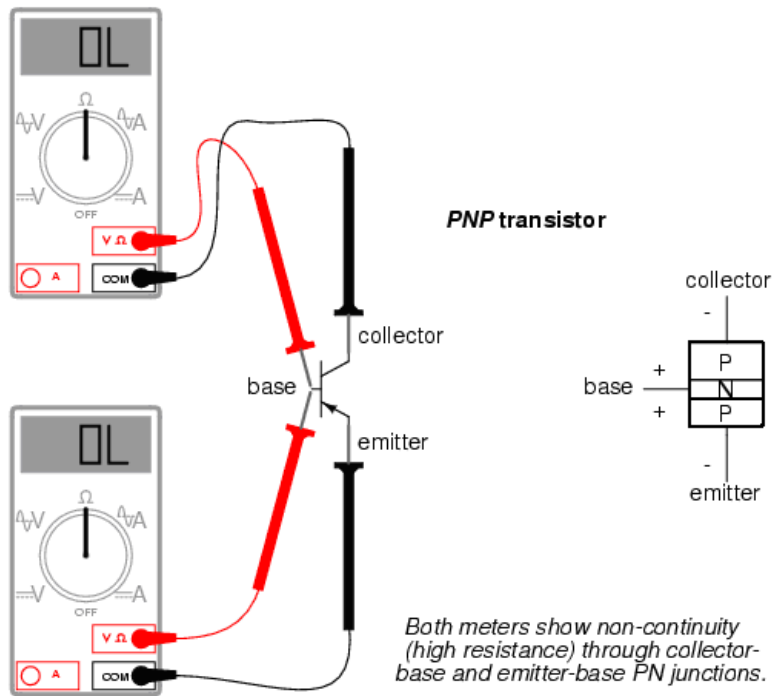


Fig. (2.2) testing the transistor in reverse bias.

Measuring an unknown bipolar transistor:

Suppose a technician finds a bipolar transistor and proceeds to measure continuity with a multimeter set in the "diode check" mode. Measuring between pairs of wires and recording the values displayed by the meter, the technician obtains the following data:

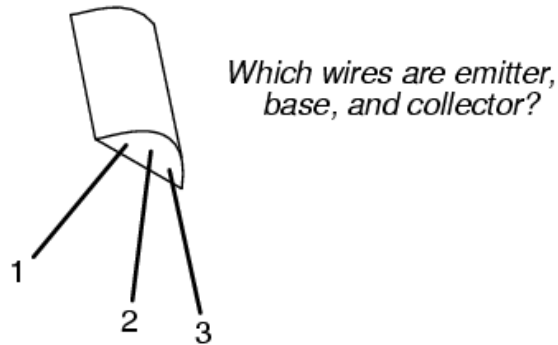


Fig. (2.3) unknown bipolar transistor

- Meter touching wire 1 (+) and 2 (-): "OL"
- Meter touching wire 1 (-) and 2 (+): "OL"
- Meter touching wire 1 (+) and 3 (-): 0.655 volts
- Meter touching wire 1 (-) and 3 (+): "OL"
- Meter touching wire 2 (+) and 3 (-): 0.621 volts
- Meter touching wire 2 (-) and 3 (+): "OL"

The only combinations of test points giving conducting meter readings are wires 1 and 3 (red test lead on 1 and black test lead on 3), and wires 2 and 3 (red test lead on 2 and black test lead on 3). These two readings *must* indicate forward biasing of the emitter-to-base junction (0.655 volts) and the collector-to-base junction (0.621 volts).

Now we look for the one wire common to both sets of conductive readings. It must be the base connection of the transistor, because the base is the only layer of the three-layer device common to both sets of PN junctions (emitter-base and collector-base). In this example, that wire is number 3, being common to both the 1-

3 and the 2-3 test point combinations. In both those sets of meter readings, the *black* (-) meter test lead was touching wire 3, which tells us that the base of this transistor is made of N-type semiconductor material (black = negative). Thus, the transistor is a PNP type with base on wire 3, emitter on wire 1 and collector on wire 2:

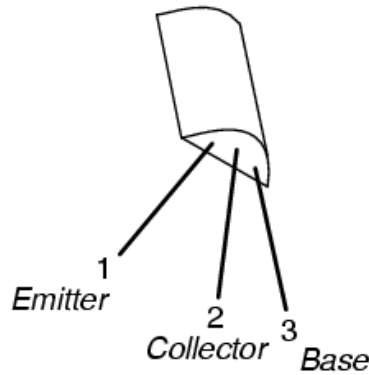


Fig. (2.4)

Please note that the base wire in this example is *not* the middle lead of the transistor, as one might expect from the three-layer "sandwich" model of a bipolar transistor. This is quite often the case, and tends to confuse new students of electronics. The only way to be sure which lead is which is by a meter check, or by referencing the manufacturer's "data sheet" documentation on that particular part number of transistor.

Knowing that a bipolar transistor behaves as two back-to-back diodes when tested with a conductivity meter is helpful for identifying an unknown transistor purely by meter readings. It is also helpful for a quick functional check of the transistor. If the technician were to measure continuity in any more than two or any less than two of the six test lead combinations, he or she would immediately know that the transistor was defective (or else that it *wasn't* a bipolar transistor but rather something else -- a distinct possibility if no part numbers can be referenced for sure identification!). However, the "two diode" model of the transistor fails to explain how or why it acts as an amplifying device.

Measuring a bipolar transistor

Equipment and materials:

- 1- Digital multimeter.
- 2- Transistors of different types and shapes.

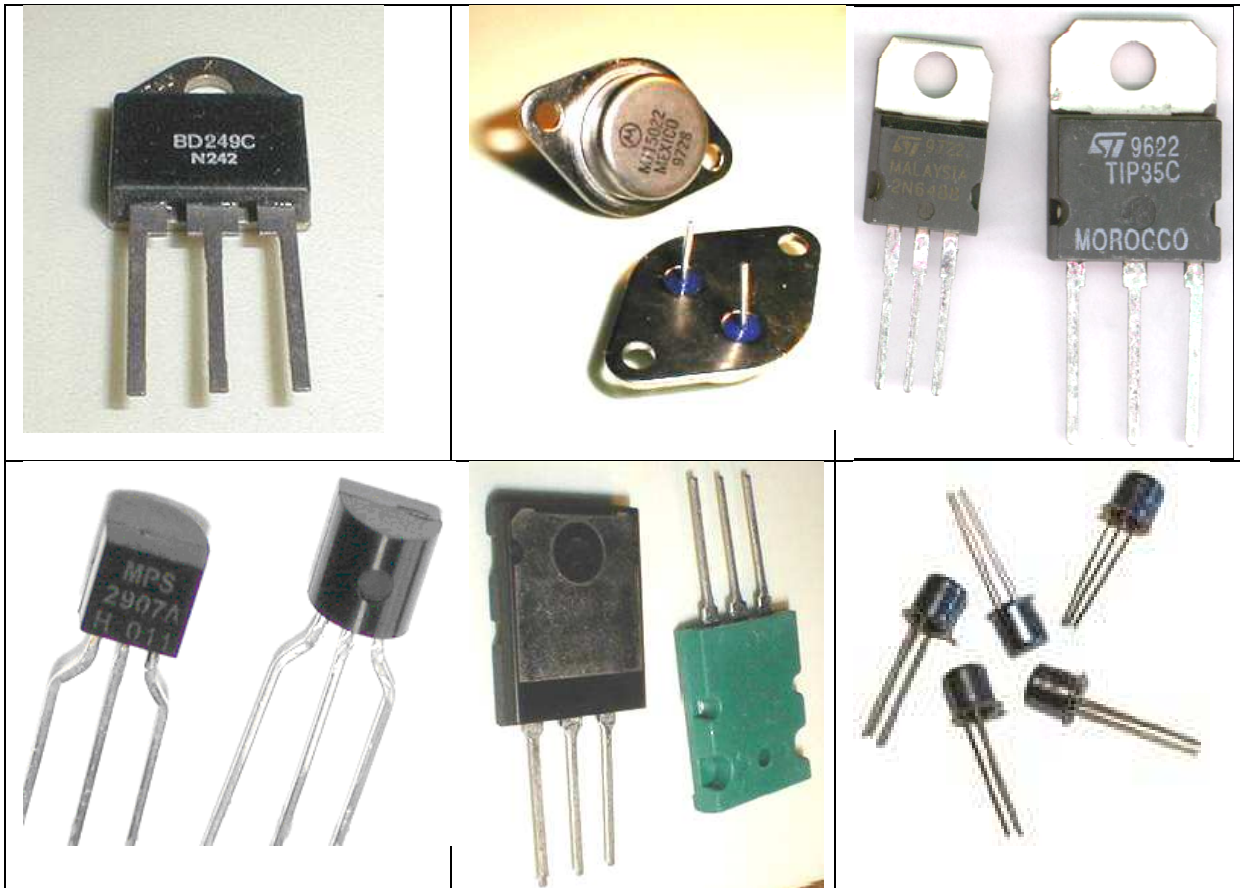


Fig. (2.5) Transistors of different types and shapes.

Procedure:

- 1- Determine the type of the multimeter
 - a- A Digital multimeter without diode check.
 - b- A Digital multimeter with diode check.
 - c- A Digital multimeter with diode check and transistor check.

2- If the Digital multimeter without diode checks, Switch the meter to Ω position.

3- Measure the transistors given to you in forward and reverse bias and record in the table 1.

4- Define which transistor is good and which is faulty, and define the type of faulty.

5- If the Digital multimeter with transistor checks, Switch the meter to h_{fe} position.

6- Determine the type of the transistor, NPN or PNP.

7- Determine the transistor terminals (Base, Emitter, and Collector).

8- Put the transistor terminals in the suitable holes, and read the meter display, and record the results in the table 2.

9- Define which transistor is good and which is faulty, and define the type of faulty.

Table 1: The Digital multimeter without Transistor check

Tr. No.	Forward reading	Reverse reading	The results		
			Good	Faulty: OC.	Faulty: SC.
1					
2					
3					
4					

Table 2: The Digital multimeter with Transistor check

Tr. No.	The reading	The results		
		Good	Faulty: OC.	Faulty: SC.
1				
2				
3				
4				

Measuring an unknown bipolar transistor

Equipment and materials:

- 1- Digital multimeter.
- 2- Transistors of different types and shapes.

Procedure:

- 1- If the Digital multimeter without diode checks, Switch the meter to Ω position.
- 2- Number the transistor terminals given to you, wire 1, wire 2, and wire 3.
- 3- Measure the transistors given to you and record in the table 1.
- 4- Define the transistor terminals.
- 5- Define the transistor type and record in the table 1.
- 6- Measure the unknown transistors given to you and record the results in the table 2.
- 7- Define which transistor is good and which is faulty, and define the type of faulty.

Table 1: Testing a properly transistor

Tr. NO.	1 +	1 -	1 +	1 -	2 +	2 -	Terminal name			Tr. type	
	2 -	2 +	3 -	3 +	3 -	3 +	wire 1	wire 2	wire 3	NPN	PNP
1											
2											
3											
4											

To use Basic Measuring Equipment

5.1 Removing conductor insulation

Removing conductor insulation is one of the important required practices for students at this stage. It is required for any electric work. Before conductors can be joined or connected to some electrical device, the conductor insulation must be removed. About 10 mm of exposed conductor will be adequate for making connections.

Tools: will be used here are

- Stripper.
- Pliers.
- Knife.

a) using a wire stripper :

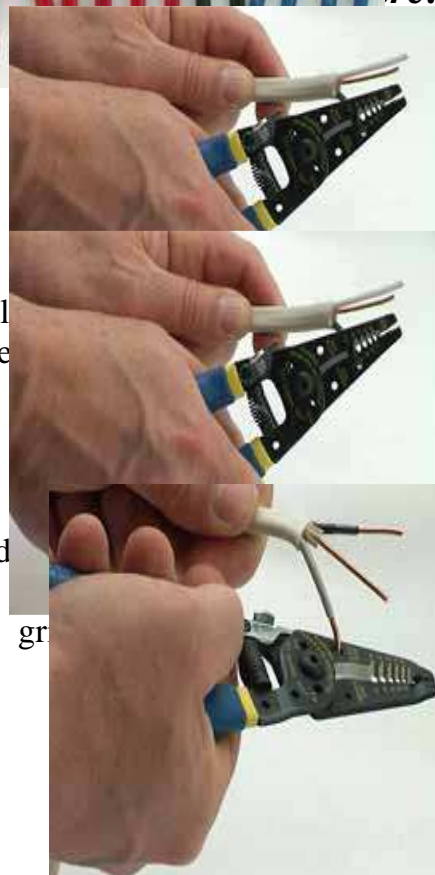
Figure (1) shows different types of a wire stripper



re:

Step2 : To make a clockwise rotation of the stripping tool

Step3 : Push the stripping tool forward



gr

other side of the cut and pull the insulation.

b) using a utility Knife

Step 1 : Using a utility knife
of having to buy another
Bend the sheathing

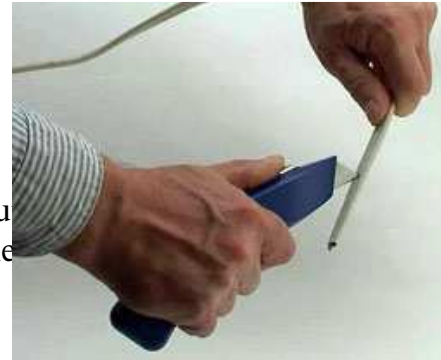
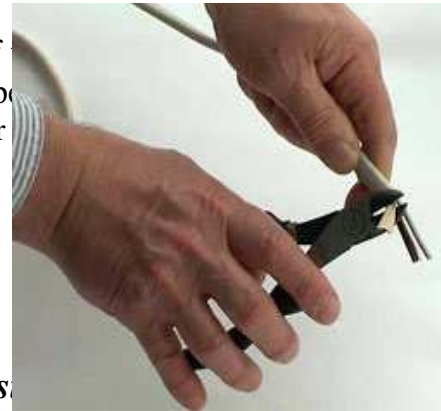


Fig. (5)

Step 2 : Slice off
paper
Use the stripper or



c) Using pliers

Note : Special care must be taken, when using

The conductor.

Step 1 : P
pl
t
pl



Step2 :

of the conductor and slide of the insulation.

5.3 Soldering lugs

The conductor is soldered into the lug, to improve the quality of an electrical connections between a wire and a screw or rivet. Most provide a hole to facilitate easier soldering of the wire to the lug.

In these practical work the student should be able to :

- Solder a different types and sizes of lugs connections.
- Connect it to a device or supply using bolts and nuts.

Materials:

- Different types of conductors.
- Different types of lugs.
- Soldering tools (soldering gun or soldering iron).
- Flux.
- Solder.
-

Tools:

- Stripper.
- Pliers.
- Knife.
- Screwdrivers.
-

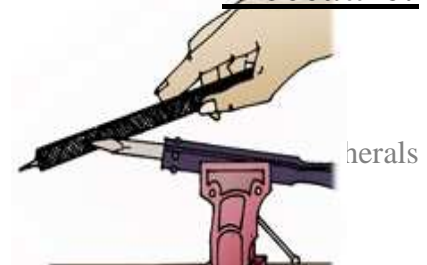
Diagrams:

The lugs are available in various styles for a variety of applications as shown in fig. (1).



Fig.(1) different types of lugs.

Procedure:



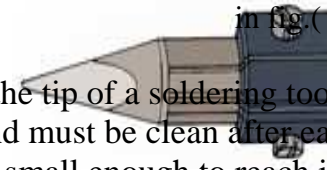
Step 1 : Strip the end of wire to a suitable length.

Step2 : Clean the exposed end of the conductor .

Step3 : Twist the conductor tightly in the direction of lay.

Step4 : Before soldering, file any corrosion from the top of the soldering iron or gun. As shown in fig (2).

Step5 : The shape of the tip of a soldering tool is also important, and must be clean after each use. It should be small enough to reach into every part to ensure that heat is transmitted to every part. See fig. (3)



Step 6 : Before beginning the soldering job, apply a thin, even coat of solder to the tip of soldering iron or gun. This coating process

is referred to as "tinning" (Fig. 4).



Fig. (4)

Note : Always be sure your soldering tool is at maximum heat to melt the solder.

Step7 : Ensure that, the inside of lug is clean.

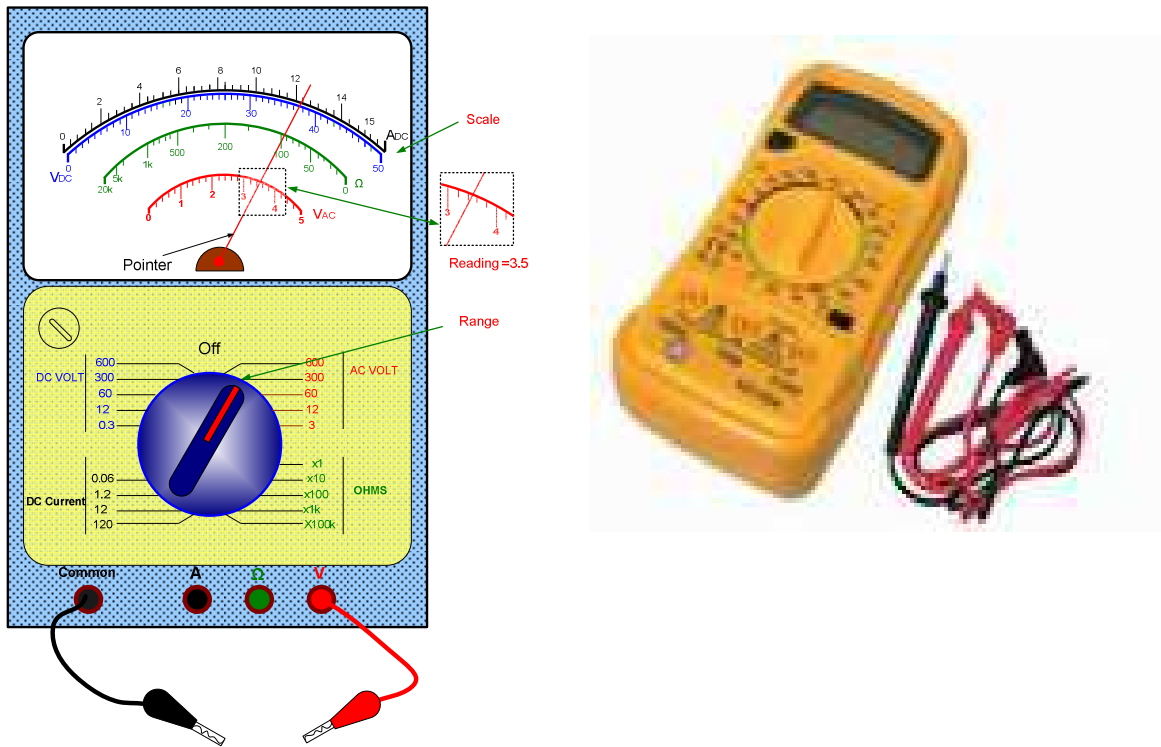
Step8 : Fill lug with the melted solder by using soldering iron and solder.

Step9 : Insert the end conductor into the lug vertically in the center of lug.

Step10 : Allow the soldered joint to cool completely.

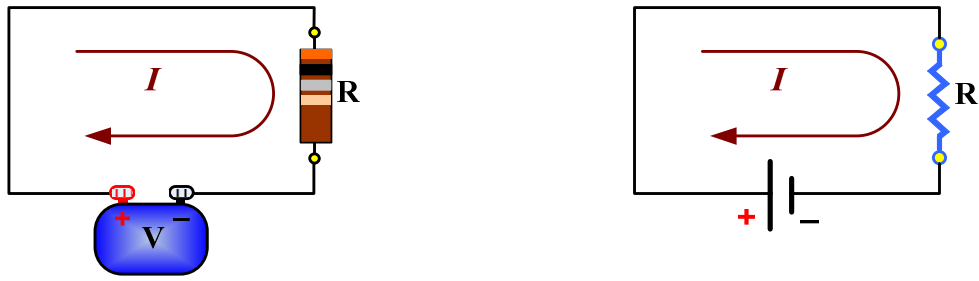
Step11 : Remove any surplus solder and lug is ready for connection. See fig. (2).

Note : A special crimping tools, can be used to connect the cable with

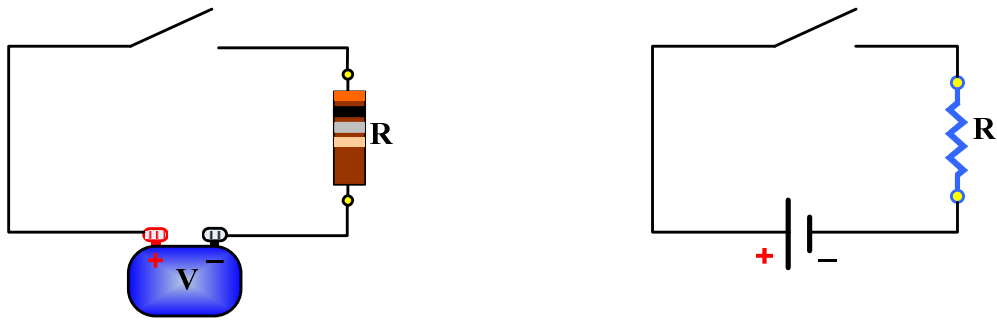


Figure(3): Analog and Digital Multimeter

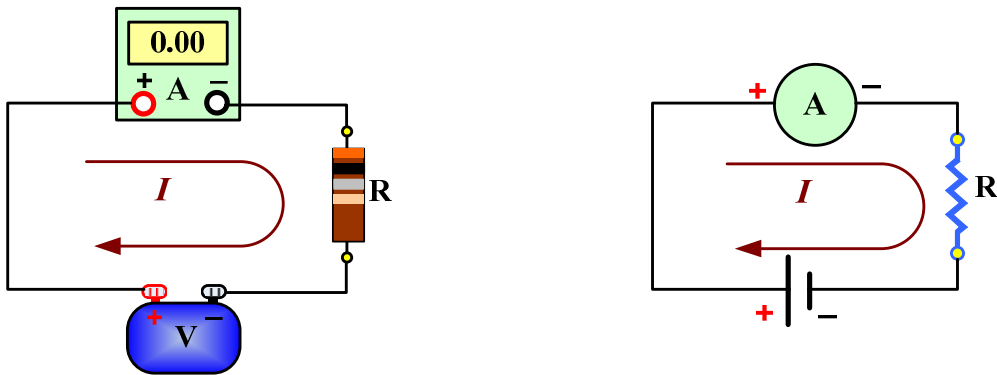
Figure(1) illustrates how to connect ammeter in the circuit and measure the current.



(a) Circuit in which the current is to be measured.



(b) Open the circuit between the resistor and the positive terminal of battery.



(c) Install the ammeter in the current pass with polarity as shown (negative to negative, positive to positive)

Figure 1: Example of an ammeter connection

Measuring Resistance with Ohmmeter

To measure resistance, connect the ohmmeter across the resistor. The resistor must first be removed from the circuit. This procedure is shown in figure(2).

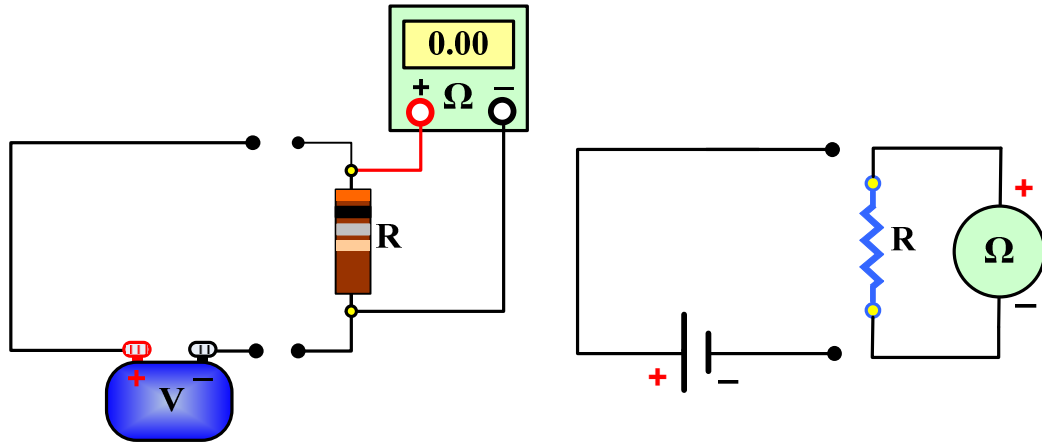


Figure (2) Example of using ohmmeter

Procedure

1. Adjust the meter so that when the two terminals are short circuited, the ohmmeter reads zero
2. Disconnect the resistor to be measured from the circuit (why?)
3. Apply the meter leads to the resistor terminals (resistor is parallel to the meter)
4. Record the reading and apply the formula $Reading \times \frac{Range}{full - scale}$ if necessary

Use measuring Instrument To measure Electronic Components

3.1 Ohm's law

s law is the most important mathematical relationship between voltage, 'Ohm current and resistance in electricity.

$$\mathbf{V = I \times R}$$

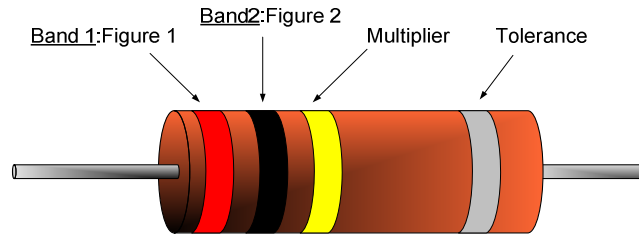
It is important to know how to read the resistors colour code and hence its ohmic value. In the following figure it shows a table of the meaning of each colour. For example, for the resistor in the figure(1),the value of the resistor is 200kΩ,since the band 1 is red i.e. equivalent to 2 in the table ,band 2 is black equivalent to zero in the table and the band 3 is yellow indicating of a multiplier of 10,000.see at the bottom of the figure.

The fourth band is the tolerance band i.e the percentage of error. It usually comes in two colors ,the silver indicates ±5% and the gold indicates ±10%.so for example, the value resistor will lie between 210kΩ and 190kΩ.

Procedure

1. Select a number of different resistors
2. Use the table below to determine their values
3. Use ohmmeter to measure the same resistors you figured out
4. Compare your calculated values with the readings you obtained

3.1.1 Resistors color code:



Colour	First figure value	Second figure value	Multiplier
Black	0	0	X1
Brown	1	1	X10
Red	2	2	X100
Orange	3	3	X1000
Yellow	4	4	X10,000
Green	5	5	X100,000
Blue	6	6	X1,000,000
Violet	7	7	X10,000,000
Grey	8	8	X100,000,000
White	9	9	X1,000,000,000



Figure1:Resistors colour code

The transistor testing

Objectives: To test the transistors with a Digital multimeter.

Introductory information:

Bipolar transistors are constructed of a three-layer semiconductor "sandwich," either PNP or NPN. As such, they register as two diodes connected back-to-back when tested with a multimeters "resistance" or "diode check" functions:

Assuming the use of a multimeter with only a single continuity range (resistance) function to check the PN junctions. Some multimeters are equipped with two separate continuity check functions: resistance and "diode check," each with its own purpose. If your meter has a designated "diode check" function, use that rather than the "resistance" range, and the meter will display the actual forward voltage of the PN junction and not just whether or not it conducts current.

Meter readings will be exactly opposite, of course, for an NPN transistor, with both PN junctions facing the other way. If a multimeter with a "diode check" function is used in this test, it will be found that the emitter-base junction possesses a slightly greater forward voltage drop than the collector-base junction. This forward voltage difference is due to the disparity in doping concentration between the emitter and collector regions of the transistor: the emitter is a much more heavily doped piece of semiconductor material than the collector, causing its junction with the base to produce a higher forward voltage drop. Knowing this, it becomes possible to determine which wire is which on an unmarked transistor. This is important because transistor packaging, unfortunately, is not standardized. All bipolar transistors have three wires, of course, but the positions of the three wires on the actual physical package are not arranged in any universal, standardized order.

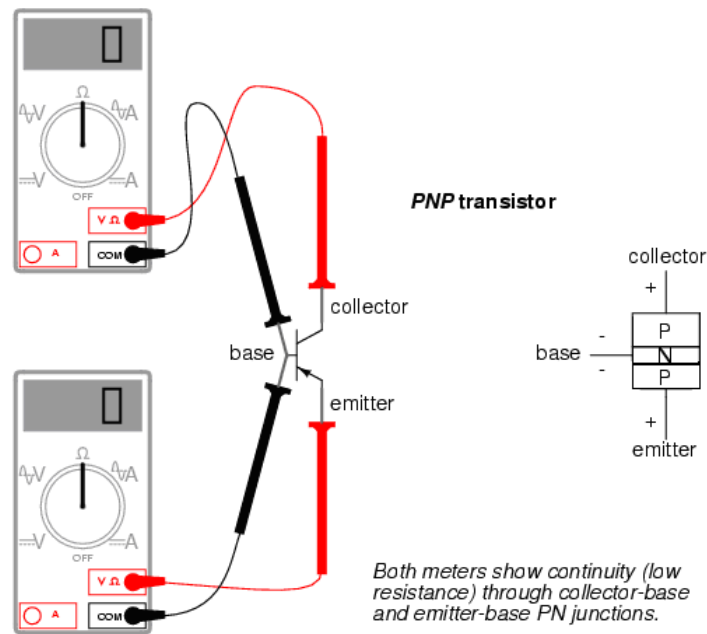


Fig. (2.1) testing the transistor in forward bias.

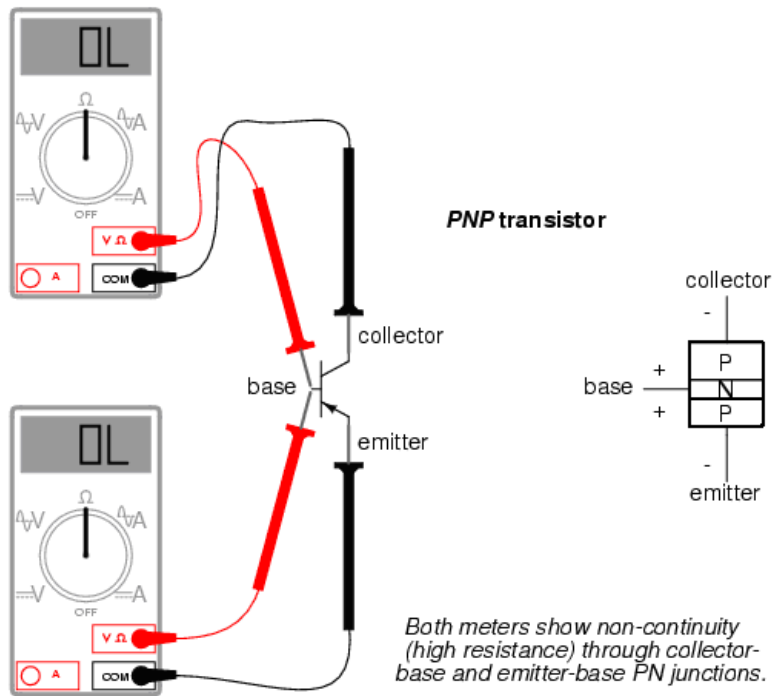


Fig. (2.2) testing the transistor in reverse bias.

Measuring an unknown bipolar transistor:

Suppose a technician finds a bipolar transistor and proceeds to measure continuity with a multimeter set in the "diode check" mode. Measuring between pairs of wires and recording the values displayed by the meter, the technician obtains the following data:

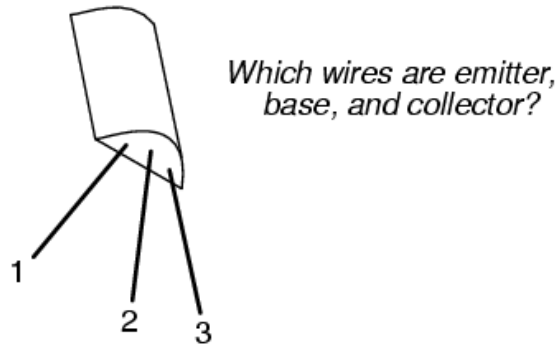


Fig. (2.3) unknown bipolar transistor

- Meter touching wire 1 (+) and 2 (-): "OL"
- Meter touching wire 1 (-) and 2 (+): "OL"
- Meter touching wire 1 (+) and 3 (-): 0.655 volts
- Meter touching wire 1 (-) and 3 (+): "OL"
- Meter touching wire 2 (+) and 3 (-): 0.621 volts
- Meter touching wire 2 (-) and 3 (+): "OL"

The only combinations of test points giving conducting meter readings are wires 1 and 3 (red test lead on 1 and black test lead on 3), and wires 2 and 3 (red test lead on 2 and black test lead on 3). These two readings *must* indicate forward biasing of the emitter-to-base junction (0.655 volts) and the collector-to-base junction (0.621 volts).

Now we look for the one wire common to both sets of conductive readings. It must be the base connection of the transistor, because the base is the only layer of the three-layer device common to both sets of PN junctions (emitter-base and collector-base). In this example, that wire is number 3, being common to both the 1-

3 and the 2-3 test point combinations. In both those sets of meter readings, the *black* (-) meter test lead was touching wire 3, which tells us that the base of this transistor is made of N-type semiconductor material (black = negative). Thus, the transistor is a PNP type with base on wire 3, emitter on wire 1 and collector on wire 2:

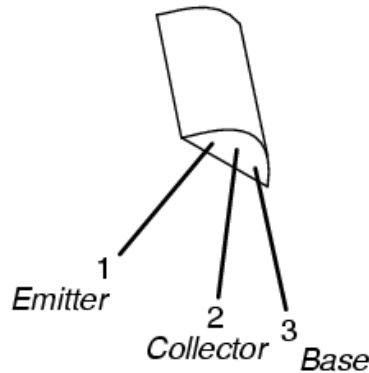


Fig. (2.4)

Please note that the base wire in this example is *not* the middle lead of the transistor, as one might expect from the three-layer "sandwich" model of a bipolar transistor. This is quite often the case, and tends to confuse new students of electronics. The only way to be sure which lead is which is by a meter check, or by referencing the manufacturer's "data sheet" documentation on that particular part number of transistor.

Knowing that a bipolar transistor behaves as two back-to-back diodes when tested with a conductivity meter is helpful for identifying an unknown transistor purely by meter readings. It is also helpful for a quick functional check of the transistor. If the technician were to measure continuity in any more than two or any less than two of the six test lead combinations, he or she would immediately know that the transistor was defective (or else that it *wasn't* a bipolar transistor but rather something else -- a distinct possibility if no part numbers can be referenced for sure identification!). However, the "two diode" model of the transistor fails to explain how or why it acts as an amplifying device.

Week 8

Objectives:

To recognize their practical shape, check for forward bias and reverse bias in open and short circuit tests.

Integrated Circuit (Semiconductor Diode Recognition)

Introduction:

The diode is the simplest semiconductor devices but it plays a very vital role in electronic systems, with its characteristics that closely match those of a simple switch.

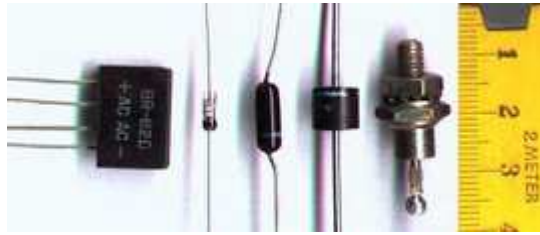
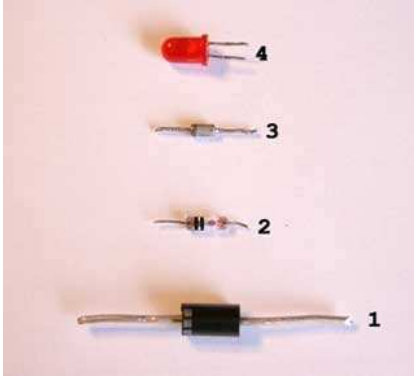
Tools and Equipment:

7. Multi-meters.
8. Power Supply.
9. Diodes of different types and shapes.

Procedure:

Step1. Recognize all diodes given to you, see the figure below.

Step2. Draw them, marking P and N terminals.



P.W. 9.2 Diode Test

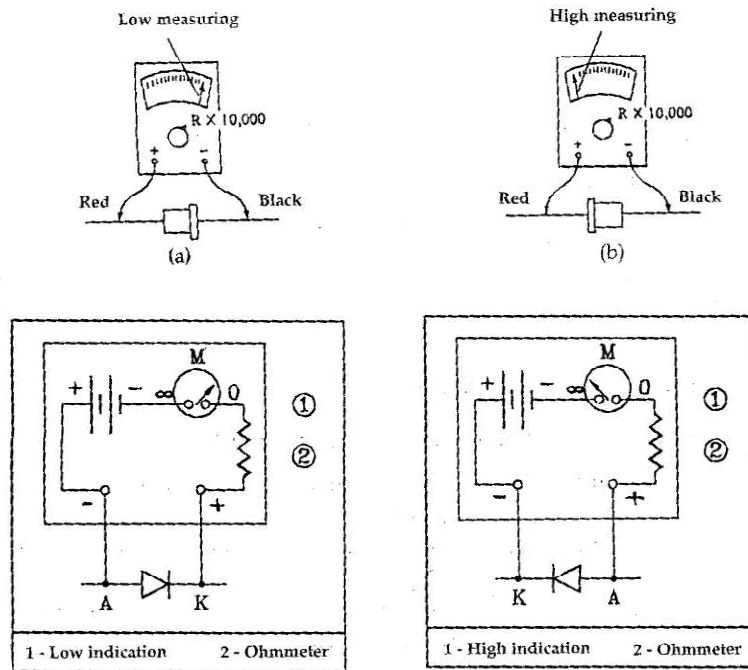
Objectives:

To use multi-meter to check the diode for:
Forward bias & Reverse bias.

- C. Open Circuit.
- D. Short Circuit.

Tools and Equipment:

- 10. Multi-meters.
- 11. Power Supply.
- 12. Diodes of different types and shapes.



Procedure:

(A) Forward bias and Reverse bias

Step1. Connect the circuit as shown above.

Step2. If the reading is low; this indicates that the diode is forward biased and has a low resistance.

Step3. If the reading is high, this indicates that the diode is reverse biased and has it has high resistance.

Step4. If steps 2 and 3 were correct, then the diode is properly operating and therefore in good condition.

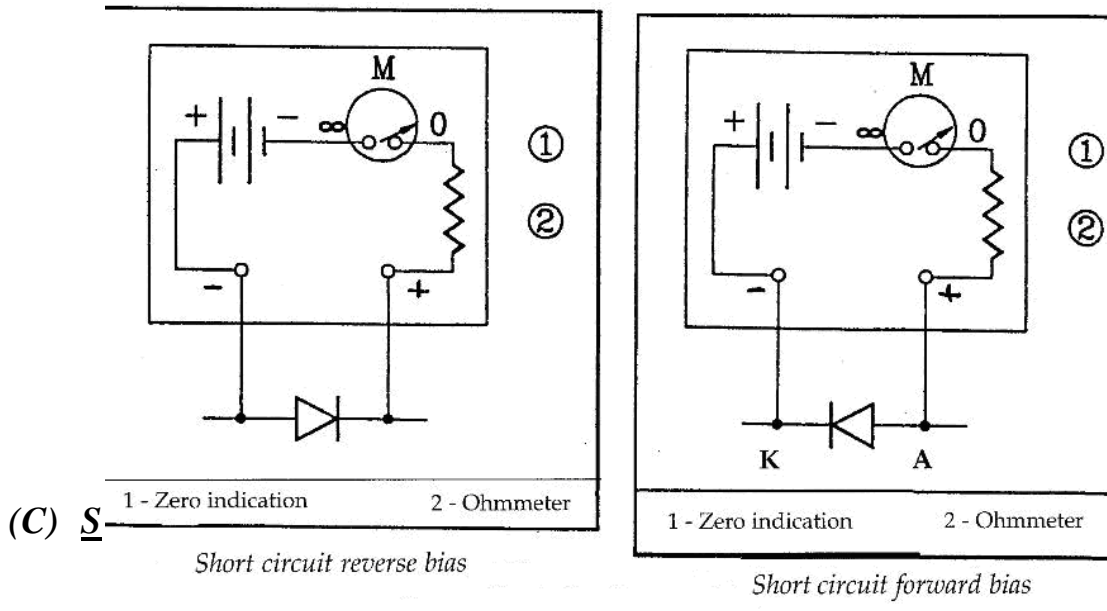
(B) Open Circuit

Step1. Connect the circuit as shown above, for forward bias test.

Step2. Infinity (∞) reading indicates open circuit.

Step3. Connect the circuit as shown above, for reverse bias test.

Step4. Infinity (∞) indication means that the diode is open circuit.



ort Circuit

Step1. Connect the circuit as shown above.

Step2. If the Ohmmeter indicated zero, then the diode is short circuited and the diode is in the forward direction.

Step3. Connect the circuit as shown above.

Step4. If the Ohmmeter indicated zero reading, then the diode is short circuited and the diode is in the reverse bias direction.

Objectives: Understand importance of preventive Maintenance of Hardware Components

Maintenance of THE CASE

Use a clean cloth lightly dampened with ammonia cleaner to remove dust, dirt, or stains from the exterior of the PC. Start at the top and work down. Add a little bit of extra cleaner to remove stubborn stains. You'll find that the housing base is typically the dirtiest (especially for tower systems). When cleaning, be careful not to accidentally alter the CD-ROM volume or sound card master volume controls. Also, do not dislodge any cables or connectors behind the PC.

Maintenance of THE AIR INTAKE

While cleaning the case, pay particular attention to the air intake(s), which are usually located in the front (or front sides) of the housing. Check for accumulations of dust or debris around the intakes, or caught in an intake filter. Clean away any accumulations from the intake area, then use your static-safe vacuum to clean the intake filter, if possible. You might need to remove the intake filter for better access. If the intake filter is washable, you might choose to rinse the filter in simple soap and water for best cleaning (remember to dry the filter thoroughly before replacing it). Of course, if there is no intake filter, simply clean around the intake area.

Maintenance of THE SPEAKERS

Multimedia speakers offer a countless number of ridges and openings that are just perfect for accumulating dust and debris. Use your can of compressed air to gently dust-out the

Always dampen a clean towel with cleaner. Never spray cleaner directly onto any part of the computer.

speaker's openings. Do not insert the long, thin air nozzle into the speaker—you can easily

puncture the speaker cone and ruin it. Instead, remove the long nozzle and spray air directly from the can. Afterward, use a clean cloth lightly dampened with ammonia solution to remove any dirt or stains from the speaker housings.

Week 10 pract

Understand Preventive Maintenance of Hardware Component

CHECK INTERNAL CABLES

You'll notice a large number of cables are inside the PC. Each cable must be installed securely—especially the wide ribbon cable connectors that can easily be tugged off. Take a moment to check any wiring between the case and the motherboard such as the keyboard connector, power LED, on/off switch, drive activity LED, turbo switch, turbo LED, etc.

Next, check the following cables:

1. Motherboard power connector(s)
2. All 4-pin drive power cables
3. Floppy-drive ribbon cable
4. Hard-drive ribbon cable
5. CD-ROM ribbon cable (usually separate from the hard drive cable)
6. CD four-wire audio cable (between the CD-ROM and sound board)
7. SCSI ribbon cable (if used)
8. SCSI terminating resistors (if used)

CHECK MEMORY

Most modern PC memory is provided in the form of *SIMMs* (*single in-line memory modules*) or *DIMMs* (*dual in-line memory modules*), which simply clip into sockets on the motherboard. Loose SIMMs or DIMMs can cause serious startup problems for the PC. Examine each SIMM/DIMM. Verify that they are inserted properly into each socket and that both ends of each SIMM/DIMM are clipped into place.

CHECK THE CPU

The CPU is the single largest IC on the motherboard, and it is installed into a *ZIF* (*Zero Insertion Force*) socket for easy replacement or upgrade. Examine the CPU and see that it is inserted evenly into its socket. The *ZIF* socket lever should be in the “closed” position and locked down at the socket itself. Check the CPU's heatsink/fan next—it should sit flush against the top of the CPU. It should not slide around or be loose. If it is, the heatsink/fan should be secured or replaced.

Slot 1 CPUs, such as the Pentium II, are installed into a slot on the motherboard and are held in place by a retaining clip. When working with a Pentium II system, see that the CPU is installed evenly and completely, and that the retaining clip is secure.

CHECK DRIVE MOUNTING

The final step in your internal check should be to inspect the drive mountings. Each drive should be mounted in place with four screws—fewer screws might allow excessive vibration in the drive, which can lead to vibration noise from the chassis or premature failure of the drive itself. Be sure that each drive has four mounting bolts and use your Philips screwdriver to snug down each bolt.

After the PC has been cleaned and checked inside and out, it's time to check the hard drive for potential problems. This involves checking the drive's file system, reorganizing files, and creating an updated boot disk. To perform a drive check, you'll need a copy of ScanDisk and Defrag. Because these utilities are already built into Windows 95, you can re-boot the system and use those utilities directly. If you are more comfortable with running these utilities from DOS, create a startup disk from within Windows 95 and boot from that diskette. Then run ScanDisk and Defrag right from the startup disk. You should perform the drive check very regularly—once a month is usually recommended, or whenever you make major additions or deletions of files from your system.

UPDATE THE BOOT DISK

Your PC should always have a boot disk, which can start the system from a floppy drive in the event of an emergency. Windows 95 has the ability to create a startup disk automatically.

If you have access to a Windows 95 system, use the following procedure to create a DOS 7.x startup disk:

1. Label a blank pre-formatted diskette and insert it into your floppy drive.
2. Click on *Start, Settings, and Control panel*.
3. Doubleclick on the *Add/remove programs* icon.
4. Select the *Startup disk* tab.
5. Click on *Create disk*.
6. The utility will remind you to insert a diskette, then prepare the disk automatically.
7. When the preparation is complete, test the diskette.

The preparation process takes several minutes and will copy the following files to your diskette: ATTRIB, CHKDSK, COMMAND, DEBUG, DRVSPACE.BIN, EDIT, FDISK, FORMAT, REGEDIT, SCANDISK, SYS, and UNINSTAL. All of these files are DOS 7.x-based files, so you can run them from the A: prompt.

Do not overtighten the bolts. This can actually warp the drive frame and cause errors or drive failure.

RUN SCANDISK

The ScanDisk utility is designed to check your drive for file problems (such as lost or cross-linked clusters), then correct those problems. ScanDisk is also particularly useful for testing for potential media (surface) errors on a disk. If you're running from the startup disk, start ScanDisk by typing:

```
A:\> scandisk <Enter>
```

If you're running from Windows 95, click *Start, Programs, Accessories, System tools*, and *ScanDisk*. Select the drive to be tested, and start the test cycle. ScanDisk will report any problems and give you the option of repairing the problems.

RUN DEFRAG

Operating systems like DOS and Windows 95 segregate drive space into groups of sectors called *clusters*. Clusters are used on an “as found” basis, so it is possible for the clusters that compose a file to be scattered across a drive. This forces the drive to work harder (and take longer) to read or write the complete file because a lot of time is wasted moving around the drive. The Defrag utility allows related file clusters to be relocated together. If you’re running from the startup disk, start Defrag by typing:

```
A:\> defrag <Enter>
```

If you’re running from Windows 95, click *Start, Programs, Accessories, System tools, and Disk defragmenter*. Select the drive to be tested and start the cycle. Defrag will relocate every file on the disk so that all their clusters are positioned together (contiguous).

Preventive Maintenance Troubleshooting

Ideally, the preventive maintenance process is designed to prevent problems—not cause them. However, at times, an accidental oversight or careless effort can result in problems.

Fortunately, most maintenance-related issues are easy to spot and resolve.

Symptom . No CD audio is audible through the CD-ROM headphone jack or no sound is emanating from the system speakers. The sound might also be too high now. In virtually all cases, you accidentally changed a volume control when wiping-down the exterior of the PC. Your cloth might have rubbed across the CD-ROM or

You can run Defrag any time, but you do not need to run Defrag until your disk is more than 10% fragmented.

Week 11 practical
objective

Understand The Diagnostic Techniques in Corrective Maintenance (Graphic card and Video Display Unit)

Installation of Graphics Card

What is AGP?

Definition: AGP is short for Accelerated Graphics Port. As the name suggests AGP ports are dedicated to graphics. AGP ports are unique, in that they are the only expansion slot found inside a computer that works for only one purpose. The AGP channel is 32 bits wide and runs at 66Mhz for a total available bandwidth of 133 MBps (Megabytes per second). AGP ports give the graphics card direct access to system memory to speed performance and allows the video card to store data directly in system memory.

Installing an AGP Graphics Card

This guide was developed to instruct users on the proper method for installing an AGP adapter card into a desktop computer system. It is a step-by-step instruction guide with photographs detailing the individual steps. The setup for a PCI graphics adapter is pretty much identical except the card goes into a PCI slot instead of an AGP slot.

Before working on a computer system at all, it is important to



power down the system to make it safe. Shut down the operating system if the computer is on. Once the computer has safely closed down, turn off the power to the internals by flipping the switch on the back of the power supply and removing the AC power cord.

Opening up the Computer Case

Since installing the card requires it be installed inside of the computer, it is now necessary to open up the case. The method for getting to the interior of the case will vary depending upon the case in question. Most new cases use a door or panel that can be removed, but older cases may require that the whole cover be removed. Be sure to unscrew the cover or panel and set aside the screws in a safe place.

Remove the PC Card Slot Cover

In order to properly install the card into the case, the slot cover that matches up to the AGP card slot needs to be removed. Be sure to check which PC card slot cover lines up with the AGP card slot because it is not always the very far left cover. Removal typically requires unscrewing the cover from the backplane and sliding it out, but some new tool free cases just slide or push out.



Placing the Card in the AGP Slot

It is now time to put the AGP card into the slot. To do this, align the AGP card directly over the slot in the motherboard. Gently press down on both the front and back of the card simultaneously to push the card down into the slot. Once the card is seated in the slot, screw or fasten down the card to the case at the PC card slot. Some AGP cards required additional power from the computer's power supply. This is provided through a 4-pin Molex power connector. If your



card requires this, find a free power connector and plug it into the card.

supply. This is provided through a 4-pin Molex power connector. If your card requires this, find a free power connector and plug it into the card.

Plugging the Monitor In

Now that the card is installed into the computer, it is time to plug the monitor into the video card. Many new video cards have multiple connectors now to support more than one monitor. They may also have DVI or Analog connectors. Plug the monitor into the appropriate connector on the video card.



Power the Computer Up

At this point, the installation of the AGP graphics card is completed. Power now needs to be restored to the computer by plugging the AC power cord back into the power supply and flipping the power switch on the back of the computer.



Once the computer has booted up into the operating system, drivers for the video card will need to be installed into the operating system. Please refer to the documentation that came with the video card on the proper method for installing the drivers into the operating system.

Troubleshooting Visual Display Units

Some of the common problems that occur in a PC monitor are given in the following table.

No	Fault Description	Diagnosis	Troubleshooting steps
1	The monitor appears not to be working at all. There are no indications that the monitor has any power	Monitor may not have power	<ul style="list-style-type: none"> • Make sure that the electrical outlet is working, by trying another appliance in the socket and seeing if it works. If the socket does not work, you will need to consult an electrician to have it fixed. • Check any power protection devices that the monitor might be plugged into, to ensure that they are working. Troubleshoot any problems here. • Make sure the power cable is connected securely and is undamaged. Try replacing the cable with another one. • If the monitor has a switch to select between 110 volt and 220 volt operation, make sure it is set to the correct value. This switch will normally be on the outside of the monitor at the back, near where the power cord connects. • Check for a blown fuse. Some monitors have these and some do not. The fuse may appear as a round black knob on the back of the monitor that can be unscrewed and removed. If the fine wire in the fuse is broken or burned out, the fuse has blown and should be replaced with another identical fuse.
2	Monitor does not appear to be working, but it does have power	Internal problem or a possible problem with the video card itself.	<ul style="list-style-type: none"> • Try the monitor with a different PC and see if it works. • Check the brightness and contrast controls. Make sure that they are turned up; a brightness control turned all the way down can make a monitor appear to be dead when it is actually working fine. • There may be a problem with the cable or video card, preventing the monitor from getting the right signal. Troubleshoot the connection from the PC to the monitor. • Try changing any of the other controls on the front of the monitor to see if something is set incorrectly. Sometimes setting the controls to a strange combination can cause the monitor to not display properly.

No	Fault Description	Diagnosis	Troubleshooting steps
3	There appears to be no signal from the video card to the monitor. There is no display on the monitor or there is only a blank white screen.	There are several possible causes, often involving a problem with the cable to the monitor.	<ul style="list-style-type: none"> • Make sure that the monitor is plugged in and turned on. Check for a power-on indicator on the front of the monitor. If the light isn't on, or the monitor is not working properly, troubleshoot the monitor. • Check the connection between the video card and monitor. Make sure the cable is connected securely on both ends and is not loose. Make sure that the cable has not become stretched or kinked. • Make sure that the PC is on and running. LEDs should be lit on the front of the case and you should hear the whirring of fans and disk drives coming from the box. • Your video card may not be producing any output due to a problem of some sort, especially with a newly-built or newly-upgraded system. Try connecting the monitor to another PC if possible. If it works on the second PC, the monitor is fine and you should troubleshoot the video card.
4	There is a very high-pitched whine (humming noise) coming from the monitor whenever it is on.	Many monitors produce this sort of noise when they are running. It tends to get worse with many monitors as they age. The noise will be exaggerated in many cases if there is no signal to the monitor.	<ul style="list-style-type: none"> • Check the signal connection from the PC to the monitor and make sure that there is a working picture. • Try adjusting the controls for the monitor, particularly turning down the brightness somewhat, as this may make some difference. • Try changing the refresh rate; that may make a difference. Refresh rate can be changed by accessing the Monitor settings in Display settings of Control panel for any windows operating system.
5	There appears to be a signal from the PC, but the picture is scrambled or wavering a great deal. The image cannot be viewed	This sort of image problem can be caused by incorrect driver or refresh settings, or by a problem with the monitor itself	<ul style="list-style-type: none"> • A common cause of this sort of image difficulty is trying to drive a monitor with a refresh rate or resolution that is too high for it. If the symptoms only occur when in Windows but not when booting to DOS, for example, this is likely the problem. Try resetting the resolution and refresh rate to lower values and see if the problem goes away. In Windows 95, you may want to hit {F8} while booting

No	Fault Description	Diagnosis	Troubleshooting steps
	clearly.		<p>and boot into Safe Mode, which will start the system with a simple driver, low resolution and low refresh rate, and then adjust the system settings and reboot normally.</p> <ul style="list-style-type: none"> • Check the image size and positioning controls on the monitor. If the image is made too large or is shifted too far in one direction on the screen, this can cause the monitor to incorrectly display the image. Try all of the various size and position adjustments to see if you can get the image to stabilize. • Troubleshoot the monitor. • Make sure that you are using the correct drivers for your video card. • Troubleshoot the video card.
6	There is a viewable image on the screen, but it is not stable, but rather somewhat distorted, moving slowly, warbling, or has wavy lines moving up or down the screen.	This kind of problem is usually the result of interference from another device affecting the image. There are two possible sources of interference: first, another device could be emitting electromagnetic radiation that affects the viewed image; second, another device on the same electrical circuit could be creating interference on the power line that affects the monitor	<ul style="list-style-type: none"> • Examine the area around the monitor and remove any devices in the proximate area that could be interference sources. Common culprits are fans, motors, transformers and especially other monitors. Putting two monitors next to each other usually will cause each to interfere with the other. • Try plugging the monitor into another power circuit to see if this causes the problem to go away. If it does, you may have line noise problems. Try isolating the monitor (and PC) to their own circuit or using a power protection device that includes line filtering or isolates devices. • Try changing the physical location of the PC within the room. This will sometimes solve the problem by moving the CRT out of the way of some unknown interference source.

Understand The Diagnostic Techniques in Corrective Maintenance(Memory Failure)

Memory failure – Symptoms and Troubleshooting

When the PC is booted up, it does not show that it is detected all of the memory in the machine. Several megabytes, usually an amount equal to the size of a memory module or half a memory module, are missing.

Beep Codes:

Error Code:

Causes of Memory failure:

Memory failure is generally caused by the following:

1. Using the wrong type of memory,
2. Incorrect installation, or incorrect configuration.
3. Putting the modules into the wrong sockets,
4. Forgetting to change jumpers that may be present,
5. Using unsupported technology or unsupported module sizes
6. Hardware failure of the memory itself

Remedial procedure

Some of the steps involved in the remedy of the Memory failure are given below:

- 1) [Check for possible general problems associated with new systems](#). One of these could be causing the memory to appear to be bad when it is not.
- 2) Make sure to carefully check the memory modules, which sometimes appear to be inserted correctly when they are not. Make sure they are all sticking up at the correct height from the motherboard. Ensure that the modules have been pushed all the way into their sockets and that the spring clips have snapped into position properly to hold them.
- 3) [Check for loose connections within the PC](#).
- 4) One of the most common causes of unrecognized memory is using an unsupported module size. Ensure that the size of memory modules you have selected is supported. Some motherboards will not support certain sizes of modules; in particular, 2 MB, 8 MB and 32 MB modules are [composite](#) and will not work in some machines. Consult your motherboard manual.
- 5) Make sure that you have used the correct sockets. Motherboards have multiple sockets and putting modules in the incorrect ones will often cause problems. For example, most Pentium motherboards have four SIMM sockets, which make up two banks. If you put the SIMMs in the middle two sockets then you have accidentally put memory into half of the first bank and half of the second bank, and the PC will not boot. Putting the memory

into the full second bank instead of the first won't work on many motherboards either (but it will on some).

- 6) Check the [technology of the memory](#) you are using. Use the type of memory suitable for the motherboard. Using unsuitable memory in some machines can cause the memory not to be recognized.
- 7) If you have an older motherboard, especially in a 486 or earlier system, there is a chance that your motherboard requires [jumpers](#) to be set when adding memory to the PC. If this is the case then failing to change the jumpers may result in either the memory not being detected.
- 8) There could be a motherboard problem. If double-checking all the settings and replacing the memory does not fix the problem, there may be a bad motherboard or a problem with how it is configured.
- 9) There could be something wrong with the memory modules themselves. Note that bad memory will often pass the BIOS memory test at boot time. If you can, try the modules in another PC that uses the same kind of memory. If you have performed all the checks listed in the points above, and the memory does not work in another PC, the memory itself may very well be bad. Try to replace the memory and see if the problem goes away. The figures below illustrate the procedure for removing and inserting a memory module.

Week 13

Objective:

Installation of Keyboard and Pointing devices

The Keyboard is an input device of computers. Keyboard is also the primary way to interact with a PC.

Types of Keyboards

Keyboards have changed very little in layout since their introduction. In fact, the most common change has simply been the natural evolution of adding more keys that provide additional functionality.

The most common keyboards classified based on the number of keys are:

- 101-key Enhanced keyboard
- 104-key Windows keyboard
- 82-key Apple standard keyboard
- 108-key Apple Extended keyboard

Keyboards are available in various forms. The different types of keyboards are:

1. Normal Windows compatible keyboard



2. Multimedia Keyboard

This is a keyboard which is provided with some additional or hot keys to take advantage of the internet.

3. Ergonomic Keyboard

This is a keyboard designed to keep the hands in a natural position that helps avoid repetitive stress injuries to the wrists



in a

4. Cordless Keyboards

These keyboards do not make use of any cord or cable connection. This communicates the data using radio frequency and is operated by a battery. The distance at which the keyboard can be used is around 15 feet.



5. Projection keyboards.

These are the latest types of keyboards. These are **virtual keyboards** that can be projected and touched on any surface. The keyboard watches your fingers move and translates that action into keystrokes in the device.



Troubleshooting Keyboards

A good Keyboard will have to be smooth keys and working properly is a must thing. Keyboard cleaning tips is very necessary for all of us who use computers. We all get tension when any button of our Keyboard sticks and cannot work properly as we like. Mostly this happened because of dust or dirt in Keyboard. then the Keyboard need cleaning. here some of Keyboard cleaning tips are listed which is useful for all of us. this Keyboard cleaning guide will take you through cleaning a Keyboard step by step. Proper cleaning and lubrication makes the keyboard performance smooth. There are many types of computer keyboards are available in market.

Installing a Keyboard

The following steps explain how to install the keyboard:

Step 1. Identify the type of keyboard to be installed. If the keyboard's cable has a connector at the end that's a circular plug with 6 pins, it will connect to a PS/2 port. If the connector has a flat, rectangular plug, the keyboard will connect to a USB port. Figures below show a PS/2 and



PS/2 Connector



USB Connector

USB
connectors
respectively.

Step 2. Power down your system before you begin the installation. Anytime you're connecting a device to a computer system, it is best to have the power turned off (with the exception of **hot-pluggable** devices, such as a thumb drive or card reader, which the system will recognize immediately after you plug it in, even if the system is running).

Locate the appropriate port in the I/O (input/output) port cluster at the back of your computer. Remember, PS/2 ports are circular round pin holes, and USB ports are flat and rectangular. Figure below shows the ports.



Step 3.
with six

Step 4. Insert the keyboard connector into the corresponding port. PS/2 and USB cables will fit into their corresponding ports only one way. If the plug doesn't slide easily into the port with minimal force, double-check that you're using the correct orientation. The rectangular key in a PS/2 cable should line up with the rectangular hole in the port. If the USB connector doesn't readily slide into the USB port, flip the connector over and try again. The USB icon that's branded into the connector will usually face up. If the connector is not fitting correctly, take care to not use excessive force or you may damage the pins on a PS/2 connector.

Step 5. With the connector in place, power-up the system and let your operating system load and detect the keyboard.

Step 6: Once the keyboard is connected to your system, there is usually no other configuration necessary. However, with some motherboards and USB keyboards, you may have to enter the system's **BIOS (Basic Input/Output System;** software built into the system that controls certain routines and functions of the computer, including the keyboard) and enable USB keyboard or USB legacy device support.

To enable USB keyboard support, power up your system and press DELETE (or F1 or F2, depending on your BIOS type) to enter the BIOS. The specific option to enable USB Keyboard support, is found in the Integrated Peripherals section or in a subsection of Integrated Peripherals that's labeled OnChip PCI Device or PCI Devices. Change the setting from Disabled to Enabled and then exit the system BIOS, making sure to save the changes. When the system restarts, the keyboard

will be ready for use..

Keyboard Cleaning

1. Switch off the computer and unplug the keyboard.
2. There is a removable cover on the bottom of the keyboard. open all the screws and remove the cover of keyboard.
3. Take a air blower or vacuum cleaner and blow the air on it. this will remove all the dust from the keyboard.
4. Now make a keyboard map on paper so you know where each key goes.
5. Carefully pry each key loose with a small screwdriver and place all these keys in to a container. open wider keys properly which may have guide wires like space bar, enter, caps lock and shift keys. Now clean every key with a dishwasher or rubbing alcohol with a soft cloth.
6. Now clean the rubber components and the plastic cover of keyboard.
7. Dry completely all the keys, rubber and plastic covers.
8. Lubricate keys if needed.
9. Properly fit all the keys to the right place. you can take the help of the paper map. cover them and tighten the screws.
10. Connect the keyboard to the computer and turn on the computer.

Week 14

Objective:

Installation of a Dial-up Modem

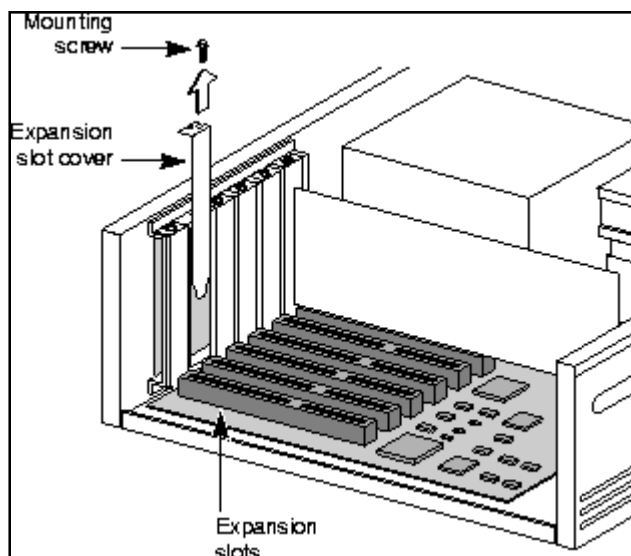
Procedure Steps:

1. Turn System Off and unplug it.
2. If your modem is a conventional type that uses jumpers to set the COM port and IRQ number, you need to configure the jumpers according to the instructions in your modem manual. If your modem is plug and play (most newer ones are) then you do not need to configure any jumpers on it.

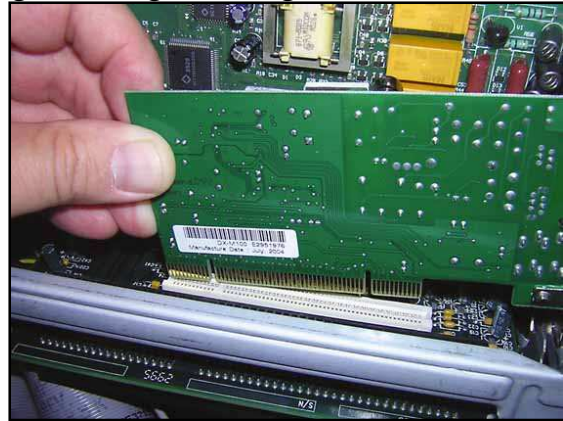
3. Select an open expansion slot (shown above), preferably away from as many other components as possible.



4. Unscrew and remove the metal insert on the back of the system case that corresponds to this expansion slot.



5. Insert the card into the expansion slot carefully. You may have to rock it back and forth from front to back to get it to go in. Figure below shows a



modem card and insertion of the card into the slot.

6. Secure the card by screwing it into place.
7. Connect one end of the phone cord to the back of the modem (in the "Wall" or "Line" jack) and the other end to the wall socket.



*Included with your new modem should be a CD (or perhaps a floppy diskette) that contains the software the computer needs to recognize and work with the modem. This small utility program is called a **device driver**. Most computers come with preinstalled device drivers for a selection of the most common modems, but it's best to work with the software the modem manufacturer*

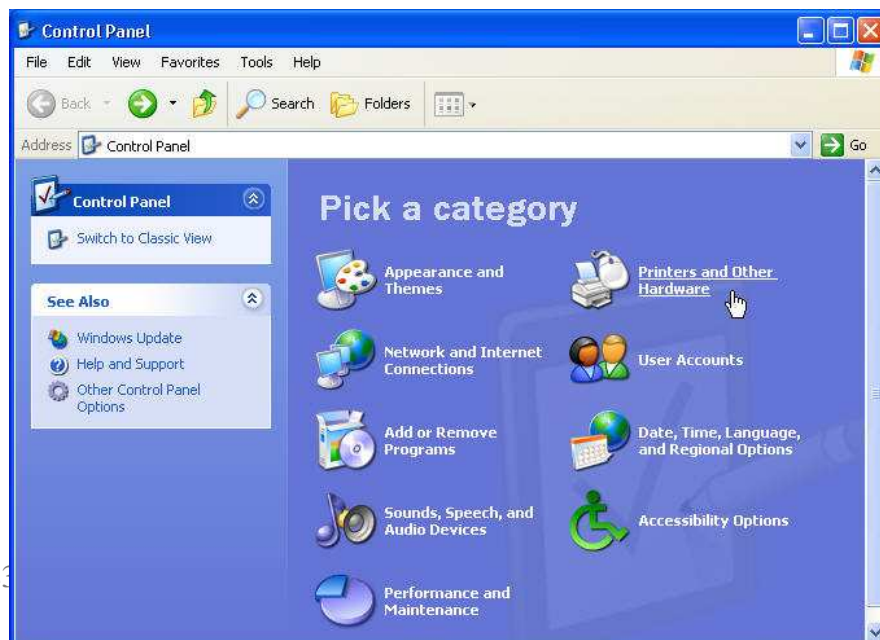
provides, as it is specifically created to match your modem. (It also may be more up-to-date than that supplied with your computer's operating system.)

8. When your computer starts up after the new modem has been installed, you should see the Found New Hardware Wizard. Follow the instructions on your screen, and the wizard will configure the computer to work with the new modem.
9. Insert the disc into the CD (or floppy) drive on your computer when the wizard prompts you to do so. When the installation is complete, the wizard will ask you to restart your computer.
10. If the Found New Hardware Wizard doesn't start up, Follow the steps given below (For Windows XP)

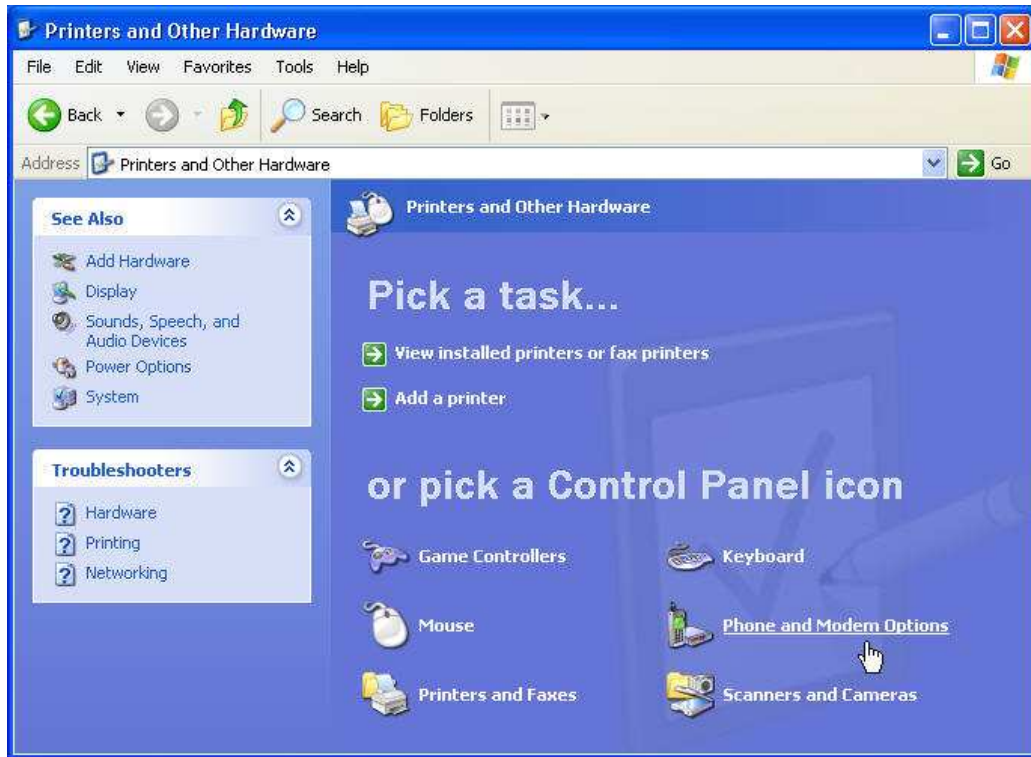
a) Click Start -> Control Panel



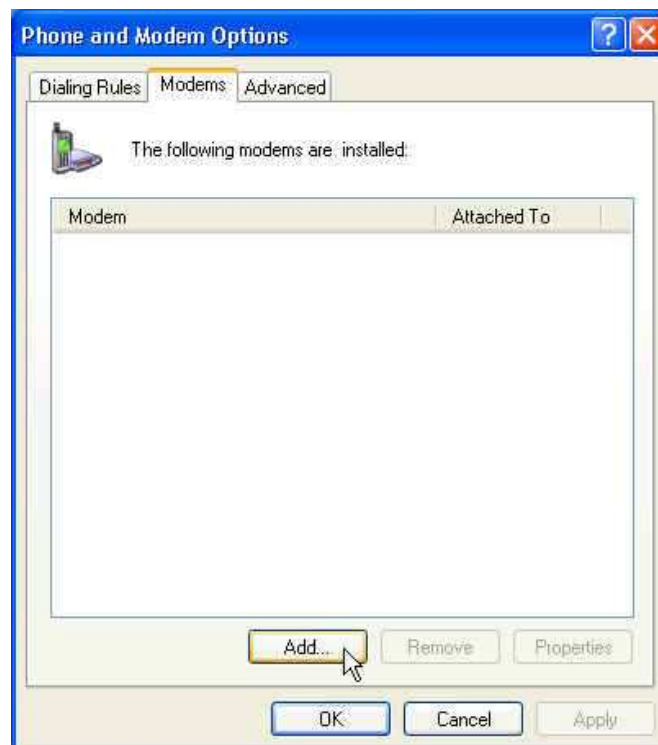
b) Double click on the Printers and Other Hardware icon



c) Double click on **Phone and modem Options**



d) To install a new
click on the Modems
press the Add button.



modem,
tab and

e) Click **Next**



f) Windows will now detect your modem.



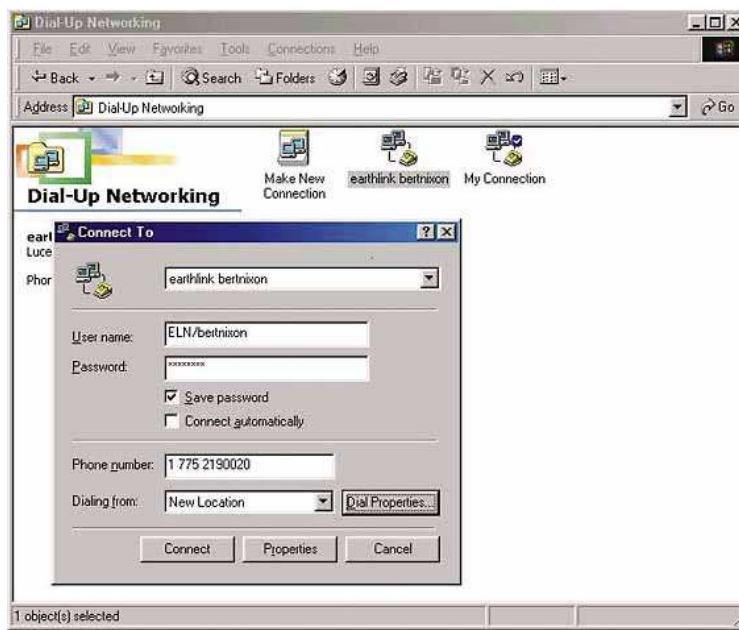
g) Press Finish to complete the installation procedure.



Note: By following the instructions above, you can install the majority of the modems that can be found in the market. However, if for any reason the installation of your modem fails, you will have to consult the manual that came with the modem for further instructions. There is also a possibility that your modem gets installed automatically by your O/S, since Windows XP uses the Plug and Play technology.

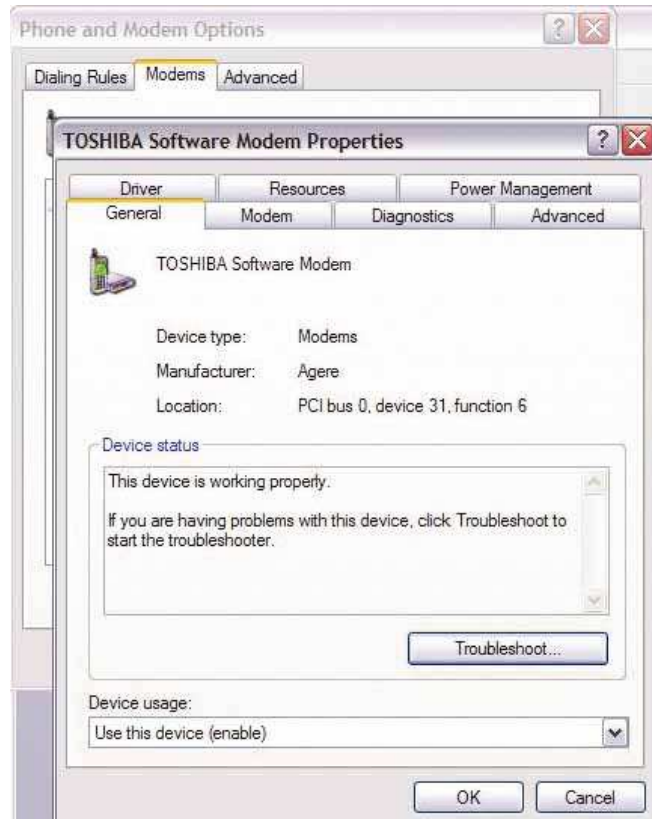
11. Set Up Your Modem

a) Click Start, Settings, Control Panel and select Dial-Up Networking.



and

b) Select the icon labeled Make New Connection. will need to name the connection (the ISP name, for instance) and supply the ISP's dial-up information, as well as username and password use with the ISP.



You
the
you

c) you can set up the connection by opening the Internet Options Icon on the Control Panel. When you select the Connections tab, you will see a button labeled Setup; clicking the button will guide you through setting up your connection. You will need some information from your ISP to do this, including the phone number to call, the names of the ISP's email servers, the type of service, and your password for initial login.

Week 15

Objective: system installation procedure (printer)

Installing Printers

A Printer connected to the output port of a computer is called a **Local Printer**. and then the computer can share this printer with others on the network. When the printer is accessed by way of the network it is called a **Network Printer**.

A computer can have several printers installed. Windows designates one printer to be the **default printer**.

The procedure for installing a printer is as follows:

1. Turn off the computer. If necessary, remove any spacers or tape that is used to secure the internal components of the printer as shown in the figure. Assemble the printer referring to the manual provided.



2. Connect the printer cable to the port on the printer as shown in figure.

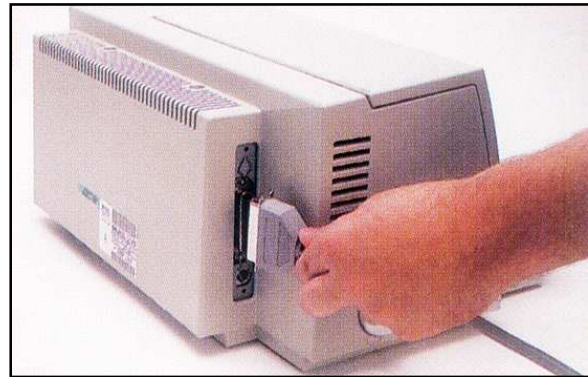


3. Connect the other end of the printer cable to the parallel port at

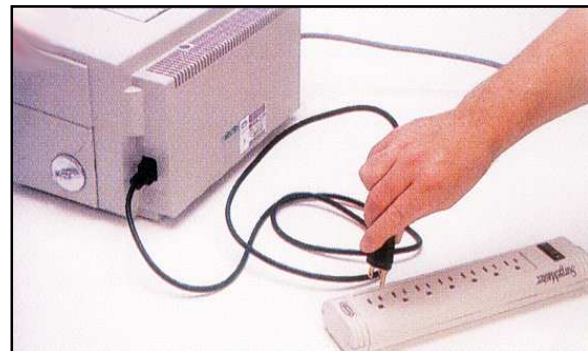


the back of the computer as shown in figure.

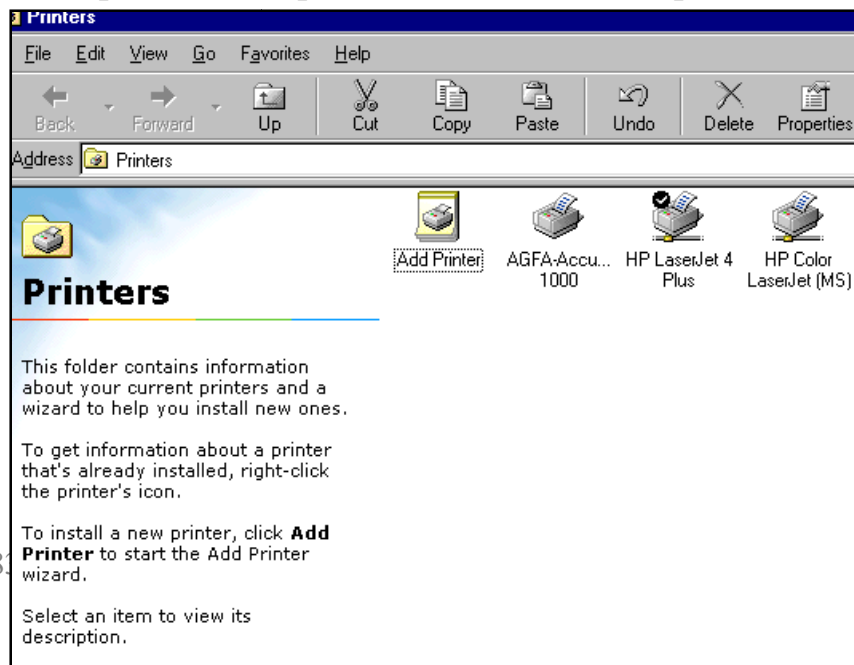
4. Connect the power cable to the power connector on the printer as shown in figure.



5. Plug the power cable into an electrical outlet as shown in figure.



6. Switch on the power for the printer and computer.
7. After the computer boots-up, Click the Start button, point to Settings, and then click



Printers. The window shown below appears.

8. Double-click Add Printer, and then click Next.
9. Click Local Printer or Network Printer as appropriate, and then click Next.
10. Click the appropriate manufacturer and model for your printer, and then click Next
11. If you chose to install a local printer, click the correct port and then click Next
12. Type a name for the printer (or accept the default name), and then click either Yes or No in the "Do you want your Windows-based programs to use this printer as the default printer?" area. Click Next.
13. To print a test page, click Yes. Click Finish

Sharing a printer between multiple computers

Users who have multiple computers in their home or work environment may wish to share a printer with the other computers to help save on cost and for convenience. Below are some of the ways you can share a printer on a network for different types of setups.

Before setting up the printer to be shared on a network, you must decide what type of setup you plan on doing. Below are the different types of setups and their advantages and disadvantages.

- 1) Printer connected to a computer / server
- 2) Dedicated print server
- 3) Network printer

1) Printer connected to computer / server

Connecting a printer to a computer and sharing the printer from that computer is the most common solution for sharing a printer because of the ease and price. The primary disadvantage of this is that the computer must always be on in order for the printer to work. Although this solution may not be the best solution for

everyone it is usually the easiest and cheapest solution for sharing your printer between all the computers on your network.

Below are steps for sharing your printer with each of the major Microsoft Windows operating systems. For these steps to work you must already have a network setup at your home or office.

Setting up the printer to be shared on the network

Microsoft Windows 2000 / XP

1. Open the Windows Control Panel
2. Double-click the "Printers" or "Printers and Faxes" icon.
3. If you currently have a printer already installed on the computer right click the printer icon and click Properties. In the Properties window click the sharing tab and make sure the printer is shared.
4. Once the printer has been shared on the computer skip to the next section for adding the shared printer on each of the computers on your network.

Microsoft Windows 95 / 98

1. Open the Windows Control Panel
2. Double-click Network
3. In the Network window under the Configuration tab click the File and Print Sharing button.
4. In the File and Print Sharing Window check the "I want to be able to allow others to print to my printer(s)" option. Note: If the computer asks to restart the computer after selecting this option make sure to restart.
5. Click Ok and then Ok again to close out of the Network Window.
6. Once back in the Control Panel double-click printers
7. If you currently have a printer already installed on the computer right click the printer icon and click Properties. In the Properties window click the sharing tab and make sure the printer is shared.
8. Once the printer has been shared on the computer skip to the next section for adding the shared printer on each of the computers on your network.

Adding the shared printer

Microsoft Windows 2000 / XP

1. Open the Windows Control Panel
2. Double-click the "Printers" or "Printers and Faxes" icon.
3. Double-click the "Add a printer" icon.
4. Once in the Printer Wizard click the Next button to get started.
5. Select either "A network printer, or a printer attached to another computer" or "Network Printer" and click Next. This option is different in Windows 2000 and Windows XP.
6. Type the name of the printer's network address. This will be the name of the computer and then the name of the printer. For example, if the computer on our network was called "Ravi" and our printer was called "hp" the network path for our printer would be: "\\Ravi\hp", if you are adding the printer on a Microsoft Windows XP computer you can click the Browse icon to browse your network and locate the printer.
7. Once the path has been typed in click Next.
8. If the printer was located over the network Windows should either install the printer or you may be required to install the drivers for that printer on the computer before completing the installation.

Microsoft Windows 95 / 98

1. Open the Windows Control Panel
2. Double-click Printers
3. Double-click the "Add a printer" icon.
4. Click Next to start the Add a printer wizard.
5. Select Network Printer and click Next.
6. Type the network name of the printer. This will be the name of the computer and then the name of the printer. For example, if the computer on our network was called "hope" and our printer was called "hp" the network path for our printer would be: "\\Ravi\hp", or click the browse icon to browse to the location of the printer.
7. If the printer was located over the network Windows should either install the printer or you may be required to install the drivers for that printer on the computer before completing the installation.

2) Dedicated print server

If we do not wish to have a computer always turned on and maintained you may want to get a hardware print server. A print server enables you to connect a small network appliance to your network and connect each your printers to it.

3) Network printer

Some printers, often high-end printers have the capability to connect directly to a network or have hardware installed into them that enables the printer to be connected to the Network. If your printer supports this option and has the necessary hardware you should be able to connect the printer directly to the Network and have it detected by the computers.