

**Terna Engineering College**  
**Computer Engineering Department**  
**Program: Sem V**  
**Course: Computer Network Lab**

**Faculty:** Umesh B Mantale, D V Thombre and Ramesh Shahabade

LAB Manual

PART A

(PART A: TO BE REFERRED BY STUDENTS)

## **Experiment No. 2**

### **A.1 Objectives:**

Demonstration of crimping and fault finding of cross-wired cable and straight through cable along with the tools, cables and connectors used.

### **A.2 Prerequisite:**

- Concept of digital communication..
- Attenuation in the transmission.
- Crimping Tool, Connectors, CAT 5 or Cat 6 cable and their specifications.

### **A.3 Outcome:**

After successful completion of this experiment students will be able to

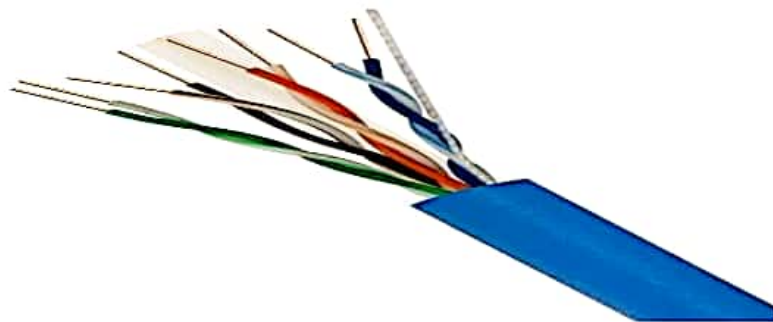
- Prepare the patch chord and LAN cables.
- Ability to find the fault in the cable and repair them.

## A.4 Theory:

### Twisted Pair

Twisted pair eventually emerged during the 1990s as the leading cabling standard for Ethernet, starting with 10 Mbps (10BASE-T, also known as Category 3 or Cat3), later followed by improved versions for 100 Mbps (100BASE-TX, Cat5, and Cat5e) and successively higher speeds up to 10 Gbps (10GBASE-T). Ethernet twisted pair cables contain up to eight (8) wires wound together in pairs to minimize electromagnetic interference.

Category 6 cable, commonly referred to as Cat 6, is a standardized twisted pair cable for Ethernet and other network physical layers that is backward compatible with the Category 5/5e and Category 3 cable standards.



Compared with Cat 5 and Cat 5e, Cat 6 features more stringent specifications for crosstalk and system noise. The cable standard also specifies performance of up to 250 MHz compared to 100 MHz for Cat 5 and Cat 5e.

Whereas Category 6 cable has a reduced maximum length of 55 meters when used for 10GBASE-T, Category 6A cable (or Augmented Category 6) is characterized to 500 MHz and has improved alien crosstalk characteristics, allowing 10GBASE-T to be run for the same 100 meter maximum distance as previous Ethernet variants.

When used for 10/100/1000 BASE-T, the maximum allowed length of a Cat 6 cable is up to 100 meters (328 ft). This consists of 90 meters (295 ft) of solid "horizontal" cabling between the patch panel and the wall jack, plus 5 meters (16 ft) of stranded patch cable between each jack and the attached device. For 10GBASE-T, an unshielded Cat 6 cable should not exceed 55 meters.

- Unshielded Twisted Pair (UTP) Cable.
- Shielded Twisted Pair (STP) Cable.

#### Coaxial Cable.

Invented in the 1880s, "coax" was best known as the kind of cable that connected television sets to home antennas. Coaxial cable is also a standard for 10 Mbps Ethernet cables. When 10 Mbps Ethernet was most popular, during the 1980s and early 1990s, networks typically utilized one of two kinds of coax cable - thinnet (10BASE2 standard) or thicknet (10BASE5). These cables consist of an inner copper wire of varying thickness surrounded by insulation and another shielding. Their stiffness caused network administrators difficulty in installing and maintaining thinnet and thicknet.

#### Fiber Optic Cable.

Instead of insulated metal wires transmitting electrical signals, fiber optic network cables work using strands of glass and pulses of light. These network cables are bendable despite being made of glass. They have proven especially useful in wide area network (WAN) installations where long distance underground or outdoor cable runs are required and also in office buildings where a high volume of communication traffic is common.

Two primary types of fiber optic cable industry standards are defined - single-mode (100BaseBX standard) and multimode (100BaseSX standard). Long-distance telecommunications networks more commonly use single-mode for its relatively higher bandwidth capacity, while local networks typically use multimode instead due to its lower cost.

A crimping tool is a device used to conjoin two pieces of metal by deforming one or both of them in a way that causes them to hold each other. The result of the tool's work is called a crimp. A good example of crimping is the process of affixing a connector to the end of a cable. For instance, network cables and phone cables are created using a crimping tool (shown below) to join the [RJ-45](#) and [RJ-11](#) connectors to both ends of either phone or [Cat 5](#) cable.

#### RJ-11 (6-Pin) and RJ-45 (8-Pin) Crimping Tool



#### How does it work?

To use this crimping tool, each wire is first placed into the connector. Once all wires are in the jack, the connector with wires are placed into the crimping tool, and the handles are squeezed together. Crimping punctures the plastic connector and holds each of the wires, allowing for data to be transmitted through the connector.

Ref.:

<https://www.computerhope.com/jargon/c/crimp.htm#:~:text=A%20crimping%20tool%20is%20a,the%20end%20of%20a%20cable.>

**RJ-45 Connectors:** RJ45 is a type of connector commonly used for Ethernet networking. It looks similar to a telephone jack, but is slightly wider. Since Ethernet cables have an RJ45 connector on each end, Ethernet cables are sometimes also called RJ45 cables.

The "RJ" in RJ45 stands for "registered jack," since it is a standardized networking interface. The "45" simply refers to the number of the interface standard. Each RJ45 connector has eight pins, which means an RJ45 cable contains eight separate wires. If you look closely at the end of an Ethernet cable, you can actually see the eight wires, which are each a different color. Four of them are solid colors, while the other four are striped.

RJ45 cables can be wired in two different ways. One version is called T-568A and the other is T-568B. These wiring standards are listed below:

T-568A

T-568B

1. White/Green (Receive +)
2. Green (Receive -)
3. White/Orange (Transmit +)
4. Blue
5. White/Blue
6. Orange (Transmit -)
7. White/Brown
8. Brown

1. White/Orange (Transmit +)
2. Orange (Transmit -)
3. White/Green (Receive +)
4. Blue
5. White/Blue
6. Green (Receive -)
7. White/Brown
8. Brown

The T-568B wiring scheme is by far the most common, though many devices support the T-568A wiring scheme as well. Some networking applications require a crossover Ethernet cable, which has a T-568A connector on one end and a T-568B connector on the other. This type of cable is typically used for direct computer-to-computer connections when there is no router, hub, or switch available.

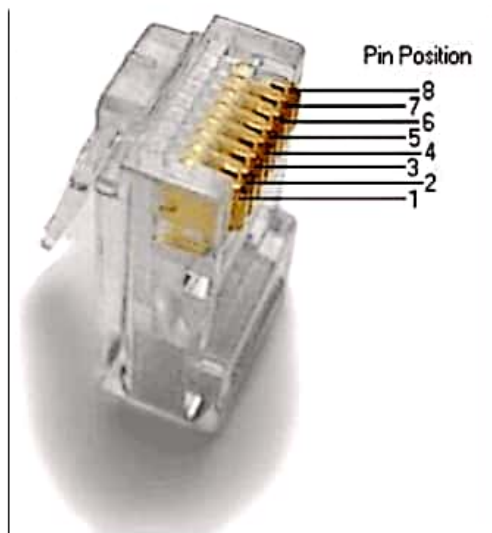


Fig: RJ-45 Connector and their pin reading

Ref.:

<https://techterms.com/definition/rj45#:~:text=RJ45%20is%20a%20type%20of%20connector%20commonly%20used%20for%20Ethernet%20networking.&text=Since%20Ethernet%20cables%20have%20an,is%20a%20standardized%20networking%20interface.>

Cross and Straight cables: Ethernet network cables are straight and crossover cable. This Ethernet network cable is made of 4 pair high performance cable that consists of



twisted pair conductors that are used for data transmission. Both ends of the cable are called RJ45 connectors.

#### Straight Cable :

Usually use a straight cable to connect different type of devices. This type of cable will be used most of the time and can be used to:

- 1) Connect a computer to a switch/hub's normal port.
- 2) Connect a computer to a cable/DSL modem's LAN port.
- 3) Connect a router's WAN port to a cable/DSL modem's LAN port.
- 4) Connect a router's LAN port to a switch/hub's uplink port. (Normally used for expanding network)
- 5) Connect two switches/hubs with one of the switches/hub using an uplink port and the other one using a normal port.

If you need to check how a straight cable looks, it's easy. Both sides (side A and side B) of cable have wire arrangement with the same color.

In straight cable connectivity is like as follows

RJ451 Connected to RJ452

Pin1-----	Pin1
Pin2-----	Pin2
Pin3-----	Pin3
Pin4-----	Pin4
Pin5-----	Pin5
Pin6-----	Pin6
Pin7-----	Pin7
Pin8-----	Pin8

Crossover Cable

Sometimes you will use crossover cable, it's usually used to connect the same type of devices. A crossover cable can be used to:

- 1) Connect two computers directly.
- 2) Connect a router's LAN port to a switch/hub's normal port. (Normally used for expanding network)
- 3) Connect two switches/hubs by using a normal port in both switches/hubs.

If you need to check how crossover cable looks, both side (side A and side B) of cable have wire arrangement with following different color.

This cable (either straight cable or cross cable) has a total 8 wires (or we can say lines), i.e. four twisted pairs ( $4 \times 2 = 8$ ) with different color codes. Right now just forget about color codes. It doesn't matter what color is given to the cable (but there is a standard).

In cross cable connectivity is like as follows

RJ451 Connected to RJ452

Pin1----- Pin3

Pin2----- Pin6

Pin3----- Pin1

Pin4----- Pin4

Pin5----- Pin5

Pin6----- Pin2

Pin7----- Pin7

Pin8----- Pin8

Ref.:

<https://sites.google.com/site/mullais/network/what-is-the-difference-between-cross-cable-and-straight-cable>

## PART B

### (PART B : TO BE COMPLETED BY STUDENTS)

***(Students must submit the soft copy as per following segments within two hours of the practical. The soft copy must be uploaded on the Blackboard or emailed to the concerned lab in charge faculties at the end of the practical in case there is no Black board access available)***

Roll No. 50	Name: Amey Thakur
Class: TE-Comps B	Batch: B3
Date of Experiment: 24/07/2020	Date of Submission: 24/07/2020
Grade :	

### **B.1 Document created by the student:**

***(Write the answers to the questions given in section 5.1 during the 2 hours of practical in the lab here)***

Refer B.5

### **B.3 Observations and learning:**

***(Students are expected to understand the selected topic. Have to list out the components & functionality. Prepare a flow of the algorithm defined in the paper. List the performance metrics that is used)***

We learned about crimping and fault finding of cross-wired cable and straight through cable along with the tools, cables and connectors

### **B.4 Conclusion:**

***(Students must write the conclusion as per the attainment of individual outcome listed above and learning/observation noted in section B.3)***

1. We learned about crimping and fault finding of cross-wired cable and straight through cable.
2. We can now identify various network cables and devices used in networking, distinguish the network cables and devices based on speed, type and functionality.
3. We can now identify and use various tools, cables and connectors.



# Computer Networks Laboratory Experiment - 2

Amey Thakur

D.O.E. - 24.07.2020

TE - Comps B-50

D.O.S. - 24.07.2020

B3

Q.1. What is the difference between straight through cable and crossover cable?

Ans!

- A straight through cable is a type of twisted pair cable that is used in local area networks to connect a computer to a network hub such as a router. On a straight through cable, the wired pins match.
- An ethernet crossover cable is a type of Ethernet cable used to connect computing devices together directly. The internal wiring of Ethernet crossover cables reverses the transmit and receive signals. It is most often used to connect two devices of the same type: eg. - Two computers or two switches to each other.

Q.2. Where straight through and crossover cables are used?

Ans!

- Use straight through ethernet cable for the following cabling:
  1. Switch to router
  2. Switch to PC or server
  3. Hub to PC or server

- Use crossover cable for the following cabling :

1. Switch to switch
2. Switch to hub
3. Hub to hub
4. Router to router
5. Router ethernet port to PC NIC
6. PC to PC.

Q.3. What is bandwidth of CAT5 and CAT6 cables?

Ans:

Bandwidth is measured in cycles per second or hertz (Hz)

- Category 5 Cable = up to 100 MHz.
- Category 6 cable = up to 250 MHz.

Q.4. How do you identify that the cable is faulty?

Ans:

Before fixing any faults in cables, the fault has to be identified first. There are many ways to find the cable faults.

1. Blavier Test (For a single Cable Faults)

- When a ground fault occurs in a single cable and there are no other cables (without faulty one) then blavier tests can be performed to locate the fault in a single cable.
- In other words, in the absence of the sound cable to locate fault in the cable (to make a loop by connecting both cables, then measurement of the resistance from one side or end is called a blavier test.



## 2. Loop tests to find cable faults.

- These kinds of tests are carried out on short circuit faults or earth fault in underground cables. Cable faults can be easily located if a sound cable runs along with the grounded cables.

- Following are the types of loop tests.

1. Murray loop test

2. Varley loop test

3. Earth overlap test

## 3. Open Circuit Test

- Open circuit Fault can occur when cable is pulled out of its joint or a break occurs in the cable. Such a fault can be traced by carrying out a capacity test. The capacitance of the faulty cable is measured from both ends of the cable either by means of ballistic galvanometer or by bridge method.

## Q.5. Why crimping needs to be done ?

When the crimping goes wrong ?

Ans :

- Wire crimping is a small part of a big process.
- However, when done incorrectly it can have large consequences on day-to-day operations.
- This is because if a barrel and wire are not crimped properly, it creates an opening for external forces, such as moisture to enter.
- This can cause your connection to corrode or overheat, resulting in voltage drop that leads to a poor connection or a complete loss of connection.

Q.6. What precautions one need to take while crimping?

Ans:

1. Work on stable surface
2. Avoid working in dark or unlit areas.
3. Keep children away from the work area
4. Wear safety glasses and gloves.
5. Only use crimping pliers for the intended purpose
6. Use Bigger Pliers for Heavier jobs
7. Keep Crimping pliers in an enclosed location

Q.7. Can we reuse the RJ-45 connectors?

Ans:

- One of the ways to mess ethernet connection is to reuse an old and bendy crimping tool or attempt to crimp the wrong kind of RJ45 plug on an incompatible cable.
- Mostly we cannot use RJ-45 connectors again

Q.8. Which electronic device is used in troubleshooting the network cables?

Ans:

- A cable tester is an electronic device used in troubleshooting the network cables

Q.9. State the difference between T568A and T568B twisted pair wires.

Ans:

- The difference between T568A and T568B is that the pin positions for the green and orange pairs are flipped. Aside from the colour placement variances, there are couple of compatibility factors that can affect the choice of an RJ45 wiring scheme.



Q.10. What are RJ-45 and RJ-11 connectors?  
Can we use RJ-11 in networking?

Ans:

- RJ-11 and RJ-45 are not Ethernet cables, they are connectors, plug or jack.
- RJ-11 is the cable connector which we use in telephone sets.
- RJ-45 is the cable connector which we use in networking to connect computer and other network elements together.
- RJ-11 has 4 wires inside and RJ-45 has 8 wires inside.
- RJ-45 is bigger in size than RJ-11
- You cannot plug in RJ-45 cable connector into RJ-11 interface / port / slot however inverse is possible but not preferable to avoid port damage.
- An RJ-45 is used for high speed internet connection and is more commonly use.
- RJ-11 cables are for dial-up modems and traditional phone systems.