

Chapter 10

10 How to Setup a Home or Small Network

- 10.1 Installing a Network Interface Card (NIC)
- 10.2 Installing Network Components
- 10.3 Identifying Ports and Cable Types
- 10.4 Preparing Straight-through Network Cables
- 10.5 Preparing Crossover Network Cables
- 10.6 Setting up a Direct Cable Network
- 10.7 Setting up a Small Network Using a Hub

Objectives

At the end of this chapter, students should be able to:

- Install a Network Interface Card (NIC)
- Install different network protocols and services
- Identify different network ports and cables
- Prepare straight-through and crossover network cables.
- Setup direct cable network
- Setup a computer network using hub/switches
- Learn about IP addressing and assign IP to computers

10.1 Installing a Network Interface Card (NIC)

Many newer computers have a **network adapter** or **Network Interface card (NIC)** built-in that you can use to connect to the network. If you want to install a Network Interface Card (NIC) and aren't sure whether your computer already has one, look for a network port on the back of the computer. Network ports resemble phone jacks, but they are slightly larger and have eight pins inside. It is named as **RJ 45 port**.

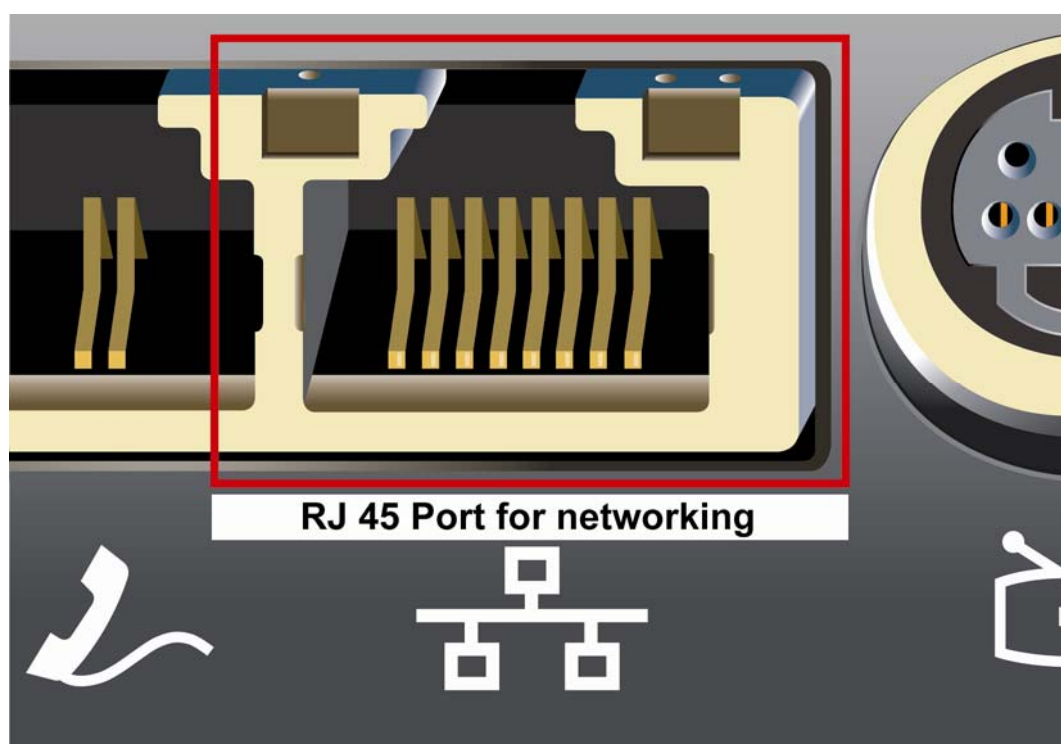


Figure RJ-45 port for networking

Once you checked out at the back of your computer and found that you don't have built-in Network Adapter card, then follow the procedure to install new one.

Once you have the adapter

1. Open the packaging and read the instructions provided with NIC.
2. If the network adapter came with a CD or floppy disk, which contains the installation software (driver software), install the software prior to connecting the hardware.
3. Shut down your computer by clicking **Start** and then clicking **Turn Off Computer**. Then click **Turn Off**.
4. After your computer shuts down, make note of where each cable is connected to the back of your computer so that you can easily reassemble the cable back again. It's handy to tape a small note on each cable with a number or letter, and put a matching note next to the spot on your computer, before unplugging the cables.

5. Lay your computer on a flat surface. Remove the side panel from your computer's case. Depending on the casing type, you may need to remove screws at the back of the computer.



Figure 10-1 PC with side panel removed

6. Once the side panel is open, you can see the inside of your computer. Identify an empty slot that fits your card. If necessary, remove the small metal panel protecting the opening for the slot at the back of your computer, and save the screw.

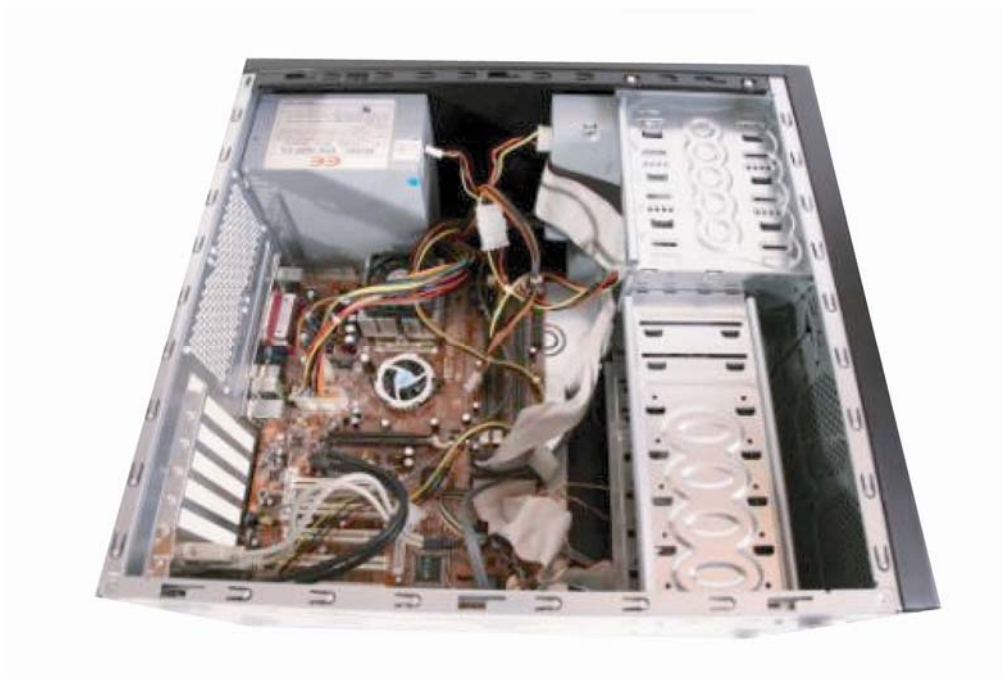


Figure 10-2 Inside view of a computer

7. Discharge any static electricity by touching an unpainted portion of your computer's case. Then carefully insert the network adapter into the open slot. Gently wiggle the card back and forth until it rests firmly in the slot.



Figure 10-3 Installing a network adapter or NIC

8. Replace the screw that you removed in step 6, which will help hold the card in place.
9. Replace the side panel to your computers case.

10. Connect the network cable to the network adapter.

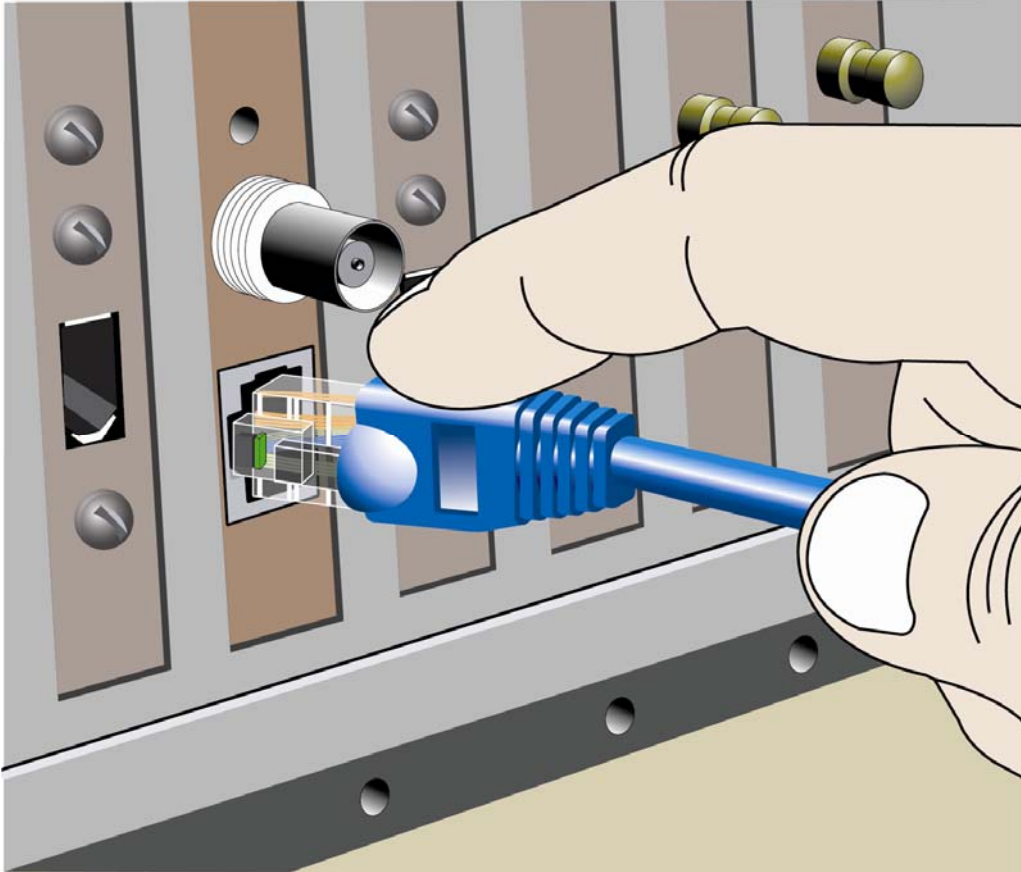


Figure 10-4 Connecting network cable to RJ-45 port

11. Connect the other end of the network cable to your networking equipment (Hub/ Switch).

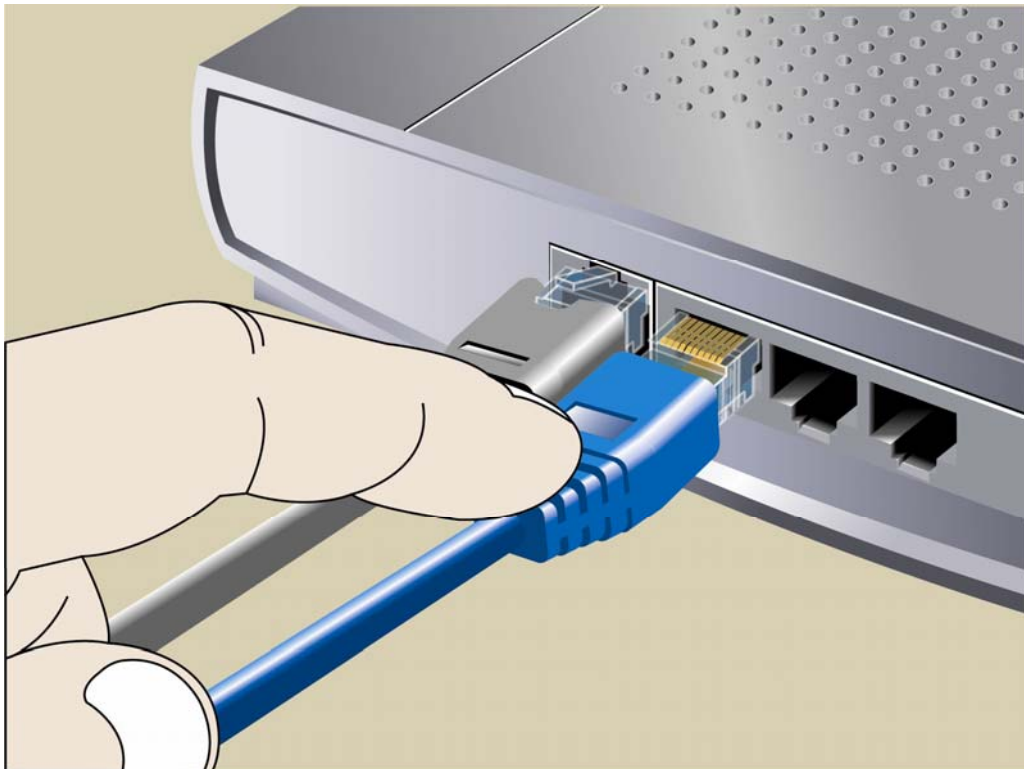


Figure 10-5 Connecting network cable to a hub/switch

12. Reconnect all cables to your computer, start your computer and log on to Windows. Windows automatically detects the new installed hardware, and then displays a notification informing about successful installation.



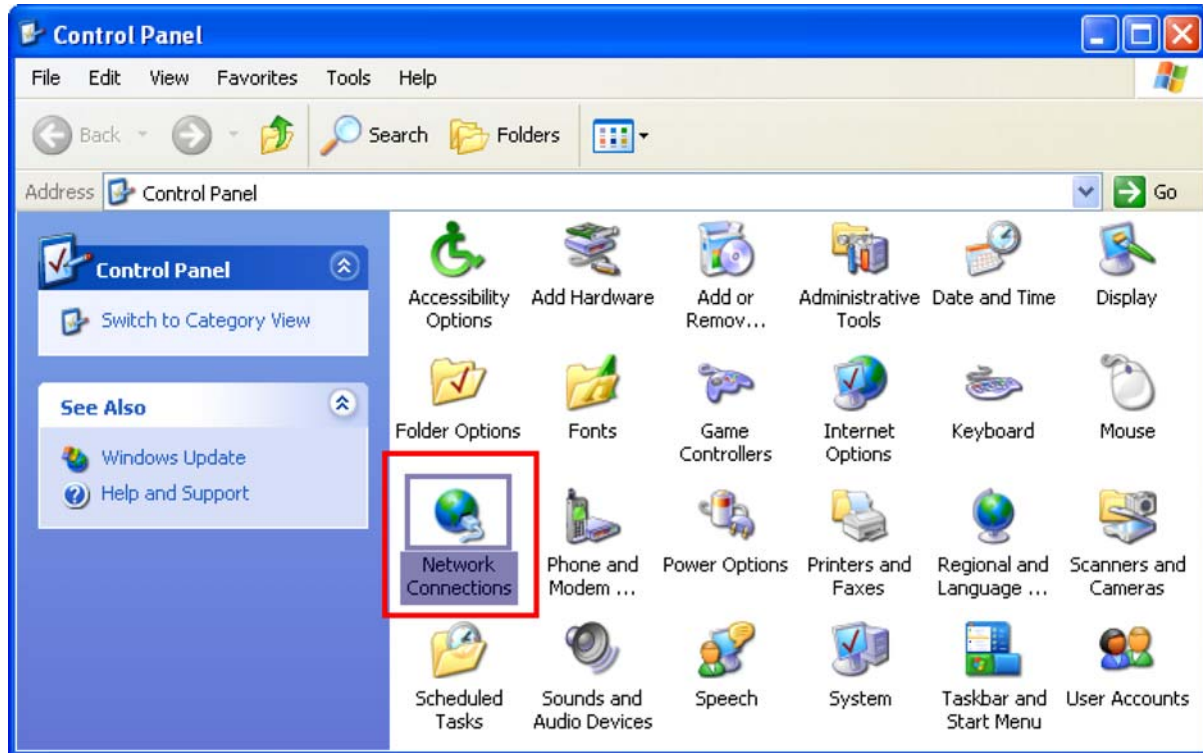
Figure 10-6 Notification on successful installation

(If in case, Windows XP does not recognize your NIC card automatically, then you have to installed the driver software from accompanying CD or Floppy manually)

10.2 Installing Network Components

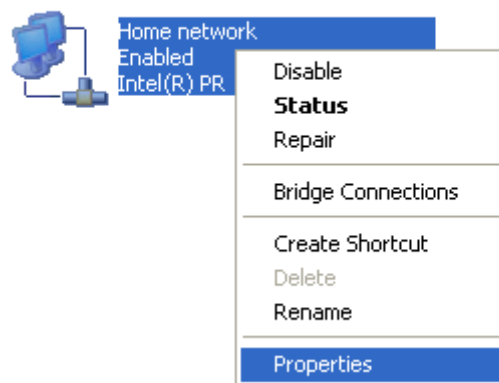
Network components mean **network protocols** and **services**. If a component is no longer available, it may have been accidentally removed or have not been installed. In this case, you can reinstall it.

1. Click **Start** button, then **Control Panel** and double click **Network Connections**

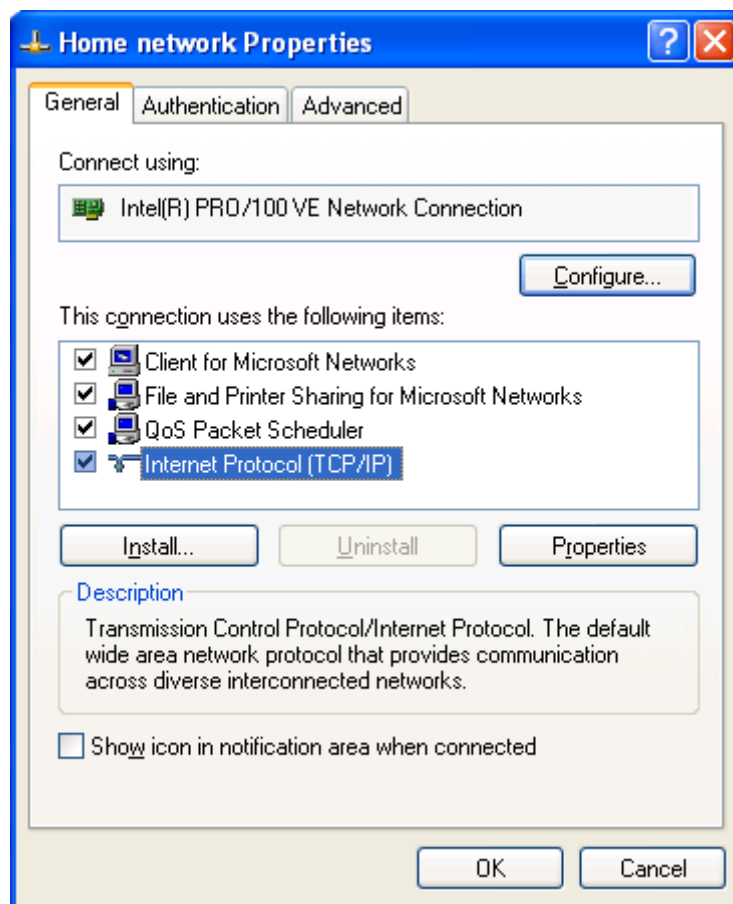


2. Right-click your **Network Connection**, and then click **Properties** the installed network components will appear.

LAN or High-Speed Internet



Network component dialog box



The key features available at this point are:

- **Client for Microsoft Networks**

This service makes connections to other Windows-based computers.

- **File and Printer Sharing**

This feature makes network resources such as File and Print sharing available.

- **Quality of Service (QoS) Packet Scheduler**

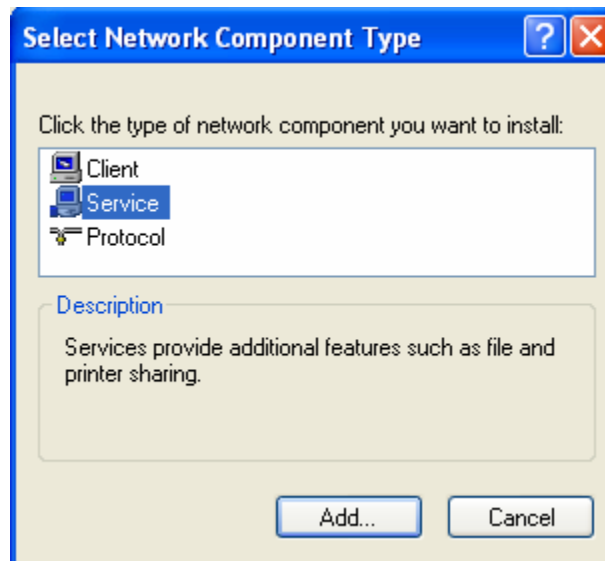
This feature optimizes network traffic.

- **The TCP/IP protocol**

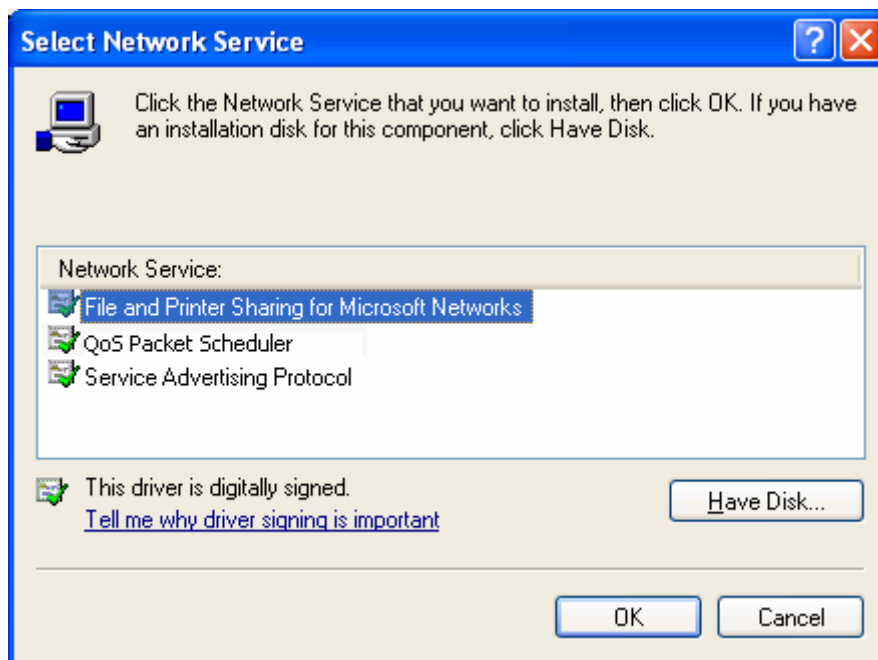
This feature allows viewing and configuring IP addresses.

(If a component is no longer available or it has been removed then in that case, you can reinstall it. Please note that these steps are optional)

3. Installing Service for Microsoft Networks.
4. Click **Install**, click **Service**.



5. Click **Add**, and then click **File and Print Sharing for Microsoft Networks**



6. Click **OK**, and then click **Close**.
7. You have successfully implemented **File and Printer Sharing for Microsoft Networks** service.

10.3 Identifying Ports and Cable Types

A computer has different ports for connecting different types of cables. Some of the most common ports a computer has are shown below.

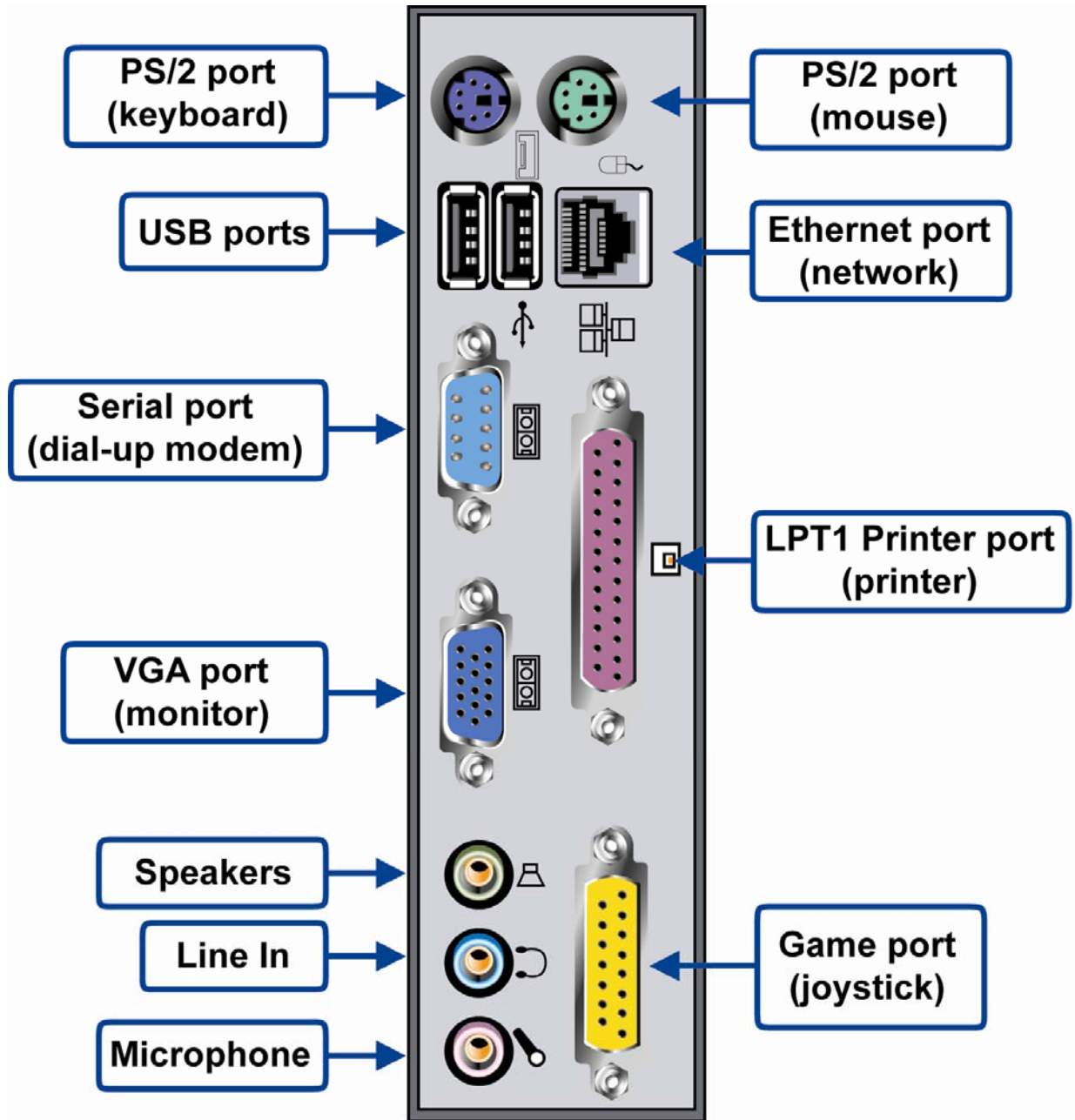


Figure 10-7 Different ports found at the back of a PC

Different types of computer cable connectors

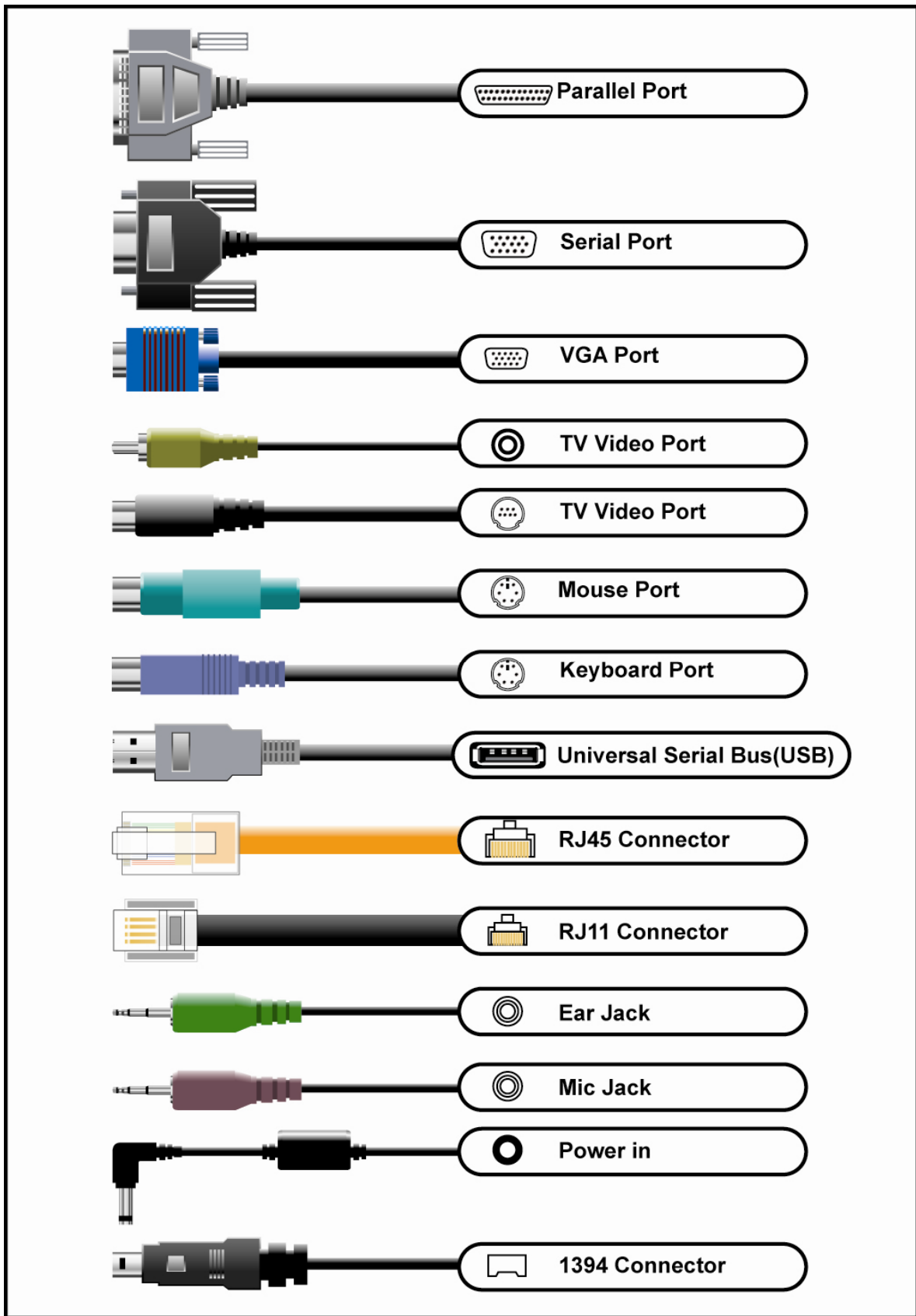


Figure 10-8 Different types of computer cables

10.4 Preparing Straight-through Network Cables

RJ-45 Connectors

RJ-45 connectors come in a bag of 50,100 etc. and are not expensive. They are similar to those of telephone cable connectors but slightly bigger in size. Unlike telephone connector with four contacts, RJ-45 connectors have eight contacts.



Figure 10-9 RJ-45 Connectors

Crimping Tool

The cost of crimping tool depends on its quality and features. A good crimping tool has a pair of wire cutters built in, as well as a blade to strip insulation. It also might support crimping of other connectors such as RJ-11.



Figure 10-10 Crimping Tool

Straight-through Network Cable

As the name implies, a **straight-through network cable** is a cable that passes data straight through from one end to another. Straight-through cables are used for a variety of connections. (e.g. connecting a computer to a hub or switch, connecting a computer to a cable/ISDN/DSL modem, and linking switches and hubs together.)

Steps for making a straight-through network cable

1. Cut the desired length of UTP (Cat5) cable

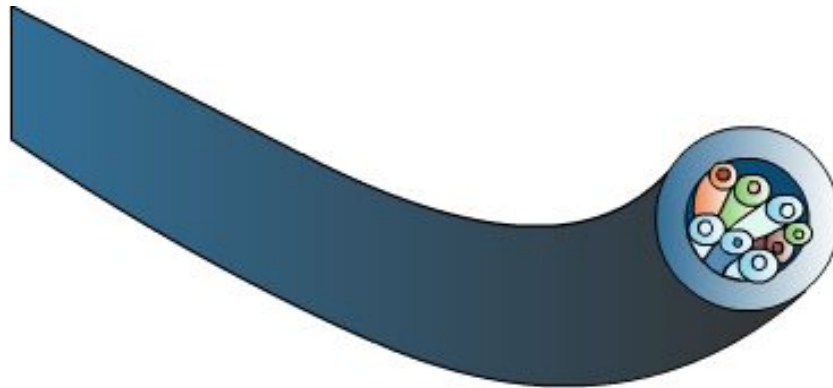


Figure 10-11 UTP cable

2. Strip about an inch of the insulation off the cable. Some crimping tools such as the one mentioned in Figure 10-10 come with a built-in wire stripper. It is extremely important that you only cut the plastic insulation/jacket and not the wire.

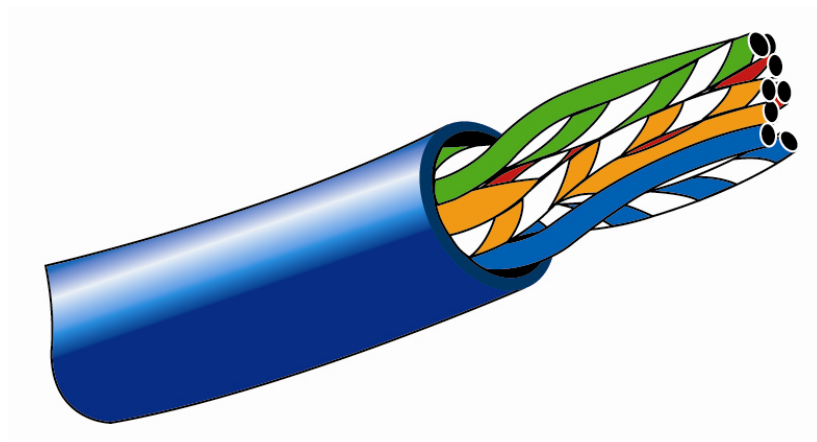


Figure 10-12 UTP cable with plastic insulation removed

3. Untwist the wires. You'll notice that there are 4 pairs of multi-colour wires inside. Sort the pairs by colour. You should end up with wires colour coded as follows: blue/blue-white, orange/orange-white, green/green-white and brown/brown-white.

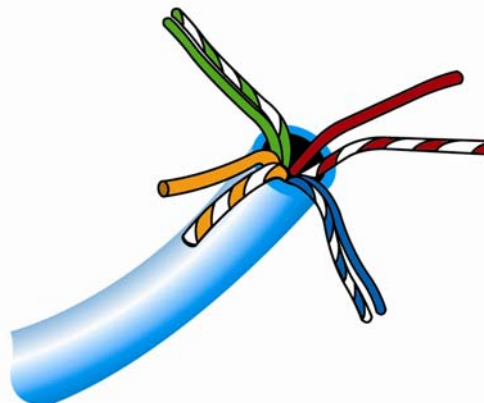


Figure 10-13 colour coded wire paired together

4. Now align the wires in the following order from left to right.

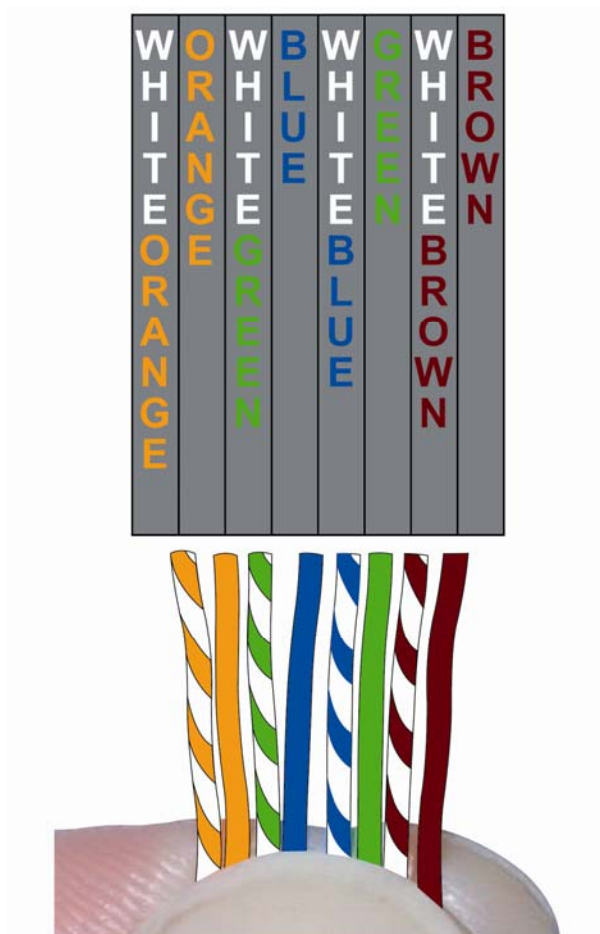


Figure 10-14 Proper arrangement order of wires

5. Get the wires lined up and nice and straight. Then clip off the top that they are all the same length and stick out about half an inch from the insulated part.

6. Getting all of the wires lined up and inserted correctly in RJ-45 connector, then inserts the RJ-45 connector into the appropriate opening of the crimping tool. Give the handle a nice, tight squeeze without crushing the RJ-45.



Figure 10-15 Prepare RJ-45 connector with a crimping tool

7. Correct cable will look like in Figure 10-16



Figure 10-16 Proper RJ-45 connector

The outer plastic insulator is firmly clamped

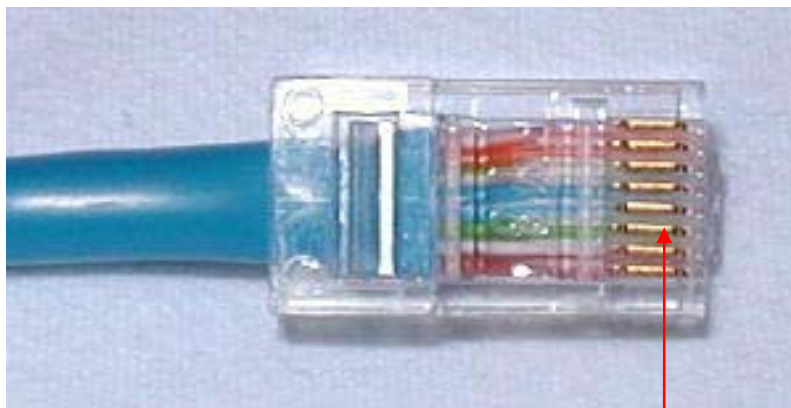


Figure 10-17 Metallic conductors of RJ-45

All metallic conductors are nicely fixed and in contact.

8. Incorrect cable might look like this

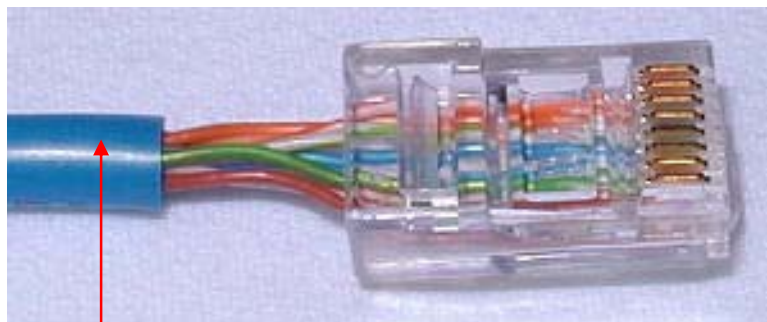


Figure 10-18 incorrectly fixed RJ-45 connector

The outer plastic insulator is not clamped

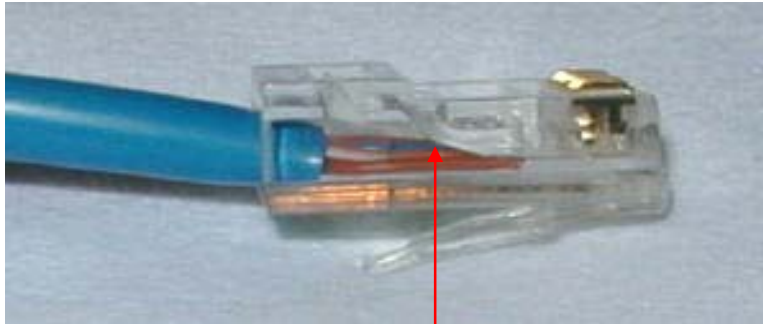


Figure 10-19 incorrectly fixed RJ-45 connector with no contact with copper conductors

No contact with metallic copper conductors.

10.5 Preparing Crossover Network Cables

Cross-over Network Cable

The **cross-over cable** can be made using the same steps as the straight-through cable. The only difference is the order in which the wires are put into the second connector (other end of the cable). On the straight-through cable you use the exact same order of wires at both end connectors where as on a cross-over cable you use a different order on each end.

1. The first end of cross-over cable network wiring



Figure 10-20 Wire arrangement of the first end of cross-over cable

2. The second end of cross-over cable network wiring



Figure 10-21 wire arrangement of the second end of cross-over cable

If you look closely and compare the two ends, you'll notice how the green and the orange pair trade places, which makes it a cross-over cable.

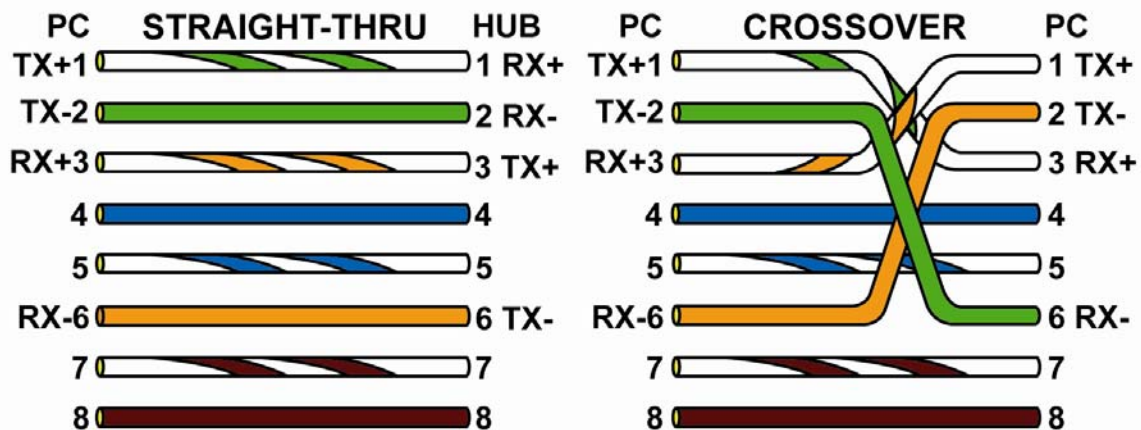


Figure 10-22 Straight-through and Crossover cable comparison

10.6 Setting up a Direct Cable Network

Sometimes you need to exchange data between a laptop computer and a desktop computer for that you do not have to set a big network. You can use a direct cable connection to exchange data between two computers without using hub or switch.

The direct cable connection is a connection between a **guest computer** and a **host computer**.

The host computer provides resources such as folders, drives, or even a printer.

The guest computer uses the resources that the host computer provides.

In this method the resources can only be accessed in one direction. To change the direction, disconnect an existing connection, reassign the tasks, and then re-establish the connection.

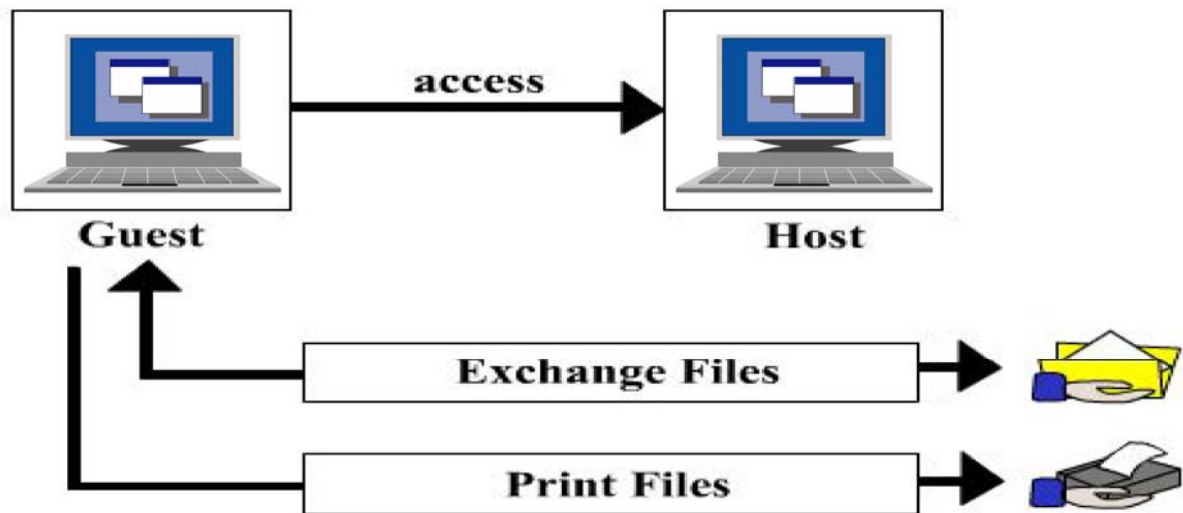


Figure 10-23 Guest and Host Computers

Connecting the cables

For two computers to exchange data, they must be physically connected using a cable. To connect one of the configurations can be used:

- A. Using a serial null modem cable for the COM port

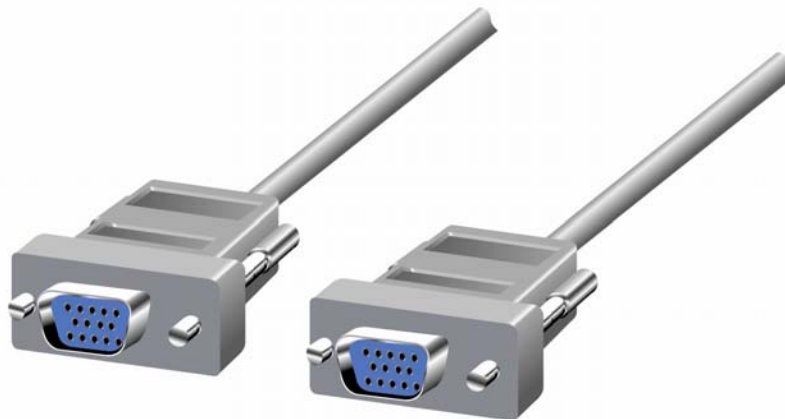


Figure 10-24 Serial null modem cable

- B. Using a parallel interlink cable for the LPT port



Figure 10-25 Parallel interlink cable

C. Using a USB link cable for the USB interface



Figure 10-26 USB link cable

D. CAT5 UTP or STP cable

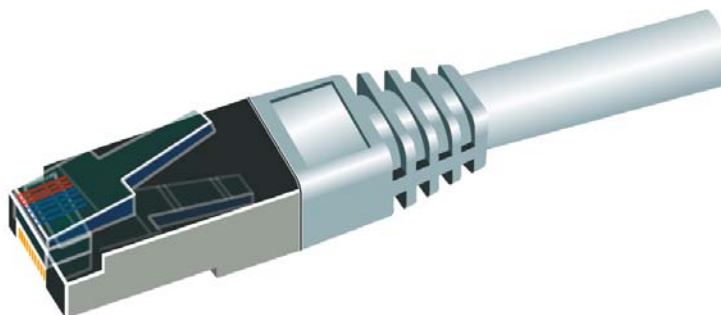


Figure 10-27 UTP cable with RJ-45 connector

E. You can even use an infrared connection if both computers have the required infrared hardware.

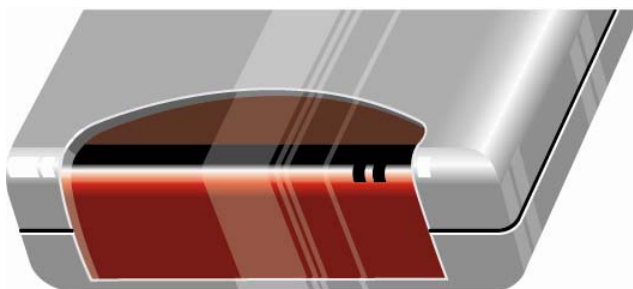


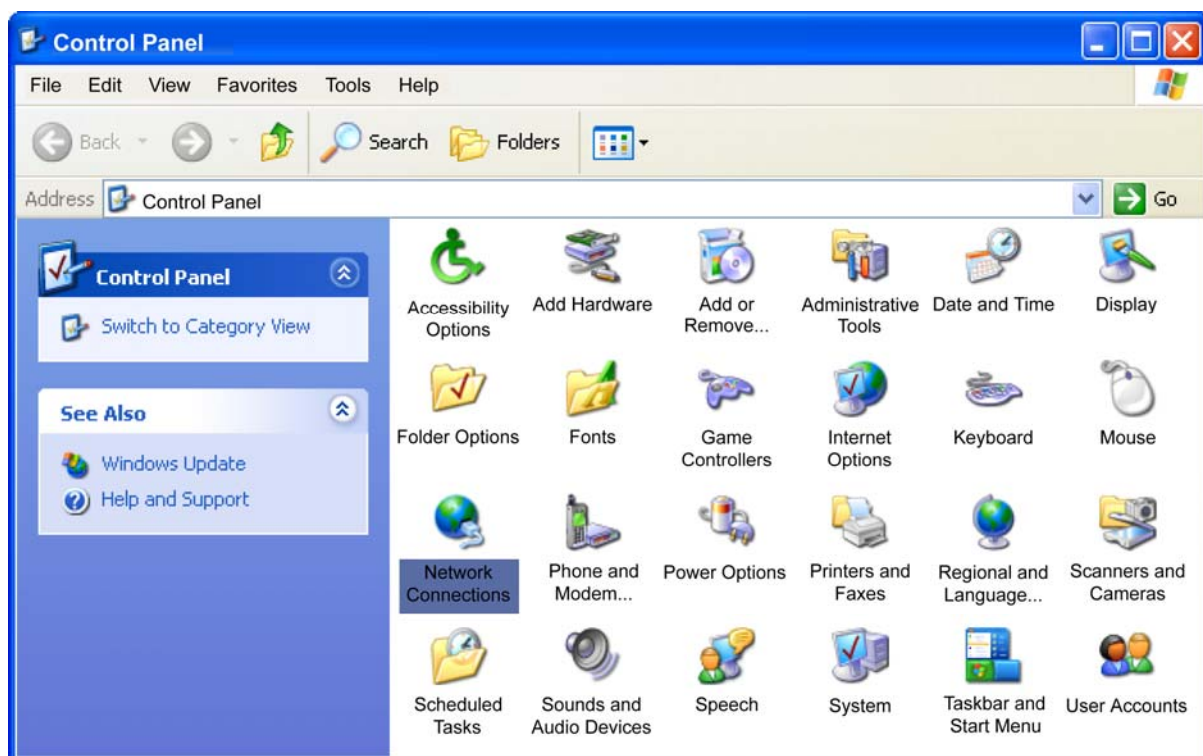
Figure 10-28 Infrared device

Setting up a connection

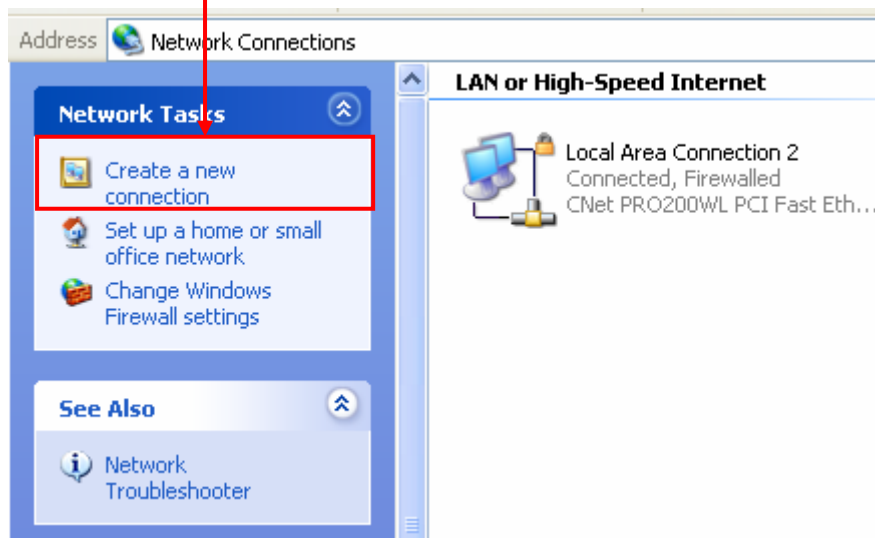
1. Click **Start** button, then click **control panel**



2. Double click the **Network Connections** icon



3. Click **Create a new connection** link

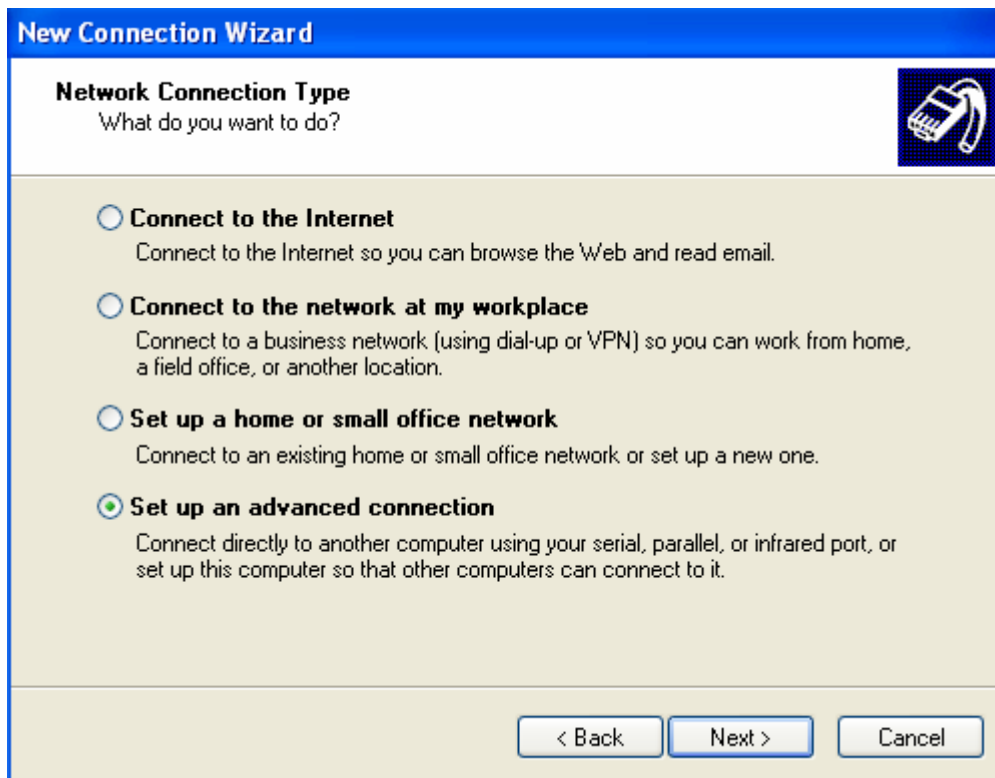


4. This will launch the **New Connection Wizard**

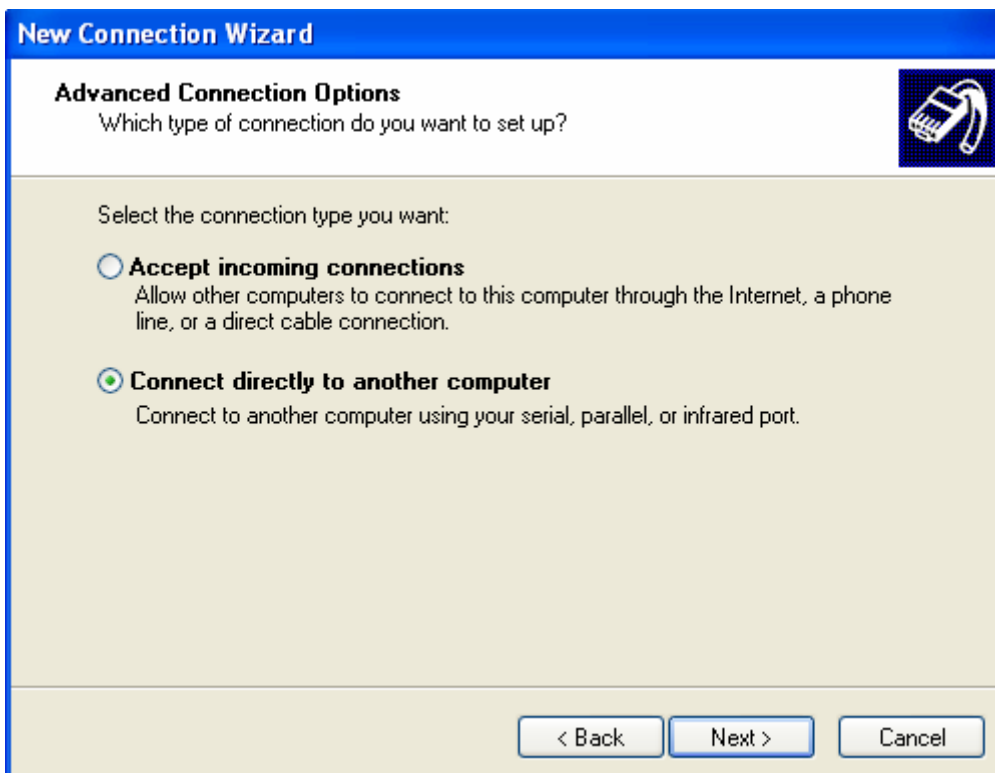


5. Click **Next** button

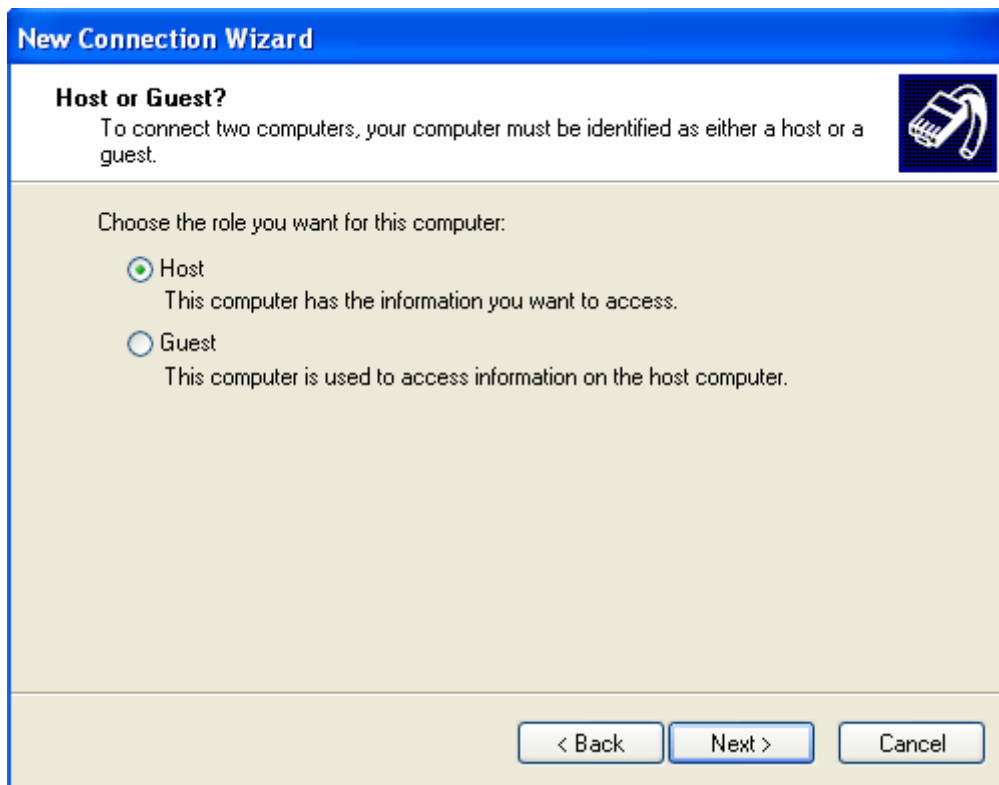
6. Select **Set up an advanced connection** and click **Next** button



7. Select **Connect directly to another computer** and click **Next** button



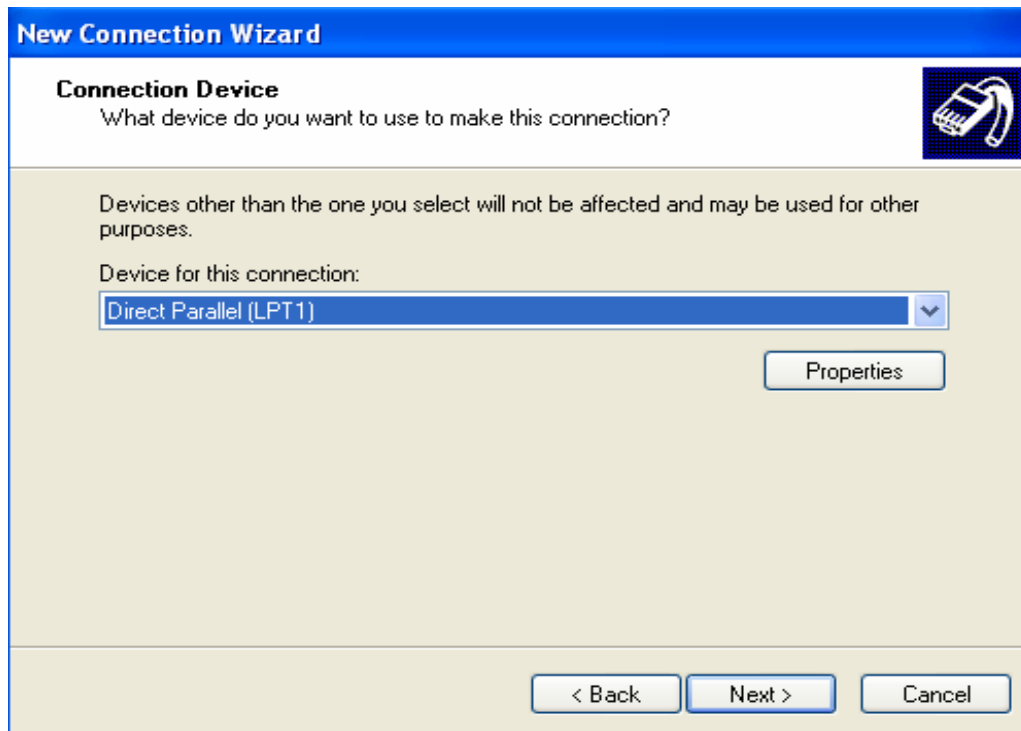
8. Select appropriate choice **Host** in this case and click **Next** button



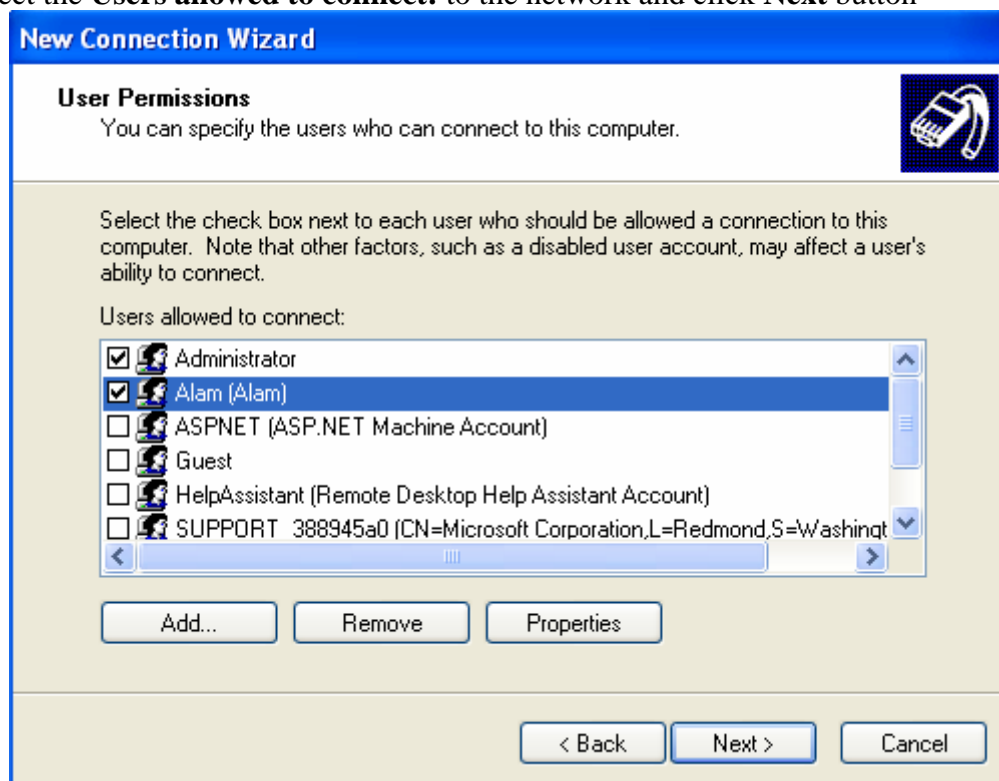
Note

You have to run the **New Connection Wizard** on other computer and make it as a **Guest** computer for proper data exchange.

9. Select appropriate **Device for this connection** (cable type you are using to connect both computers): in this case **Direct Parallel (LPT1)** and click **Next** button



10. Select the **Users allowed to connect:** to the network and click **Next** button



11. Click **Finish** button.



Now you have successfully created **direct cable network** between two computers. Go ahead and use the benefit provided by a network (e.g. Exchange of data between two computers)

10.7 Setting up a Small Network Using a Hub

It takes only few hours to setup a small network for home users or small office users if all the required equipments like hub/switch, cables and NICs are available. Network is done to share hard disks, folders, hard disk, CR-ROM drives, printers and the Internet.

Note

A small network can connect up to 10 workstations in a **workgroup**. A workgroup divides the corresponding tasks among the workstations. Because all the computers have the same rights, this configuration is known as a **peer-to-peer network**. Larger networks have **servers** that provide services to **client** computers that use these services. Such network is called **client-server network**. The small network does not need a server.

Setup of a small network requires:

A. Installation of Network Interface Cards (NICs) to all computers.



Figure 10-29 Internal NIC card

Most of the computers today come with built in NIC, if your computer don't have one then follow the instructions of **1.1 Installing a Network Interface Card (NIC)**.

B. One network cable per computer. Use CAT5 UTP or STP cables.



Figure 10-30 UTP cable

See section **10.4 Preparing straight-through cables** and section **10.5 Preparing Crossover cables** for more information.

C. Hub or Switch



Figure 10-31 Switch

Hub or Switch works as a signal distributor, which connects computers with each other, controls data flow and can negotiate data transfer between computers. These devices come in different quality and port numbers. Greater the port numbers more computers can be connected to it.

Connecting the Computers

All the computers are connected with Cat5 cables to a central hub as shown in the Figure 10-32. This configuration is called star topology.

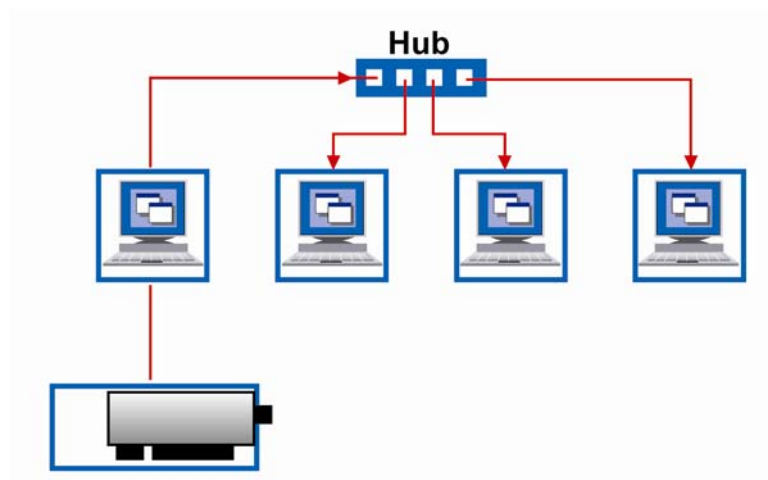


Figure 10-32 Cable layout diagram

Configuring TCP/IP Protocol

Once you have connected all computers to the central hub using Cat5 cables, next step is to configure TCP/IP protocol, assigning a proper and unique IP address to each computer.

IP Address

Each machine connected to the Internet or Network has an address known as an Internet **Protocol address (IP address)**. The format of an IP address is a 32-bit numeric address written as four numbers separated by periods. Each number can be 0 to 255. For example, 1.120.15.185. IP addresses are split into three classes (A, B and C) which allow for a small number of very large networks, a medium number of medium- sized networks and a large number of small networks.

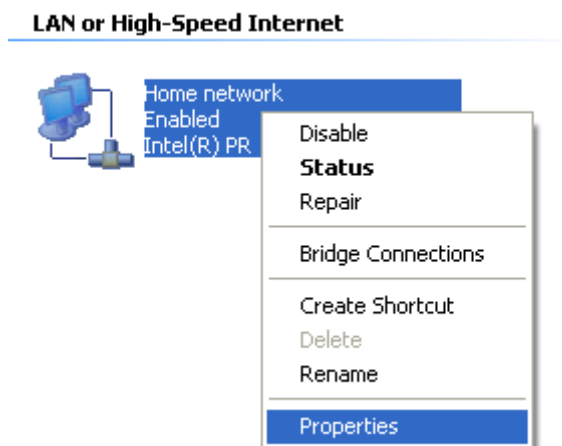
1. Click **Start** button, click **Control Panel**, and click **Network and Internet Connections**



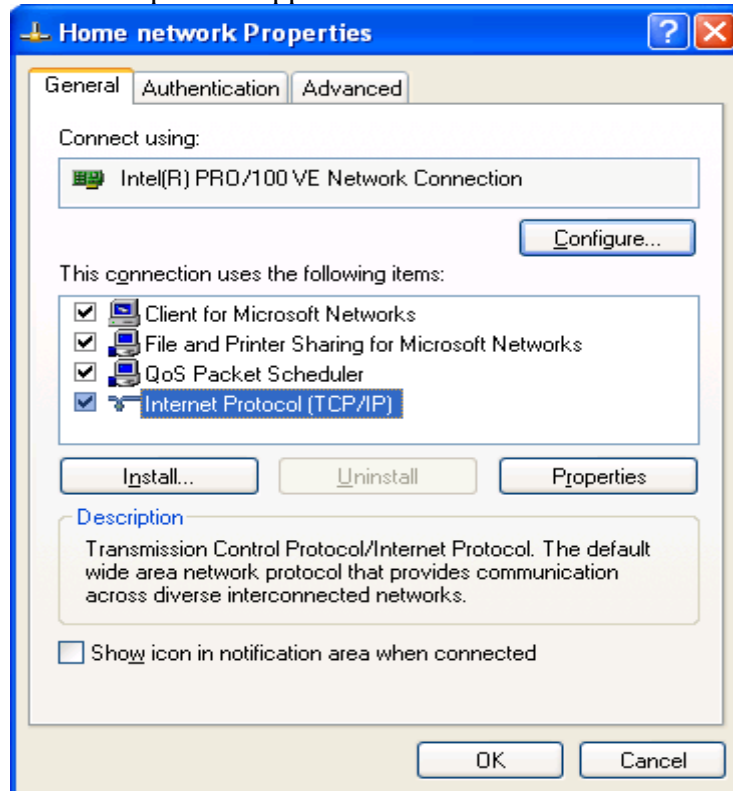
2. Click **Network Connections**. Windows has installed a **LAN connection** for your small network here.



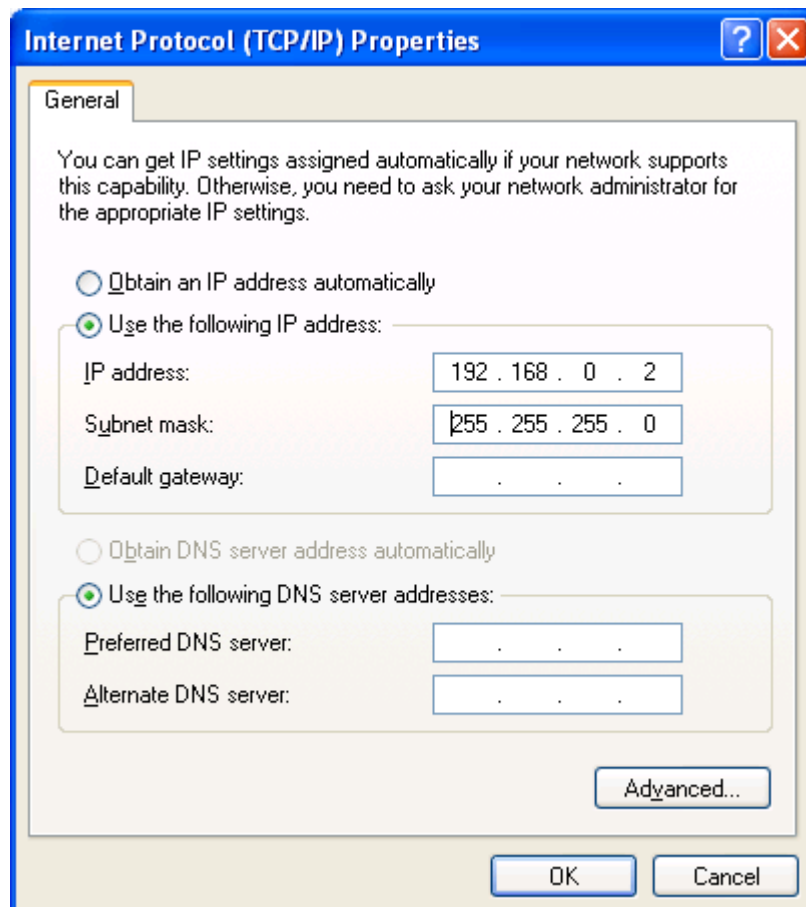
3. Right click the **LAN Connection** icon and select **Properties**.



4. The installed network components appear.



5. Click **Internet Protocol (TCP/IP)**, and then click **Properties**.



6. Click **Use the following IP address**, and then type the corresponding number combination. If you use 192.168.0.1 for the first computer, use 192.168.0.2 on the second computer, and 192.168.0.3 for the third computer, and so on. The subnet mask stays the same for all the computers. Use 255.255.255.0 for this, as recommended. Leave other setting blank.

7. Click **OK**, and then click **Close**.

8. Restart all the Computers for new configuration to take place

9. You have successfully completed all the procedures for setting up a small network using a hub.

Checking your network connection

10. Click **Start** button then click **control panel**. Double click **network connections**, after that double click **local area icon**, **Local Area Status** windows appears. Check packet activity, if there is increase in sent and received packets; this proves that you have successfully implemented the network.

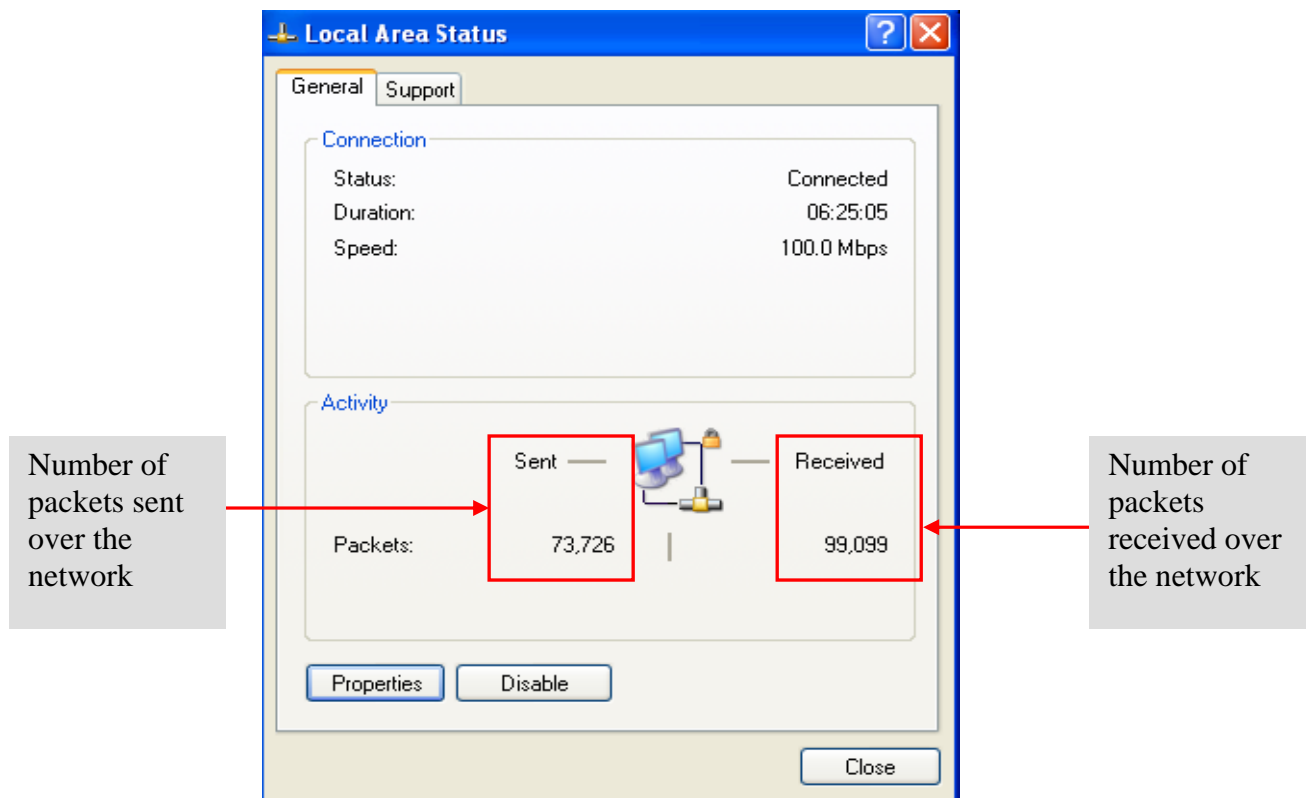


Figure 10-33 Local area status windows