

Practical 02

Getting familiar with system unit rear panel: ports and connectors

Objectives

- To be able to identify and get familiar with different ports and connectors.
- To get familiar with pin functionality of different ports and connectors.

Tools

- System unit with motherboard.

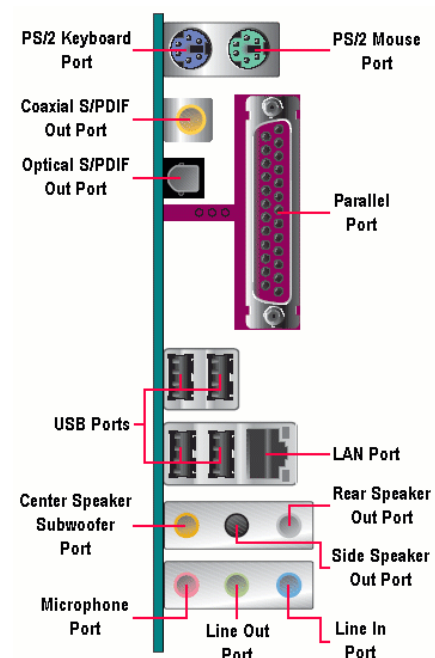
Keywords: System unit, Rare panel, Port, Connector, Pin.

Duration: 03 hours

2 Introduction

2.1 System Unit

System Unit is one of the important components of the computer system which houses all the main components. At the back of the system unit there is a panel containing different types of ports.



2.2 Computer Port

A computer port is a connection point or interface between a computer and an external or internal device. Internal ports may connect such devices as hard drives and CD ROM or DVD drives; external ports may connect modems, printers, mice and other devices.

A port serves as an interface between the computer and other computers or peripheral devices. Physically, a port is a specialized outlet on a piece of equipment to which a plug or cable connects. Electronically, the several conductors making up the outlet provide a signal transfer between devices.

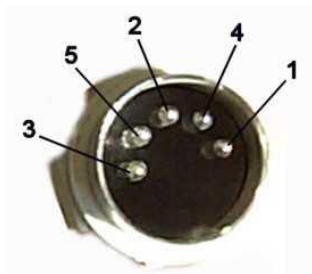
There are many types of ports available which connect different types of the input and output devices to the system unit. Some of them are listed below:

- DIN5
- PS/2
- Serial
- Parallel
- VGA
- USB A
- USB B
- USB Mini A
- USB Mini B
- USB Micro AB
- USB Micro B
- Firewire
- RJ 45
- RJ 11
- Audio (Mic, Line-out, Line-In)
- S/PDIF
- DVI
- HDMI
- S-Video

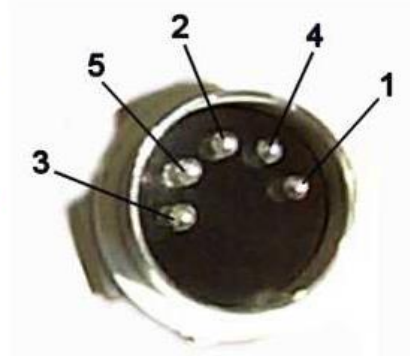
2.3 DIN5 Port and Connector

A DIN connector is a connector that was originally standardized by the *Deutsches Institut für Normung (DIN)*, the German national standards organization.

The 5-pin DIN (DIN5) cable interface is commonly known as a PC/AT connection and is utilized for serial data transfer between computers and peripherals such as PC keyboards, MIDI keyboards, and electronic instruments. Amphenol Tuchel 5-pin DIN Cables are perfect for connecting or extending any DIN5 enabled device.



Connector Pin #	Purpose
Pin 1	KBDCLK (clock)
Pin 2	KBDAT (data)
Pin 3	KBRST (reset, not used)
Pin 4	GND
Pin 5	VCC (+5V)



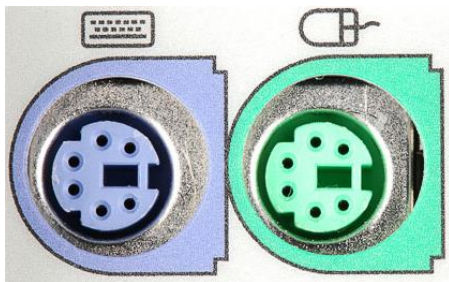
DIN5 connector has 5 pins, every pin has a different task to do:

- PIN1 is keyboard clock signal, which synchronizes the keyboard with system unit.
- PIN2 is keyboard data, it carries data signals from keyboard to system unit (either 0 or 1).
- PIN3 is keyboard reset, which resets the state of the keyboard.
- PIN4 provides ground (0V).
- PIN5 provides power to the keyboard (+5V).

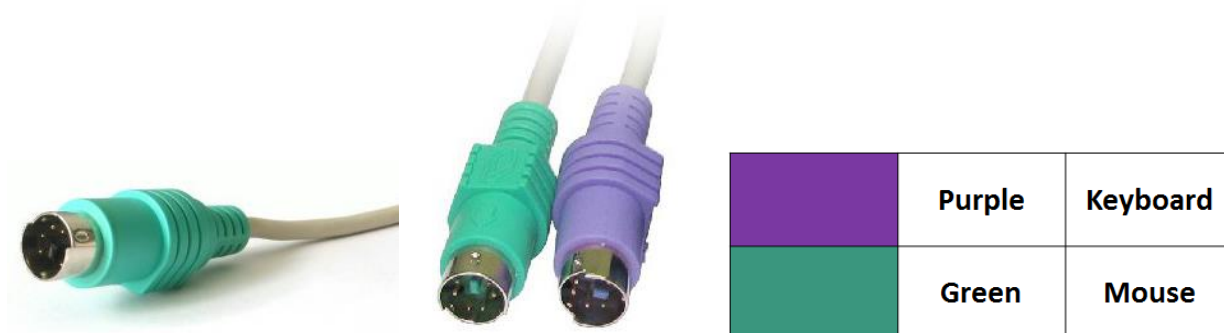
2.4 PS/2 Port and Connector

The PS/2 connector is a 6-pin Mini-DIN connector used for connecting some keyboards and mice to a PC compatible computer system. Its name comes from the IBM Personal System/2 series of personal computers, with which it was introduced in 1987.

It is also called Mini-DIN 6 port.



PS/2 connectors are color coded. The purple colored port is used for connecting keyboard and green colored port is used to connect a mouse.



PS/2 connector has 6 pins, every pin has a different task to do:

- PIN1 is keyboard data, it carries data signals from keyboard to system unit (either 0 or 1).
- PIN2 is not used.
- PIN3 provides ground (0V).
- PIN4 provides power to the keyboard (+5V).
- PIN5 is keyboard clock signal, which synchronizes the keyboard with system unit.
- PIN6 is not used.

2.5 Serial Port and Connector

A port that can be used for serial communication, in which only 1bit is transmitted at a time. Most serial ports on personal computers conform to the RS-232C or RS-422 standards. A serial port is a general-purpose interface that can be used for almost any type of device, including modems, mice, and printers (although most printers are connected to a parallel port).

It has the following characteristics:

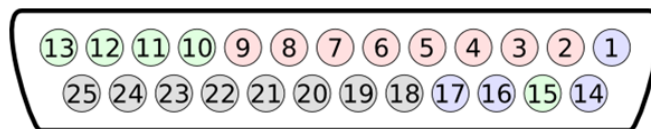
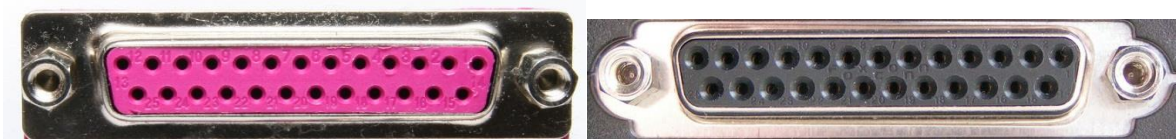
- Sends the data serially bit by bit.
- It has 9 pins/connectors.
- It is also called DB9 because it is D in shape and has 9 pins.
- Also called COM ports (Communication).
- It is bi-directional (it transmit and receive the bits).
- Mostly used to connect serial mouse, modem, GPS Receivers and Bar code scanners.



2.6 Parallel Port and Connector

Less commonly referred to as the Centronics interface or Centronics connector after the company that originally designed it, the port was later developed by Epson. The parallel port is found on the back of IBM compatible computers and is a 25-pin (type DB-25) computer interface commonly used to connect printers to the computer.

- Sends 8 bits at a time.
- Also called DB25 or Centronics port.
- It has 25 pins/connectors.
- Also called Printer Port or LPT (Line Printer Terminal).
- Mostly used to connect printers, scanners and external drives.
- A newer type of parallel port, which supports the same connectors as the Centronics interface, is the EPP (Enhanced Parallel Port) or ECP (Extended Capabilities Port).



Pins (2 – 9) = Data (0 bit – 7 bit)

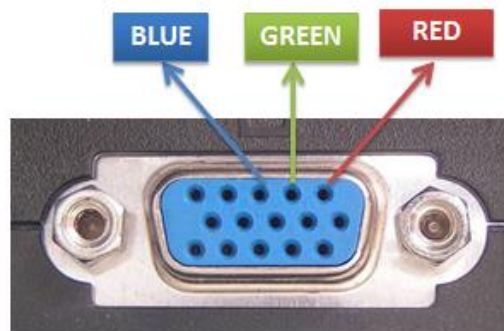
2.7 VGA Port and Connector

A Video Graphics Array (VGA) connector is a three-row 15-pin DE-15 connector. The 15-pin VGA connector is found on many video cards, computer monitors, and high definition television sets. On laptop computers, or other small devices, a mini-VGA port is sometimes used in place of the full-sized VGA connector.

- VGA stands for Video Graphics Array.
- It is also called DE15 or DB15.
- Sometimes it is also referred to as RGB Connector.
- Used to connect Monitor, TV and Projector.



VGA can represent any color by the combination of Red, Green and Blue colors.



2.8 USB Port and Connector

A USB port is a standard cable connection interface on personal computers and consumer electronics. USB ports allow stand-alone electronic devices to be connected via cables to a computer (or to each other).

USB stands for Universal Serial Bus, an industry standard for short-distance digital data communications. USB allows data to be transferred between devices. USB ports can also supply electric power across the cable to devices without their own power source.

- USB stands for Universal Serial Bus.
- Used to connect many different types of devices to the system unit.
- It is Plug and Play.
- Maximum of 127 devices can be connected to one USB port at a time.
- Used to connect Monitor, TV and Projector.

Versions of USB

1. USB 1.0 (Full Speed)

- Released in the year 1996
- Maximum transfer speed of 12 Mbits/s

2. USB 2.0 (High Speed)

- Released in the year 2000
- Maximum transfer speed of 480 Mbits/s

3. USB 3.0 (Super Speed)

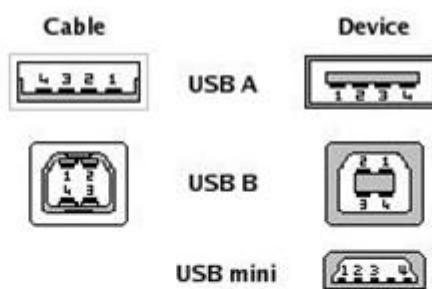
- Released in the year 2008
- Maximum transfer speed of 5 Gbits/s

Types of USB Connectors and ports

- USB A
- USB B
- USB Mini A

- USB Mini B
- USB Micro AB
- USB Micro B





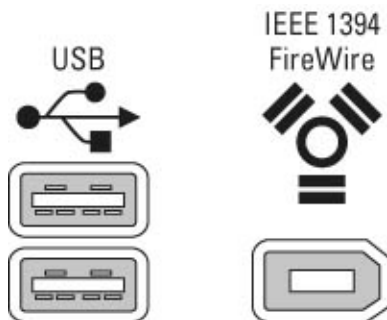
Pin	Signal	Color	Description
1	VCC		+5V
2	D-		Data -
3	D+		Data +
4	GND		Ground

2.9 Firewire Port and Connector

Firewire is Apple Computer's version of a standard, IEEE 1394, High Performance Serial Bus, for connecting devices to your personal computer. Firewire provides a single plug-and-socket connection on which up to 63 devices can be attached with data transfer speeds up to 400 Mbps (megabits per second). The standard describes a serial bus or pathway between one or more peripheral devices and your computer's microprocessor. Many peripheral devices now come equipped to meet IEEE 1394. Firewire and other IEEE 1394 implementations provide:

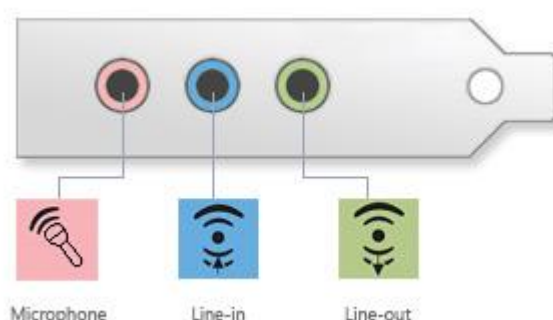
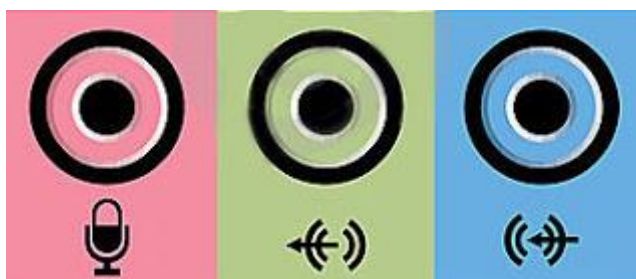


- A simple common plug-in serial connector on the back of your computer and on many different types of peripheral devices
- A thin serial cable rather than the thicker parallel cable you now use in your printer, for example
- A very high-speed rate of data transfer that will accommodate multimedia applications (100 and 200 megabits per second today; with much higher rates later)
- Hot-plug and plug and play capability without disrupting your computer
- The ability to chain devices together in a number of different ways without terminators or complicated set-up requirements.
- Also called IEEE1394 Interface.
- Developed by Apple in 1990s.
- It provides serial communication.
- Up to 63 devices can be attached.
- Provides maximum transfer rate of 400 Mbps/s.



2.10 Audio Ports

Connectors built into an expansion card or the motherboard itself that allow audio input and output. Generally speaking, any computer will have three audio connectors, audio-in, audio-out and mic-in. These use the same 3.5mm stereo plugs that most home audio devices use. Depending on the device, there may be more than one audio-out connector for multiple channel sound. Though the color coding can vary, it is generally accepted that audio-out connectors are green or black, mic-in ones are pink, and audio-in blue. All audio cables can be plugged and unplugged without damage to a running computer.



In many cards, the microphone connector will be pink, the line out or headphone will be lime green, and the stereo line in will be light blue. Additional jacks may be present on newer soundcards for rear and mid surround speakers.

Color	Connector
Lime Green	Line-Out, Front Speakers, Headphones
Pink	Microphone
Light Blue	Stereo Line In
Orange	Subwoofer and Center out
Black	Rear Surround Speakers for 5.1 and 7.1 systems
Gray	Middle Surround Speakers for 7.1 systems
Gold	Midi / Game port (Joystick)

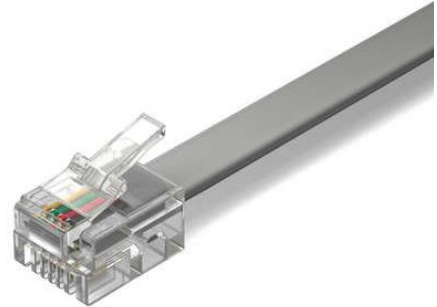
There is a widely accepted color standard for computer sound card input and output jacks, but connector colors may vary between different brands. If you think you have a nonstandard card, consult your soundcard's manual or the manufacturer's web site before making any connections.

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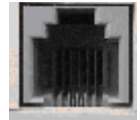
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2.11 RJ 11

More commonly known as a modem port, phone connector, phone jack or phone line, the RJ-11 is short for Registered Jack-11 and is a four or six wire connection primarily used for telephones and computer modem connectors in the United States. The picture is an example image of what the RJ-11 phone cable and connection looks like.

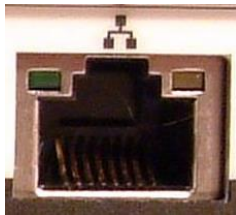


Note: Although this cable can be used to connect your modem to the Internet it should not be confused with the RJ-45 connector, which is used with your network card.



2.12 RJ 45

Short for Registered Jack-45, a RJ-45 is an 8-pin connection used for Ethernet network adapters. This connector resembles the RJ-11 or 6-pin connector used with telephones in the United States, but they're completely different. The picture is of a RJ-45 connector separated from the cable.



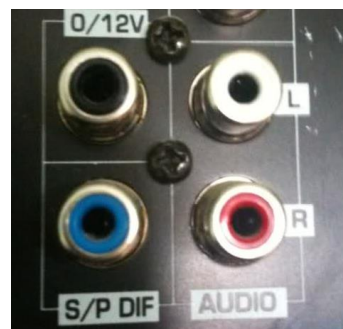
This connector is most commonly connected to the end of Cat5 cable, which is connected between a computer network card and a network device such as a network router.

2.13 S/PDIF

Short for Sony and Phillips Digital Interconnect Format, the S/PDIF or SPDIF interface is used to transmit digital audio, in a compressed form, between audio equipment and home theater systems. The S/PDIF interface can utilize a coaxial cable or a fiber optic cable to transmit the audio. Common equipment to use this interface are DVD Players and CD Players, connecting to a home theater system for Dolby Digital or DTS surround sound. High quality sound cards and laptops also have this connector. In the first picture to the right, is an example of what the SPDIF connector may look like on your computer motherboard.

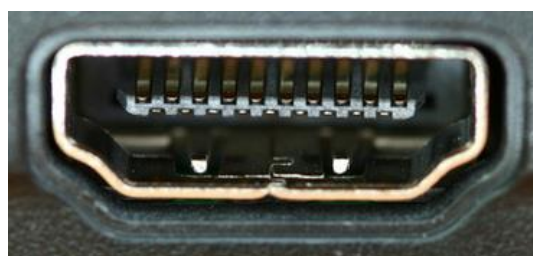


S/PDIF connection on back of audio equipment. The audio transmitted is through the S/PDIF interface is defined by the IEC 61937 standard. The common formats transmitted are the 48 kHz sample rate (used in DAT) and the 44.1 kHz sample rate (used in CD audio). In the picture to the second picture to the right, is an example of a fiber optic connection on the back of audio equipment.



2.14 HDMI

Short for High-Definition Multimedia Interface, it is the first industry-supported uncompressed, all-digital audio/video interface. It's a single cable and user-friendly connector that replaces the maze of cabling behind the home entertainment center. HDMI provides an interface between any audio/video source, such as a set-top box, DVD player, or A/V receiver and an audio and/or video monitor, such as a digital television (DTV), over a single cable. HDMI supports standard, enhanced, or high-definition video, plus multi-channel digital audio on a single cable. It transmits all ATSC HDTV standards and supports 8-channel digital audio with bandwidth to spare to accommodate future enhancements and requirements.



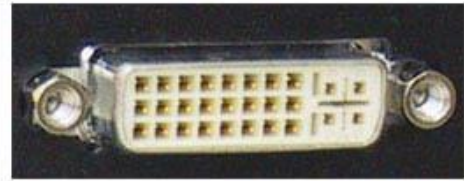
HDMI was defined to carry 8 channels, of 192kHz, 24-bit uncompressed audio, which exceeds all current consumer media formats. In addition, HDMI can carry any flavor of compressed audio format such as Dolby or DTS. HDMI has the capacity to support existing high-definition video formats such as 720p, 1080i, and 1080p, along with support of enhanced definition formats like 480p, as well as standard definition formats such as NTSC or PAL.



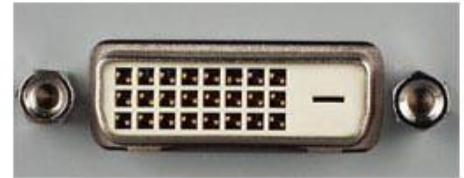
HDMI was developed by Developed by Sony, Hitachi, Thomson (RCA), Philips, Matsushita (Panasonic), Toshiba and Silicon Image.

2.15 DVI

DVI (Digital Visual Interface) is a specification created by the Digital Display Working Group (DDWG) to accommodate analog and digital monitors with a single connector. There are three different DVI configurations: DVI-A, designed for analog signals, DVI-D, designed for digital signals, and DVI-I (integrated), and designed for both analog and digital signals.



DVI -I (integrated digital & analog)



DVI-D (digital only)

Using a DVI connector and port, a digital signal that is sent to an analog monitor is converted into an analog signal. If the monitor is a digital monitor, such as a flat panel display, no conversion is necessary. Many monitors now include a DVI connection and many video adapters include a DVI port along with, or instead of, the traditional 15-pin Video Graphics Array (VGA) port.

2.16 S-Video

Short for Super-Video, a technology for transmitting video signals over a cable by dividing the video information into two separate signals: one for color (chrominance), and the other for brightness (luminance). When sent to a television, this produces sharper images than composite video, where the video information is transmitted as a single signal over one wire. This is because televisions are designed to display separate Luminance (Y) and Chrominance (C) signals. (The terms Y/C video and S-Video are the same.)

Computer monitors, on the other hand, are designed for RGB signals. Most digital video devices, such as digital cameras and game machines, produce video in RGB format. The images look best, therefore, when output on a computer monitor. When output on a television, however, they look better in S-Video format than in composite format.

To use S-Video, the device sending the signals must support S-Video output and the device receiving the signals must have an S-Video input jack. Then you need a special S-Video cable to connect the two devices.



EXERCISE

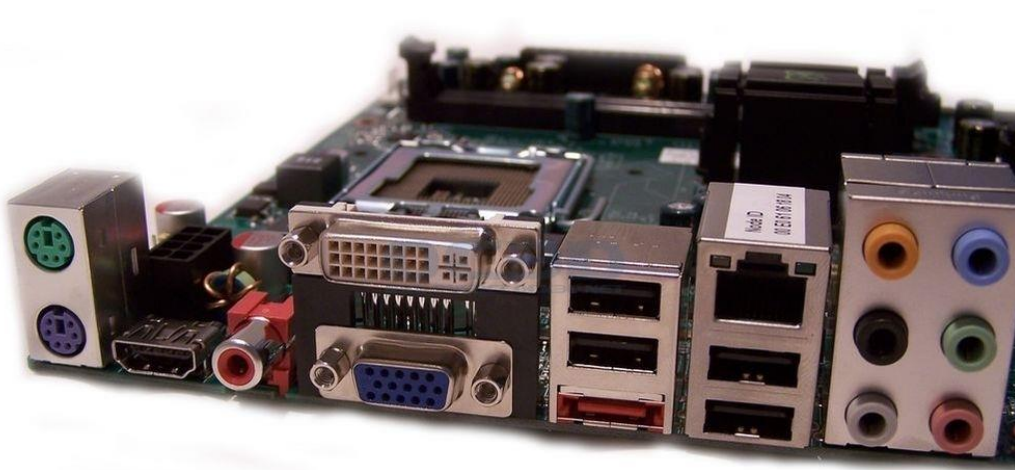
1. What different ports and connectors do you found in the lab? For each, fill in the following:

[illegible]

2. Identify and label the ports in the motherboard shown below.



3. Identify and label the ports in the motherboard shown below.



4. Identify and label the ports in the motherboard shown below.



5. Describe the function of each of the pin for the following ports:

USB Port

Pin Number	Function
Pin 1	
Pin 2	
Pin 3	
Pin 4	

PS/2 Port

Pin Number	Function
Pin 1	
Pin 2	
Pin 3	
Pin 4	
Pin 5	
Pin 6	

Serial Port

Pin Number	Function
Pin 1	
Pin 2	
Pin 3	
Pin 4	
Pin 5	
Pin 6	
Pin 7	
Pin 8	
Pin 9	

Firewire Port

Pin Number	Function
Pin 1	
Pin 2	
Pin 3	
Pin 4	
Pin 5	
Pin 6	

RJ-11 Port

Pin Number	Function
Pin 1	
Pin 2	
Pin 3	
Pin 4	
Pin 5	
Pin 6	

RJ-45 Port

Pin Number	Function
Pin 1	
Pin 2	
Pin 3	
Pin 4	
Pin 5	
Pin 6	
Pin 7	
Pin 8	

S-Video In Port

Pin Number	Function
Pin 1	
Pin 2	
Pin 3	
Pin 4	
Pin 5	
Pin 6	
Pin 7	

S-Video Out Port

Pin Number	Function
Pin 1	
Pin 2	
Pin 3	
Pin 4	