SCSX1027 Hardware Peripherals and Interfacing

UNIT 4

IO PERIPHERALS

Peripherals are external devices that you connect to your PC.There are two main ways that you can connect peripherals to your machine: through a serial connection, or through a parallel connection:

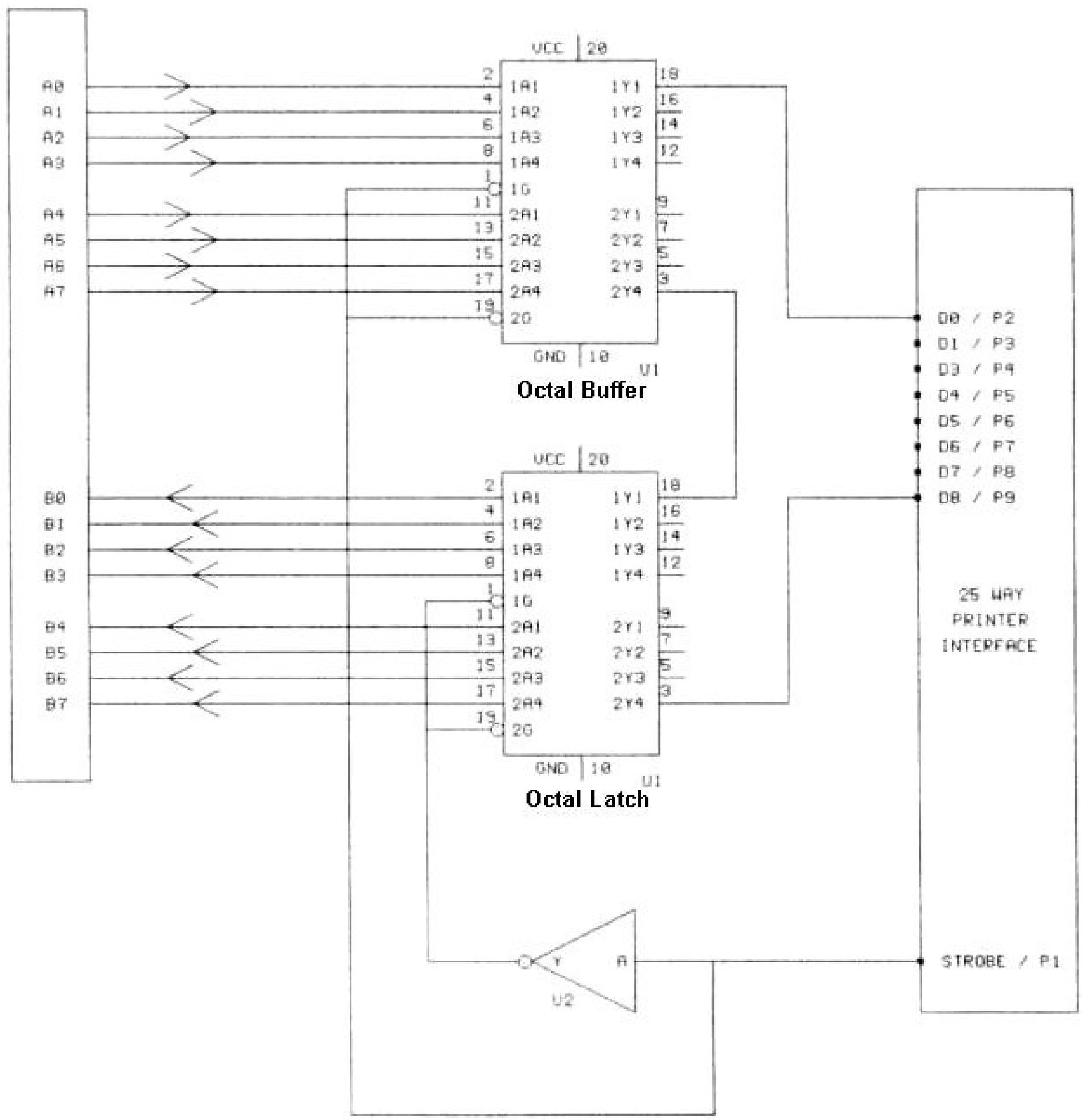
- **Serial Communications:** A serial connection sends information over the line one bit at a time. It is a simple way to send information in or out of the computer, but is not as fast as other ways the computer can communicate. Serial connections are typically used for devices such as mice and modems.
- **Parallel Communications:** A parallel connection is faster than a serial one because it sends many bits in parallel. The advantage of this is that it is faster, but the disadvantage is that it is more complicated to do. Parallel connections are used most often for printers and removable storage drives, which need more speed than serial peripherals.

PARALLEL PORT & TIMING DIAGRAM:

- The Parallel Port allows the input of up to 9 bits or the output of 12 bits at any one given time, thus requiring minimal external circuitry to implement many simpler tasks. The port is composed of 4 control lines, 5 status lines and 8 data lines. It is available on a PC as a D-Type 25 Pin female connector.
- Newer Parallel Port's are standardized under the IEEE 1284 standard first released in 1994. This standard defines 5 modes of operation which are as follows:
- 1. Compatibility Mode.
  2. Nibble Mode.
  3. Byte Mode.
  4. EPP Mode (Enhanced Parallel Port).
  5. ECP Mode (Extended Capabilities Mode).

Bi-directional Ports

The schematic diagram below, shows how a Standard Printer Port (SPP) can transfer Input and Output data via an Octal Buffer and Octal Latch, respectively.



The bi-directional ports utilise the 74LS373 as the Octal Latch and the 74LS245 as an Octal Buffer. The Strobe (Pin 1) output from the Standard Printer Port (SPP) is connected to an Inverter (U2). When the Strobe is Active Low the Octal Buffer is enabled and the Octal Latch is disabled, so data can be READ into the Port. When the Strobe is Active High the Octal Buffer is disabled and the Octal Latch is enabled, so data can be WRITTEN from the Port. This way you can read data present on the Parallel Port's Data Pins, without having bus conflicts and excessive current drains.

Bit 5 of the Control Port enables or disables the bi-directional function of the Parallel Port. This is only available on true bi-directional ports. When this bit is set to one, pins 2 to 9 go into high impedance state. Once in this state you can enter data on these lines and retrieve it from the Data

Port (base address). Any data which is written to the data port will be stored but will not be available at the data pins. To turn off bi-directional mode, set bit 5 of the Control Port to '0'.

However not all ports behave in the same way. Other ports may require setting bit 6 of the Control Port to enable Bi-directional mode and setting of Bit 5 to disable Bi-directional mode,

Parallel Port Modes in BIOS

Today, most Parallel Ports are mulimode ports. They are normally software configurable to one of many modes from BIOS. The typical modes are:

Printer Mode (Sometimes called Default or Normal Modes)
Standard & Bi-directional (SPP) Mode
EPP1.7 and SPP Mode
EPP1.9 and SPP Mode
ECP Mode

Printer Mode is the most basic mode. It is a Standard Parallel Port in forward mode only. It has no bi-directional feature, thus Bit 5 of the Control Port will not respond.

Standard & Bi-directional (SPP) Mode is the bi-directional mode. Using this mode, bit 5 of the Control Port will reverse the direction of the port, so you can read back a value on the data lines.

EPP1.7 and SPP Mode is a combination of EPP 1.7 (Enhanced Parallel Port) and SPP Modes. In this mode of operation you will have access to the SPP registers (Data, Status and Control) and access to the EPP Registers. In this mode you should be able to reverse the direction of the port using bit 5 of the control register.

EPP1.9 and SPP Mode is just like the previous mode, only it uses EPP Version 1.9 this time. As in the other mode, you will have access to the SPP registers, including Bit 5 of the control port. However this differs from EPP1.7 and SPP Mode as you should have access to the EPP Timeout bit.

ECP Mode will give you an Extended Capabilities Port. The mode of this port can then be set using the ECP's Extended Control Register (ECR). However in this mode from BIOS the EPP Mode (100) will not be available.

IEEE 1284 MODES:

standardization. IEEE 1284 can operate in five modes: is a standard that defines bi-directional parallel communications between computers and other devices. It was originally developed in the 1970s by Centronics, and was widely known as the **Centronics port**, both before and after its IEEE

- **Compatibility Mode**
- **Nibble mode**
- **Byte Mode**
- **Enhanced Parallel Port** (**EPP**)
- **Extended Capability Port** (**ECP**)

ASYNCHRONOUS COMMUNICATION:

In telecommunications, **asynchronous communication** is transmission of data, generally without the use of an external clock signal, where data can be transmitted intermittently rather than in a steady stream.[1] Any timing required to recover data from the communication symbols is encoded within the symbols. The most significant aspect of asynchronous communications is that data is not transmitted at regular intervals, thus making possible variable bit rate, and that the transmitter and receiver clock generators do not have to be exactly synchronized all the time.

SERIAL PORT SIGNALS:

a **serial port** is a serial communication interface through which information transfers in or out one bit at a time.t Throughout most of the history of personal computers, data was transferred through serial ports to devices such as modems, terminals and various peripherals.

While such interfaces as Ethernet, FireWire, and USB all send data as a serial stream, the term "serial port" usually identifies hardware more or less compliant to the RS-232 standard, intended to interface with a modem or with a similar communication device.

- **DTE & DCE**
  individual signals on a serial port are unidirectional and when connecting two devices the outputs of one device must be connected to the inputs of the other. Devices are divided into two categories "data terminal equipment" (DTE) and "data circuit-terminating equipment" (DCE). A line that is an output on a DTE device is an input on a DCE device and vice versa so a DCE device can be connected to a DTE device with a straight wired

cable. Conventionally, computers and terminals are DTE while modems and peripherals are DCE.

If it is necessary to connect two DTE devices (or two DCE devices but that is more unusual) a cross-over null modem, in the form of either an adapter or a cable, must be used.

- **Male and female**

The "gender" of a connector is determined by its physical appearance: if pins protrude from the base of the connector, the connector is male; otherwise, if the connector has holes to accept the pins, the connector is female.[2] if a DE-9 or DE-25 connectors is male, it is likely to be a DTE, but if it is female, it is likely to be a DCE. However, there are many cases in which this does not apply; for instance, most serial printers have a female DB25 connector, but they are DTEs.[3]

VIDEO ADAPTER:

A **video card** (also called a **video graphics adapter or VGA**, **display card**, **graphics card**, **graphics board**, **display adapter**, **graphics adapter** GPU or **frame buffer**[1]) is anexpansion card which generates a feed of output images to a display (such as a computer monitor). Frequently, these are advertised as **discrete** or **dedicated** graphics cards, emphasizing the distinction between these and integrated graphics.

PARTS:

- Graphics Processing Unit
- Heat sink
- Video bios
- Video memory
- RAMDAC

OUTPUT INTERFACES:

- Video graphics array(VGA)
- Digital visual interface(DVI)
- Video in video out(VIVO)
- High definition multimedia interface(HDMI)
- Display port

GRAPHIC ACCELERATORS:

A graphics accelerator (a chipset attached to a *video board*) is a computer microelectronics component to which a computer program can offload the sending and refreshing of images to the display monitor and the computation of special effects common to 2-D and 3-Dimages. Graphics accelerators speed up the displaying of images on the monitor making it possible to achieve effects not otherwise possible - for example, the presentation of very large images or of interactive games in which images need to change quickly in response to user input. Many new personal computers are now sold with a graphics accelerator built in. The power of a graphics accelerator can be extended further if the personal computer is equipped with the Accelerated Graphics Port (AGP), a bus (data path) interface between the computer components involved in image display.

Each graphics accelerator provides an application program interface (API). Some support more than one API. Among the most popular API's are the industry standard OpenGL and Microsoft's DirectX and Direct3D.

3D GRAPHIC ACCERLERATOR ISSUES:

DIRECTX:

Microsoft DirectX is a collection of application programming interfaces (APIs) for handling tasks related to multimedia, especiallygame programming and video, on Microsoft platforms. Originally, the names of these APIs all began with Direct, such as Direct3D,DirectDraw, DirectMusic, DirectPlay, DirectSound, and so forth. The name Direct*X* was coined as shorthand term for all of these APIs (the X standing in for the particular API names) and soon became the name of the collection. When Microsoft later set out to develop a gaming console, the X was used as the basis of the name Xbox to indicate that the console was based on DirectX technology.[1]The X initial has been carried forward in the naming of APIs designed for the Xbox such as XInput and the Cross-platform Audio Creation Tool (XACT), while the DirectX pattern has been continued for Windows APIs such as Direct2D and DirectWrite.

Direct3D (the 3D graphics API within DirectX) is widely used in the development of video games for Microsoft Windows, SegaDreamcast, Microsoft Xbox, Microsoft Xbox 360, and Microsoft Xbox One. Direct3D is also used by other software applications for visualization and graphics tasks such as CAD/CAM engineering. As Direct3D is the most widely publicized component of DirectX, it is common to see the names "DirectX" and "Direct3D" used interchangeably.

The DirectX software development kit (SDK) consists of runtime libraries in redistributable binary form, along with accompanying documentation and headers for use in coding. Originally, the runtimes were only installed by games or explicitly by the user. Windows 95 did not launch with DirectX, but DirectX was included with Windows 95 OEM Service Release 2.[2] Windows 98 and Windows NT 4.0 both shipped with DirectX, as has every version of Windows released since. The SDK is available as a free download. While the runtimes are proprietary, closed-source software, source code is provided for most of the SDK samples. Starting with the release of Windows 8 Developer Preview, DirectX SDK has been integrated into Windows SDK.

MIC:

MODEMS:

A **modem** (**mo**dulator-**dem**odulator) is a network hardware device that modulates one or more carrier wave signals to encode digital information for transmission and demodulates signals to decode the transmitted information. The goal is to produce a signal that can be transmitted easily and decoded to reproduce the original digital data. Modems can be used with any means of transmitting analog signals, from light emitting diodes to radio. A common type of modem is one that turns the digital data of a computer into modulated electrical signal for transmission over telephone lines and demodulated by another modem at the receiver side to recover the digital data.

Modems are generally classified by the amount of data they can send in a given unit of time, usually expressed in bits per second (symbol**bit/s**, sometimes abbreviated "bps"), or bytes per second (symbol **B/s**). Modems can also be classified by their symbol rate, measured inbaud. The baud unit denotes symbols per second, or the number of times per second the modem sends a new signal. For example, the ITU V.21 standard used audio frequency shift keying with two possible frequencies, corresponding to two distinct symbols (or one bit per symbol), to carry 300 bits per second using 300 baud. By contrast, the original ITU V.22 standard, which could transmit and receive four distinct symbols (two bits per symbol), transmitted 1,200 bits by sending 600 symbols per second (600 baud) using phase shift keying.

KEYBOARDS:

a **computer keyboard** is a typewriter-style device which uses an arrangement of buttons or keys to act as a mechanical lever or electronic switch. Following the decline of punch cards and paper tape, interaction via teleprinter-style keyboards became the main input device for computers

TYPES:

- Standard
- Laptop size
- Flexible keyboards
- Hand held
- Thumb sized
- Multi functional.

SOUND BOARDS:

- Sound board (music), a part of a musical instrument
- , an attachment to a pulpit to assist a human speaker
- Alternate name of a mixing console, used to combine electronic audio signals
- Soundboard (computer program), a Web application or computer program with buttons that play short, often humorous sound clips
- *Soundboard* (magazine), a quarterly publication of the Guitar Foundation of America

- *Sound board* may refer to any circuit board used to produce or handle sound, such as a sound card
- building construction material used for soundproofing
- a wooden board in a boat used to measure depth

a pushbutton switch covered board which has a sound assigned to each. Used by talk show hosts.

AUDIO BENCH MARKS:

The CPU (Central Processing Unit) is just one factor that influences your computer's audio performance. There are others, not covered here, including the type of storage used and the amount and speed of RAM, but the CPU plays a hugely important part.

The days of being able to identify the best CPU by looking at the headline clock speed are long gone. Despite the clock speeds not having increased dramatically in recent years, the processor manufacturers have continued to improve their chips in other ways. (See the Intel & AMD box.) This means that when comparing different generations of similarly named chips, the clock speed and core count may appear similar, but the real-world audio performance will vary significantly. When moving on from a product that's three, four or perhaps even more years old to a new setup, it's therefore very difficult to figure out what sort of performance improvement your money will buy — and it's particularly difficult to establish at what point spending more money takes you past the point of diminishing returns.

Test Methodology

I spent quite some time comparing a wide range of CPUs commonly used in audio machines, using a standard test, the freely available DAWBench DSP Universal 2014 test. This reveals a lot about a CPU's suitability for audio production: although it won't give the full picture in regards to ASIO performance, which can vary according to other system factors, this test is designed specifically to 'stress test' a computer's CPU. DAWBench has been discussed many times in SOS and there's plenty of information at www.dawbench.com but, essentially, it loads instances of a plug-in in a DAW, measures the performance and generates a score. By restricting the tests to a standard plug-in (Cockos's ReaXComp multiband compressor, in this case), DAWBench enables you to make meaningful comparisons in performance.

It's important to keep other factors as consistent as possible, so I used the same USB audio interface (Native Instruments Komplete Audio 6) for all tests. Some expensive, better-performing interfaces may result in better performances overall, but the important thing is to establish a stable baseline. (It's also worth mentioning that, while better interfaces are available, I have established via group testing that this particular model offers a great performance/price ratio for new users wanting to make music.) For the same reason, all tests were performed in an identical Windows 7 OS installation, and the same DAW software (Reaper) was used: we can therefore be sure that the differences in performance shown on the chart aren't due to any differences in software.

I could have tested just the current generation of CPUs, but chose also to include legacy models because most users will keep a dedicated audio computer running for three to five years before upgrading — I hope the chart will give some indication of how the performance has progressed over the last several years, and how newer but lower-spec CPUs compare with older top-of-the-line ones.

As we'll see, another important 'take away' from this test is that not all CPUs with the same nomenclature are created equal, even if they're of the same generation and have the same naming system — this is particularly important to bear in mind when moving from a mobile to a desktop setup, or vice versa.

Finally, these tests are inevitably a snapshot: it won't be too many months before a new bigger, badder, faster model comes along, so perhaps we'll revisit this question when the next generation of chips becomes available. With all that in mind, let's run through the results, from the bottom of the chart upwards...