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RAM

SPECS

- **Memory Size**
  - comes with various size such as 4GB, 8GB, 16GB, 32GB
- **Heat spreader/sink**
  - Modern RAM modules have enclosures containing heat spreaders or passive heat sinks which help keep the memory chips cooler.
    Heat spreaders for RAMs are usually made of Aluminum, to efficiently dissipate heat and maintain high clock speeds
- **DDR types**
  - **SDRAM**
    - Bus Clock (MHz) - 100 – 166
    - Data Rate (MT/s) - 100 – 166
    - Voltage (V) - 3.3
  - **DDR1**
    - Bus Clock (MHz) - 133 – 200
    - Data Rate (MT/s) - 266 – 400
    - Voltage (V) - 2.6
  - **DDR2**
    - Bus Clock (MHz) - 266 – 400
    - Data Rate (MT/s) - 533 – 800
    - Voltage (V) - 1.8
  - **DDR3**
    - Bus Clock (MHz) - 533 – 800
    - Data Rate (MT/s) - 1066 – 1600
    - Voltage (V) - 1.5
  - **DDR4**
    - Bus Clock (MHz) - 1066 – 1600
    - Data Rate (MT/s) - 2133 – 3200
    - Voltage (V) - 1.2
- **RGB**
  - RGB is a fancy addon to the aesthetics of the RAM sticks. If you like the the glowing LEDs then go ahead and select RAMs with inbuilt RGB.
- **Frequency**
  - RAM frequency or clock speed is the maximum number of commands it can handle per second, measured in the unit of Megahertz (MHz) or MT/s.
- **CAS Latency**
  - Column Address Strobe (CAS) Latency or CL is the amount of time between sending a READ command to the RAM and the time when the data is available. It is measured in absolute time in nano-seconds (ns) as well has clock cycles.
- **Memory Bandwidth**
  - The rate at which a RAM can read or write data to/from the processor and vice versa is termed as the Memory Bandwidth. The memory bandwidth is determined by the memory bus width, the clock speed and transfers per cycle.
- **Memory Channels**
  - The memory channels are the link between the RAM and the CPU. It is the electrical path for data to move back and forth.
    Most modern consumer-grade or high-end motherboards employ two or four rows of memory channel configuration to take advantage of multi-channel memory technology

BRAND

- CROSAIR
- G-SKILL
- KINGSTON(HYPER X)
- CRUCIAL
- PATRIOT

Installation

- Step 1: Remove power cable and unplug any other cables so you can turn your computer on its side.
- Step 2: Take out the side panel. take out the RAM sticks by pressing on the tabs holding them in. Remove the sticks carefully.
- Step 3: To put in your new RAM sticks, match the notches with the gaps in the motherboard and push firmly and evenly until you hear a 'click'. The tabs on the outside should secure the RAM sticks.
- Pro tip: if it doesn't click into place the first time, you should take the RAM stick out and double check to make sure it's in the right way. If you try to force a RAM stick into the slot incorrectly, it could harm the motherboard.
- Step 4: After you've installed the new RAM kit, close your computer. Restart everything and reboot. Then, enjoy your upgrades in performance.

What's RAM

- Random Access Memory, or RAM, is the physical hardware inside a computer that temporarily stores data, serving as the computer's "working" memory.

PRICE

- Range from RM80-RM500

COMPUTER SYSTEM UNIT

MOTHERBOARD

- How to recognise a motherboard?
  - Motherboard – alternatively referred to mainboard/ main circuit board/ mobo. The motherboard is a printed circuit board that is the foundation of a computer and allows the CPU, RAM, and all other computer hardware components to function and communicate with each other.
- Parts of Motherboard
  - PCI slot
  - AGP slot
  - Northbridge
  - Southbridge
  - Memory slot
  - IDE connector
  - CPU socket
  - BIOS (Basic Input/ Output System)
  - Serial Advanced Technology Attachment(SATA)
- BRAND
  - ASRock, MSI, ASUS, Gigabyte
- PRICE
  - Its average cost is from RM522 to RM1060
- SPECIFICATION
  - Motherboard Size - 3 popular sizes - ATX, micro-ATX (mATX), and mini-ITX (ITX). All differ in sizes and number of interfaces (like RAM slots, PCIE slots, USB slots)
  - CPU Socket- determines what CPU you can install onto the motherboard. Different processors from different venders require different sockets, intel compatible socket for intel processors and AMD socket for AMD processors.
  - Chipset-Any processor is only compatible with a limited set of chipsets. Is the main chip on the motherboard that enables the CPU and peripherals to communicate with each other. Determines how fast and efficient components exchange data.
  -
    USB Ports-Motherboards will often have multiple different versions of USB ports available on them. Present on the backside IO panel and also onboard as header pins. The header pins connect to the front USB ports on the pc case via cables.
  - RAM Slots-RAM Slots (also known as DIMM slots) determine the type and capacity of RAM your motherboard supports. Motherboards usually support only a specific version of DIMM like DDR3 or DDR4 and then is a maximum upper limit to the amount of RAM that can be installed.
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    Video Connector Ports - HDMI, DP, DVI, and VGA. Used to access the on-board graphics of your processor. Most modern motherboards have both HDMI and DisplayPort interfaces together.
  - PCI-E Slots
    where peripherals like graphics cards are plugged into the motherboard. Most motherboards will have at least 1 x16 PCI-E slot and additional x1 or x16 slots. They allow you plug numerous other peripherals like USB port adapters, Wi-Fi adapters, Capture Cards etc.
  - Onboard Wi-Fi Support
    These motherboards are targeted towards the gaming users who need fast connectivity without having to depend on wires. Not upgradable like PCI-E based Wi-Fi cards. Sometimes the PCI-E based Wi-Fi cards may offer superior bandwidth and connectivity with better antennas compared to the motherboard's inbuilt Wi-Fi.
  - SATA 3 Ports
    Allows to connect SATA devices like hard disks, SSDs, internal optical drives etc. Most motherboards have between 4-6 sata ports.
  - RGB Headers
    for users who like bright and flashy lights in their PC.
- HOW TO INSTALL ?
  - Step 1: Prepare your tools.
    Phillips's head screwdriver, preferably one with a lightly magnetized tip to hold the screws in it.
    A pair of needle-nose pliers is a good idea too, should you need to fish out any screws that are dropped within the bowels of your PC case.
  - Step 2: Screw in the standoffs
    They are male screws with a female head, letting you screw the motherboard into them directly.
    Many cases come with these pre-fitted, but not always for the specific form or size of motherboard you're using.
  - Step 3: Install the I/O shield
    The final step before the motherboard itself, is installing the I/O shield.
    It's the silver or black panel that will protect the rear ports of your motherboard.
    Find it and press it into the rear gap in your case.
  - Step 4: Install the motherboard
    To install the motherboard, you'll want to carefully lower it into the case — coming in at an angle slanted upwards towards the front of the case
    You want to line up the screw holes on the board with the spacers you've put in place.
  - Step 5: The power cables
    To give power to your motherboard, you'll need to plug in its power cables too.

CENTRAL PROCESSING UNIT (CPU)

- How to recognize a CPU?
  - 1. A CPU is a square chip with a lot of small golden pin (microscopic transistors) embedded in it.
  - 2. The silicon chip sits in a special socket located on the main circuit board (motherboard or mainboard) inside the Chassy (PC)
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- COMPONENT OF CPU
  - 1.CONTROL UNIT
    - Tells a computer how to carry out program instructions
  - 2.ARITHMETIC-LOGIC UNIT
    - Carry our arithmetic and logical operations
- BRAND AND PRICE
  - BRANDS AVAILABLE:
    - Intel
    - AMD (Ryzen)
  - PRICE RANGE: RM500 – RM5000
- HOW TO INSTALL A CPU?
  - Step 1: Locate the CPU Socket
  - Step 2: Open the CPU Socket
  - Step 3: Match Arrow and Lower CPU Into Socket
  - Step 4: Lower the CPU on the socket gently
  - Step 5: Lock the CPU Socket
- SPECIFICATION
  - 1.CORE
    - Decade ago, all processors came with a single core.
    - Multi-core processors have become more popular as their availability has become increasingly common and software has been designed to utilize multi-core technology.
    - Dual-core to eight-core processors
    - If the software is only able to utilize three of the eight cores, then five cores are going to be unused
  - 2.CACHE
    - A processor's cache is similar to the memory of a computer.
    - Cache is a small amount of very fast memory that is used for temporary storage
    - Allows a computer to retrieve the files that are in the processor's cache quickly
    - The larger a processor's cache, the more files it will be able to store for that quick retrieval
  - 3.SOCKET COMPATIBILITY
    - Socket compatibility is a primary concern when it comes to buying a processor.
    - If a motherboard has already been acquired, make sure that the processor installed is compatible with the motherboard's socket
  - 4. FREQUENCY (CLOCK SPEED)
    - The frequency of a CPU, measured in hertz (Hz), is the speed at which it operates
    - In the past, faster frequency equaled better performance
    - It is important to look at a CPU's "instructions per clock" in addition to the frequency of the CPU
    - frequency is still a good indication of how quickly a processor can perform, it is no longer the only factor that impacts the actual speed of a processor.
  - 5.THERMAL DESIGN POWER
    - Processors generate heat
    - Thermal design power specification assigned to a CPU explains how much heat the processor is going to give off
    - Will directly affect the type of cooling device needed for a CPU
    - Overheating is a primary danger to a computer's componentry
  - 6.INTERGRATED GRAPHICS PROCESSING UNITS (GPUs)
    - Many of today's processors have integrated graphics processing units
    - Designed to perform the calculations related to graphics
    - If the computer will be used for graphics-intensive software and programs, then a CPU with an integrated GPU will likely not perform as needed

GRAPHICS CARD

- How to recognize a graphics card?
  - Looks like a smaller version of computer motherboard - has processor, RAM, etc
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- Prices
  - Ranges from RM300 - RM10,000
  - RTX 3060 – RM700, GTX1050 – RM250
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- Brands
  - Asus
  - MSI
  - Gigabyte
  - EVGA
  - Sapphire
- How to install
  1. Turn off PC and unplug from wall
  2. Open the PC case's sidde panel.
  3. Locate PCI-E x16 slot closest to the heat sink
  4. Firmly insert the card into the slot, then push down the plastic tab on the end of the PCI-E slot to hold it in place.
  5. Use a screw to secure the graphics card metal retention bracket to the PC's case
  6. Connect PCI-E power cables to the PSU
  7. Plug the display cable into the new graphics card
  8. Turn on PC
  9. Install the driver for the graphics card in the GPU company's website
- Specifications
  - 1. The GPU
    - referring to the graphics chips
    - only 2 brands, Nvidia & AMD
    - also referred as graphics chipset/co-processor
    - have 2 types, Integrated GPUs (cannot be replaced) and discrete GPUs (replaceable)
  - 2. Stream processors (AMD)/ CUDA Cores (Nvidia)
    - many individual computing units in the GPU that do the graphics computations and calculations
    - generally, more cores will deliver more performance
  - 3. Core Clock Speed
    - indicates the number of computations the cores does every second, measured in MHz
    - modern GPUs can reach speeds that and heavily depend on thermal conditions. make sure there is ample cooling
  - 4. Memory Type – GDDR
    - same as the regular RAM, called VRAM
    - stores graphics data temporarily to be processed by the GPU
    - GDDR6, GDDR6
    - in general higher GDDR version, perform better
  - 5. Memory Size
    - measured in GB
    - the bigger, more space to store graphical information, the better
    - VRAM cannot be changed like RAM, built in
  - 6. Motherboard Interface
    - need to make sure that the graphics card you purchase is compatible with the motherboard
    - Interface examples : PCIe
  - 7. Thermal Design Power (TDP)
    - power required to generate the highest amount of heat that the cooling system can handle
    - measured in watts
    - if power rating high, recommended to have PC case with good ventilation for max heat dissipation
  - 8. Power Connectors
    - Graphics card have become so power-intensive, so require more power
    - modern graphics card have power connectors that allow them to receive power directly from the power supply unit.
    - either six-pin or eight-pin connectors
  - 9. API Support
    - software that send instruct the graphics card to process graphical information
    - DirectX, OpenGL, Vulkan
  - 10. GFLOPS/TFLOPS
    - gigaflop/teraflop is unit to measure theoretical performance of a processing unit (GPU or CPU)
    - floating-point operations per second (how many floating-point operations it can do in a second)
    - one of the ther ways to compare processing unit performance

STORAGE

External Storage

- External Solid State Drive (SSD)
  - Around RM400-RM1000 depends on storage capacity and size
  -
- External Hard Disk Drive (HDD)
  - Around RM200-RM600 depends on storage capacity and brands
  -
- USB Flash Drive
  - Around RM20-RM100 depends on storage capacity and brands
  -

INTERNAL STORAGE

SPECIFICATION

- Both are non-volatile storage device, it will store data even if shut down the devices
- Size of storage is measured in GB and TB, largest capacity up to 20TB

SOLID STATE DRIVE (SSD)

- ADVANTAGES
  - Has higher reading speed and writing speed (550 MBps)
  - Durable (around 10 years)
  - Smaller Size
  - Less electricity required
- DRAWBACK
  - Expensive
  - Less storage capacity, up to 2TB only
- BRANDS AND PRICE
  - ADATA, Samsung, Sandisk, Kingston, Seagate
  -
  - Around RM150-RM900 depends on storage capacity and brands

HOW TO INSTALL SSD/HDD

- TOOLS: SCREWDRIVER
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- 1) Backup all your data in computer
- 2) Power off the system
- 3) Open the computer's back panel
  -
- 4) Locate the storage bay
- 5) Remove the old SSD/HDD
- 6) Insert the new SSD/HDD at appropriate angle
  -
- 7) Fasten the screws
- 8) Plug SSD into the system
- 9) Screw back the back panel
  -

Hard Drive Disk (HDD)

- ADVANTAGES
  - Large storage capacity
  - Cheap
- DRAWBACK
  - Noisy while operating
  - more electricity required
  - low reading speed and writing speed (125MBps)
  - short lifespan (3-5 years)
- BRANDS AND PRICE
  - Western Digital, Seagate, Toshiba, Hitachi, Sandisk
  - Around RM110-RM400 depends on storage capacity and brands